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Maternal Concern about Child Weight in a Study of Weight-Discordant Siblings

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Abstract

Objective—This study examined concern about child weight in mothers of weight-discordant siblings and determined the accuracy of maternal self-report versus measured child height, weight, and corresponding body mass index (BMI; kg/m²) z-score.

Design—Discordant-sibling design.

Sample—Forty-seven mothers of 5- to 12-year-old, weight-discordant siblings.

Measurements—Mothers self-reported their concern about child weight for each child separately and, for a subset of children, self-reported their heights and weights. Siblings' height, weight, waist circumference, and adiposity were measured.

Results—The majority (83%) of mothers expressed concern about their overweight/obese child's weight and 20% of mothers expressed concern about their normal-weight child's weight ($P<0.001$). Difference scores in maternal concern about child weight were positively associated with difference scores in sibling BMI z-score ($r=0.42$; $P=0.01$) and percent body fat ($r=0.56$; $P<0.001$). For overweight/obese children only, *maternal-reported* child heights and weights were significantly lower compared to the *measured* values ($P<0.03$).

Conclusions—One fifth of mothers of weight-discordant siblings were unconcerned about their overweight/obese child's weight and, for overweight/obese children only, mothers tended to under-report children's height and weight. Mothers' concern for their overweight/obese child's weight was greater for sibling pairs who were more discordant in their weight.

Keywords

weight-discordant siblings; obesity; maternal concern about child weight

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Background and Research Questions

The marked increase in childhood obesity over the past decades is a growing public health concern. Efforts to prevent or treat childhood obesity have only shown modest success (Birch & Ventura, 2009; Wilfley et al., 2007). One hurdle that may delay early prevention and treatment may be low rates of maternal recognition and concern about child overweight/obesity (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Campbell, Williams, Hampton, & Wake, 2006; Wen, Baur, Simpson, & Rissel, 2010). In a recent study among Hispanic mothers participating in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), > 77.5% of mothers misclassified their overweight or obese child as normal-weight (Chaparro, Langellier, Kim, & Whaley, 2011). Maternal misclassification of child weight status is common across different child ages and ethnicities. Specifically, underestimation of weight status among overweight/obese children has been shown to occur in 78-94% of infants, 60-97% of preschool children, 50-92% of primary school children, and in at least 35% of adolescents (e.g., Al-Qaoud, Al-Shami, & Prakash, 2010; Boutelle, Fulkerson, Neumark-Sztainer, & Story, 2004; Chaparro, et al., 2011; Oude Luttikhuis, Stolk, & Sauer, 2010). These and similar patterns of underestimation have been reported in multi-ethnic populations in North/South America, Australia/Pacific Islands, Europe, and the Middle East (e.g., Heimuli, Sundborn, Rush, Oliver, & Savila, 2011; Shrewsbury et al., 2012; Vuorela, Saha, & Salo, 2010; Warschburger & Kroller, 2009). These findings suggest that many mothers of overweight/obese children do not perceive their child to be at risk for excess weight.

Previous studies that examined maternal perception and concern about child weight were conducted among independent mother-child pairs. Little is known, however, to what extent mothers with multiple children may be differentially concerned about their children's weight especially when siblings differ in their weight status. It is possible that having two or more children in the home who are very different in their weight status may increase mothers' awareness and level of concern about a heavier child's weight because the presence of a lean child may present more of a contrast for mothers.

The primary aim of this study was to assess concern about child weight in mothers of weight-discordant siblings. We hypothesized that mothers would be more concerned about the weight status of their overweight/obese than their normