

Maternal Perceptions of Weight Status of Children

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ABSTRACT. *Objective.* We quantified maternal misclassification of child weight status and examined determinants associated with maternal perceptions of child weight status.

Methods. Data from the Third National Health and Nutrition Examination Survey (1988–1994) were used. The sample included 5500 children (aged 2–11 years) with maternal interview data. Maternal perceptions of children's weight status were compared with measured weights and statures from which body mass index (BMI; weight/stature²; kg/m²) percentiles and z scores were determined. Frequency analyses determined the percentages of mothers considering their child to be "overweight," "underweight," or "about the right weight." Multivariable logistic regression analyses determined predictors of maternal misclassification of overweight children (≥ 95 th BMI-for-age percentile) and those at risk for overweight (≥ 85 th to < 95 th BMI-for-age percentile).

Results. Nearly one third (32.1%) of mothers reported their overweight child as "about the right weight." Younger children and those with lower BMI-for-age z scores had significantly greater odds of maternal underclassification of child overweight status. For children at risk for overweight, 14.0% of mothers reported sons to be "overweight," whereas 29.0% considered daughters to be "overweight." Odds of maternal misclassification of at-risk children as "overweight" were significantly greater for daughters, older children, children with higher BMI-for-age z scores, and children whose mothers had a lower BMI. Race/ethnicity was not a significant predictor in either model.

Conclusions. Nearly one third of mothers misclassify overweight children as being lower than their measured weight status. Mothers are more likely to identify daughters who are at risk of overweight as being "overweight" than they are sons. *Pediatrics* 2003;111:1226–1231; *maternal perception, child, overweight, obesity, weight status, body weight, mother-child relations.*

ABBREVIATIONS. NHANES III, Third National Health and Nutrition Examination Survey; CDC, Centers for Disease Control and Prevention; NCHS, National Center for Health Statistics; BMI, body mass index.

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The prevalence of childhood obesity has increased dramatically in the United States.¹ This trend is of concern because obese children and adolescents are at risk for numerous social and medical problems,^{2,3} including adverse concentrations of blood lipids^{4,5} non-insulin-dependent diabetes,⁶ steatohepatitis,⁷ and cholelithiasis.⁸ Other medical complications include elevated blood pressure,^{5,9} sleep apnea,¹⁰ and orthopedic abnormalities.^{11,12} In addition, childhood obesity tracks into adulthood, during which time the health consequences associated with obesity are well documented.^{13,14} Thus, recognition of children who are overweight or at risk for becoming overweight is important so that prevention and treatment strategies may be implemented early in life.

In a recent study, Baughcum et al¹⁵ found that 79% of mothers with an overweight preschool-aged child failed to perceive that child as being overweight. These investigators reported that the adjusted odds that a mother would misclassify her overweight child were greater among mothers who had a high school education or less as compared with mothers who had at least some college education.¹⁵ In an analysis with focus groups, mothers with low household incomes often described overweight preschoolers using terminology with less negative connotations than "overweight" (such as "thick" or "solid") and indicated that they had little concern with overweight as long as the child was playful and happy and had a good appetite.¹⁶

These preliminary investigations of maternal perceptions of weight status of preschool children have important implications for the success or failure of overweight prevention and intervention efforts in children. Programs to prevent or treat childhood overweight status are unlikely to be successful if mothers do not recognize their children as having excess adiposity or if they do not recognize that there are health risks associated with excess fat accumulation. To further our understanding of maternal perceptions of children's weight status, we used nationally representative data from the Third National Health and Nutrition Examination Survey (NHANES III) to 1) quantify the extent to which mothers misclassify their children's weight status, 2) examine the demographic characteristics associated with maternal failure to classify overweight children accurately, and 3) examine the determinants associated with maternal misclassification of children who are at risk for overweight as "overweight."

METHODS

In NHANES III, data were collected by Centers for Disease Control and Prevention's (CDC's) National Center for Health Statistics (NCHS) between 1988 and 1994 from a nationally representative sample of United States residents using a complex, stratified, multistage probability cluster sampling design, details of which have been reported elsewhere.¹⁷ Data for this investigation were obtained from a household survey, which was conducted during a home interview with a caregiver (usually the mother) serving as the respondent and from a physical examination of the child, conducted in a mobile examination center. The time between the home interview and the physical examination ranged from 0 to 3 months for the sample included in the current study.

Maternal perception of weight status was assessed from responses to the question, "Do you consider [name of child] to be overweight, underweight, or about the right weight?" These responses were compared with the children's weight status determined from the CDC/NCHS sex- and age-specific percentiles¹⁸ for body mass index (BMI; weight/stature²; kg/m²) calculated from measured values for weight and stature. These BMI-for-age percentiles were then used to classify children's weight status as suggested by a committee of pediatric obesity experts convened by the Maternal and Child Health Bureau, Health Resources and Services Administration, the Department of Health and Human Services.^{19,20} Children's BMI values were plotted for sex and age, and values ≥ 95 th percentile were considered overweight, values ≥ 85 th and < 95 th percentile were considered at risk for overweight, values > 5 th to < 85 th percentile were considered normal weight, and values ≤ 5 th percentile were considered underweight. Other variables of interest included each child's age, sex, BMI-for-age z score, race/ethnicity (non-Hispanic white, non-Hispanic black, Mexican American), census region of residence (northeast, midwest, south, west), household poverty income ratio (calculated using family income and size; based on data from the Bureau of Census), and mother's BMI (calculated using self-reported values for weight and stature).

A total of 13 941 children aged 17 years and younger participated in the NHANES III survey. We limited our analyses to children aged 2 to 11 years because maternal perceptions of child weight status were reported only for children through 11 years of age, and measurements of stature, rather than recumbent length, were collected on children 2 years and older. Of the 8309 children between 2 and 11 years of age, we then excluded records in which: the interview respondents were not the mothers of the child participants ($n = 913$); maternal perceptions of weight status were not reported ($n = 37$); weight or stature values were missing ($n = 491$); the z scores for weight-for-age (< -5 or > 3), stature-for-age (< -5 or > 3), or BMI-for-age (< -4 or > 5) were not biologically plausible ($n = 54$); weights or statures were reported rather than measured ($n = 161$); mothers' weights or statures were not reported ($n = 467$); values for poverty income ratios were missing ($n = 455$); and children were of a race/ethnicity other than non-Hispanic white, non-Hispanic black, or Mexican American ($n = 231$). We did not include the race/ethnicity category of "other" because the heterogeneity within this group (eg, Asian American, American Indian/Alaska Native, and Hispanics other than Mexican American) makes interpreting the data difficult. The final sample for these analyses included 5500 child participants with accompanying maternal interview data.

Data were analyzed using SAS²¹ and SUDAAN²² statistical packages to account for the complex sampling. For all analyses, sampling weights were incorporated to account for differential probabilities of selection and response. Weighted means and standard errors were calculated for children's age, weight, stature, and BMI-for-age z score and for maternal BMI values. Differences between the means were calculated using general linear contrasts. Statistical significance for the contrasts was adjusted for multiple comparisons using a Bonferroni test to obtain an overall α of 0.05. Thus, the significance level for each comparison was set at $P \leq .0017$. Frequency analyses were conducted to determine the percentages of mothers who considered their son or daughter to be "overweight," "underweight," or "about the right weight."

Multivariable logistic regression analysis was used to identify predictors of 1) maternal misclassification of children's overweight status, 2) maternal misclassification of children's at risk for overweight status as "overweight," and 3) maternal misclassification of a child's at risk for overweight status as "underweight."

For the first model, the dependent variable was the failure of mothers to classify correctly their child as "overweight," and sex, age, BMI-for-age z score, mother's BMI, poverty income ratio, census region of residence, and race/ethnicity served as the predictor variables. For the second and third models, the effects that contributed to both overprediction and underprediction of children at risk for overweight were examined. Predictor variables for these models included the same variables as those for the first model. Only 9 mothers misclassified their at-risk child as being "underweight;" therefore, data are shown only for mothers who misclassified the weight status of their child as "overweight." Maternal education was not included in any of the logistic regression models because these data were available only for a smaller subset of mothers. Significance for the logistic regression analyses was set at $P \leq .05$.

An important methodological consideration involved our definition for misclassification of at risk for overweight. Maternal responses to the child weight perception question included "underweight," "about the right weight," or "overweight," with no option of choosing a term that would describe a weight status between "about the right weight" and "overweight." Because children who are at risk for being overweight are not yet overweight as defined by the expert committee convened by the Department of Health and Human Services,^{19,20} we considered responses of "about the right weight" to be correct and responses of "overweight" and "underweight" to indicate misclassification. Because at-risk children have excess weight, however, maternal identification of these children as "overweight" may not be entirely inappropriate.

RESULTS

Descriptive characteristics are reported for boys and girls at each level of measured weight status (Table 1). There were no differences between boys and girls within any of the weight status levels. As expected, weight and BMI-for-age z scores differed significantly across levels of weight status. Girls who were at risk of overweight and both overweight boys and overweight girls were significantly taller than their underweight or normal-weight counterparts. Overweight boys were significantly older than underweight boys, and overweight girls were significantly older than normal-weight girls. Mothers of overweight children had higher BMI values than mothers with children at a lower weight status.

Comparisons of mothers' perception of their child's weight status with the measured weight status of the child are shown for boys and girls in Table 2. Two thirds (66.7%) of mothers correctly classified their children who were at or above the 95th percentile as "overweight," but 32.1% of mothers of an overweight child classified that child as at "about the right weight." When boys at risk for overweight were considered, 14.0% of mothers perceived their son to be "overweight" and 84.7% perceived their son as "about the right weight." In contrast, 29.0% of mothers of girls considered their at-risk daughter to be "overweight," whereas 70.4% of these mothers perceived their daughter to be "about the right weight." Mothers were generally more likely to consider their normal-weight child to be "underweight" than "overweight." Mothers classified underweight children either as "underweight" or "about the right weight."

Odds ratios calculated from the multivariable logistic regression analyses are shown in Table 3. Factors significantly associated with the failure of mothers to report their overweight child as being "overweight" were the child's age and BMI z score.

TABLE 1. Descriptive Characteristics of Children Aged 2 to 11 Years

	Weight Status of Children*							
	Underweight		Normal Weight		At Risk for Overweight		Overweight	
	Boys (n = 125)	Girls (n = 106)	Boys (n = 1977)	Girls (n = 2040)	Boys (n = 332)	Girls (n = 350)	Boys (n = 280)	Girls (n = 290)
Age (y)	6.2 (0.4)	6.7 (0.4)	6.8 (0.1)	6.9 (0.1)	7.4 (0.3)	7.7 (0.3)	7.8† (0.3)	7.7‡ (0.2)
Weight (kg)	18.1 (0.6)	18.6 (0.6)	23.7† (0.4)	24.1† (0.5)	32.0†‡ (1.4)	33.9†‡ (1.3)	41.1†‡§ (1.6)	41.7†‡§ (1.5)
Stature (cm)	114.3 (1.9)	116.2 (1.9)	119.7 (0.7)	120.1 (0.9)	126.4† (2.2)	127.9†‡ (1.8)	130.5†‡ (1.9)	130.1†‡ (1.7)
BMI-for-age z score	-2.1 (0.05)	-2.1 (0.06)	-0.1† (0.02)	-0.1† (0.03)	1.3†‡ (0.01)	1.3†‡ (0.02)	2.1†‡§ (0.04)	2.1†‡§ (0.03)
Maternal BMI (kg/m ²)	22.8 (0.9)	22.7 (0.5)	24.4 (0.2)	24.1 (0.1)	25.8 (0.6)	26.2†‡ (0.6)	29.2†‡§ (0.7)	28.5†‡ (1.0)

* Status determined by BMI-for-age. Underweight ≤5th percentile; normal weight >5th percentile and <85th percentile; at risk for overweight ≥85th percentile and <95th percentile; overweight ≥95th percentile. Values are means (standard errors).

† P ≤ .0017 versus underweight of same sex.

‡ P ≤ .0017 versus normal weight of same sex.

§ P ≤ .0017 versus at risk for overweight of same sex.

TABLE 2. Maternal Perception of Weight Status of Children Aged 2 to 11 Years by Measured Weight Status

	Weight Status of Children*							
	Underweight		Normal Weight		At Risk for Overweight		Overweight	
	Boys (n = 125)	Girls (n = 106)	Boys (n = 1977)	Girls (n = 2040)	Boys (n = 332)	Girls (n = 350)	Boys (n = 280)	Girls (n = 290)
Underweight	55.5 (7.5)	66.6 (8.1)	12.2 (1.3)	9.6 (1.3)	1.3† (1.3)	0.6† (0.4)	0.3† (0.2)	2.2† (1.3)
About right weight	44.5 (7.5)	33.4 (8.1)	86.1 (1.4)	88.6 (1.4)	84.7 (4.1)	70.4 (3.5)	35.0 (6.2)	29.2 (4.7)
Overweight	0.0 (0.0)	0.0 (0.0)	1.8† (0.6)	1.9 (0.5)	14.0 (3.8)	29.0 (3.5)	64.7 (6.2)	68.7 (4.4)

* Status determined by BMI-for-age. Underweight ≤5th percentile; normal weight >5th percentile and <85th percentile; at risk for overweight ≥85th percentile and <95th percentile; overweight ≥95th percentile. Values are percentages (standard errors).

† Data are unstable because of small sample size within cell.

Specifically, the younger the child and the lower the child’s sex-specific BMI-for-age z score, the greater the odds that the mother would misclassify her overweight child as “about the right weight” or “underweight.” Factors significantly associated with maternal misclassification of an at risk for overweight child as being “overweight” included the child’s sex, age, and BMI-for-age z score and maternal BMI. Thus, daughters, older children, children with higher sex-specific BMI-for-age z scores, and children with mothers who had lower BMI values all had greater odds that their mother would report them as “overweight” rather than as “about the right weight” or “underweight.” Poverty income ratio, census region of residence, and race/ethnicity were not significant predictors for either model.

DISCUSSION

In our nationally representative study, two thirds of mothers with an overweight child (defined as ≥95th BMI-for-age percentile) classified that child as “overweight.” This percentage is greater than percentages reported in other investigations.^{15,23,24} The differences between findings may be attributable to variations in sampling, the type of indices used to define weight status, the BMI-for-age percentile se-

lected to define levels of weight status, the terminology used to describe weight status, and the age range of children studied.

The finding that essentially one third of mothers failed to classify correctly their overweight child as “overweight” may reflect a failure of mothers to recognize overweight status of their child, a reluctance to admit that their child is overweight, or a lack of understanding of what “overweight” means. Although there were no data available in the current study to examine reasons surrounding maternal misclassification of child overweight status, in small focus group discussions, Jain et al¹⁶ provided qualitative evidence of the reluctance of low-income mothers to describe their preschool children as “overweight.” These mothers expressed a distrust of growth charts, perceived them as having little relevance to their child, and indicated concern about their child’s weight only if their child was teased or inactive.¹⁶ The tendencies of these mothers to minimize issues related to overweight might also be seen in mothers with other sociocultural and economic backgrounds, but at this point, we do not know whether this is the case. Clearly, additional research is necessary to gain a more thorough understanding of how mothers perceive their child’s weight status.

TABLE 3. Odds Ratios and 95% Confidence Intervals for Predictors of Maternal Misclassification of Weight Status

Measured Weight Status of Children	Dependent Variable for Multivariable Logistic Regression Analyses	Predictors of Maternal Misclassification of Children's Specified Weight Status	Odds Ratio	Confidence Intervals
Overweight	Maternal misclassification of overweight status as "about the right weight" or "underweight"	Sex of child		
		Boys	1.00	reference
		Girls	0.65	0.30–1.40
		Age of child	0.68	0.58–0.80
		BMI-for-age z score	0.07	0.02–0.26
		Maternal BMI	1.02	0.96–1.09
		Poverty income ratio	0.83	0.62–1.09
		Census region		
		Northeast	0.61	0.18–2.03
		Midwest	1.00	reference
		South	1.29	0.45–3.75
		West	0.84	0.25–2.82
		Race/ethnicity		
		Non-Hispanic white	1.00	reference
Non-Hispanic black	0.72	0.37–1.40		
Mexican American	0.85	0.35–2.03		
At risk for overweight	Maternal misclassification of at risk for overweight status as "overweight"	Sex of child		
		Boys	1.00	reference
		Girls	2.86	1.28–6.39
		Age of child	1.35	1.20–1.51
		BMI-for-age z score	18.92	2.57–139.14
		Maternal BMI	0.94	0.88–0.99
		Poverty income ratio	1.14	0.81–1.59
		Census region		
		Northeast	1.28	0.63–2.62
		Midwest	1.00	reference
		South	1.34	0.59–3.03
		West	1.15	0.33–4.06
		Race/ethnicity		
		Non-Hispanic white	1.00	reference
Non-Hispanic black	1.49	0.68–3.26		
Mexican American	2.21	0.89–5.51		

Although reasons for maternal misclassification of overweight children are not known, 2 predictors were identified in the current investigation. First, mothers were less likely to misclassify older children as overweight as compared with younger children. With younger children, mothers tend to believe that their child will outgrow being overweight once the child becomes older, taller, and more active.¹⁶ Considering Jain's finding, perhaps mothers become less confident that their older, overweight child will outgrow their weight problem; however, we could not address this possibility. Similarly, we determined that as children's BMI-for-age z score increased, the likelihood for mothers to misclassify an overweight child decreased. This finding was expected; children who have BMI-for-age z scores just over the threshold for overweight may be more likely to be misclassified as being at a lower weight status than children whose BMI-for-age z scores are substantially higher such that there is little uncertainty regarding overweight status. Children's age and BMI-for-age z score explained 22% of the variation in mothers' failures to classify correctly their overweight child.

Children who are at risk for overweight, as defined by the 85th to <95th BMI-for-age percentile, represent a segment of the population that, although not defined as overweight as suggested,^{19,20} may present secondary complications such as hypertension and dyslipidemia that are attributable to excess weight.^{19,25} From a clinical perspective, recognizing

this group is important for screening and, if needed, treatment of these secondary disorders. Thus, we were also interested in how mothers perceived the weight status of their children who were at risk for overweight. In our investigation, mothers were more likely to classify older and heavier at-risk children as being "overweight." The multivariate logistic regression analyses also indicated that mothers were more likely to classify at-risk children as being "overweight" as their own BMI decreased.

Perhaps the most interesting finding from the logistic regression analyses was that mothers were nearly 3 times as likely to classify at-risk daughters as "overweight" as compared with at-risk sons. This finding has both positive and negative implications. On the one hand, it may be desirable for mothers to recognize their at-risk daughters as overweight, as doing so might ultimately be beneficial in terms of altering the food environment of the household or urging the child to maintain a more healthful diet and become more active. On the other hand, this finding suggests that sons may be held to a different (lower) standard, suggesting that they may be less likely to be given guidance about the importance of good nutrition or regular exercise, or their mothers may be less likely to create a supportive environment for healthful eating within the household. Until additional studies are conducted, however, this suggestion is only speculative. In addition, the sex difference observed in maternal perceptions of the at-risk

child is disconcerting in that the mothers' negative perceptions of their daughter's weight status may contribute to young girls being extraordinarily pressured to engage in weight control practices. Hill et al²⁶ showed that 8-year-old girls are drawn to weight control practices as a means to improve self-worth and that this behavior is closely tied to maternal dieting. Even girls as young as 5 years have been shown to exhibit negative self-concepts that are associated with parental concern about weight status and with maternal restriction of food.²⁷ In addition, Pierce and Wardle²⁸ showed that lowered self-esteem of girls is influenced by parents' dissatisfaction with their daughters' body weight, as well as by the girls' beliefs about their parents' dissatisfaction. Recently, Faith et al²⁹ reported that children whose weight is criticized by family and peers have reduced physical activity levels and that this criticism is more common among girls than boys and among heavier versus lighter children. Thus, maternal efforts to thwart the development or worsening of their child's overweight status should be approached delicately so as not to harm the child's self-concept or participation in physical activity.

The finding that race/ethnicity did not significantly predict maternal misclassification of child overweight or at risk for overweight status was a somewhat surprising finding, although our odds ratios for race/ethnicity differences were suggestive of a difference (especially for misclassification of at-risk children). Previous studies have documented differences between races in acceptance of body image, weight loss behavior, and/or self-esteem; these findings have been reported in adults,^{30,31} adolescents,^{32,33} and even preadolescents.^{34,35} For example, in 1997, Neff et al³² reported that white adolescent girls were 1.57 times as likely as their black counterparts to perceive themselves as overweight, and Adams et al³⁴ recently reported that black students (grades 4 and 7) selected, from drawings, a significantly larger ideal adult body size for both sexes than did white students. Despite these findings, little is known regarding racial differences in how mothers perceive the weight status of their children. Although, black fourth- and seventh-graders perceived significantly less family/peer concern about their weight than did white students,³⁴ in a study of maternal perceptions of overweight preschool children, Baughcum et al¹⁵ did not detect a significant difference between white and nonwhite children in multivariable logistic regression to determine the odds of mothers' failure to describe their overweight child as "overweight." Our nonsignificant finding for race/ethnicity is consistent with Baughcum's work; however, we were unable to compare odds ratios because these were not reported for this variable in the Baughcum investigation.¹⁵

To our knowledge, this is the first study to use a large, randomly selected national sample to examine maternal perceptions of children's weight status. A few limitations of this study should be considered, however. First, data in the current analyses were obtained from 1988–1994. Although these data are not recent, there are no other nationally representa-

tive data collected in more recent years from which the information provided from this investigation can be obtained. Second, the use of BMI as an indicator of adiposity in children is somewhat limited. This is because BMI is correlated with fat-free mass as well as fat mass.^{36,37} The relationships between BMI and the fat and fat-free body components are also complicated by varying growth rates and maturity levels.^{38,39} In addition, BMI is not completely independent of stature,³⁶ although independence is generally assumed. Despite these limitations of BMI, the use of BMI-for-age percentiles for screening overweight and at risk for overweight children is warranted because measurements of weight and stature are simple and reliable to make, correlations between BMI and fat mass are high,^{37,38,40} and the childhood cut points of the 85th and 95th BMI-for-age percentiles for at risk for overweight and overweight correspond closely to the adult BMI cut points of 25 and 30 kg/m² for overweight and obesity at 18 years of age. In addition, the 95th percentile for BMI is associated with persistence of obesity into adulthood, detrimental levels of cardiovascular disease risk factors, and increased mortality.¹⁹

CONCLUSIONS

The 3 most important findings gleaned from this investigation are that 1) nearly one third of mothers failed to classify correctly overweight children as "overweight," 2) girls at risk for overweight were nearly 3 times as likely as their male counterparts to be classified by their mothers as "overweight," and 3) race/ethnicity did not significantly predict maternal failure to correctly classify overweight and at risk for overweight children. These findings have important public health implications. Intervention programs for children are unlikely to be successful without parental support,⁴¹ but such support is unlikely if mothers do not recognize their overweight children are overweight. Thus pediatricians need to determine whether a mother recognizes that her child is overweight before counseling her regarding the health risks associated with excess weight. Furthermore, maternal recognition of children who are at risk for overweight as "overweight" could have both positive and negative implications. On the one hand, mothers may be more likely to make lifestyle decisions that positively affect the health of their child (eg, changing the food environment of the household or encouraging their child to eat nutritiously and exercise regularly); however, it is important that mothers exercise care in ensuring that their perceptions of overweight do not have a negative impact on the self-esteem of their children. Thus, physician counseling is extremely important in guiding mothers' interactions with their children regarding weight issues.

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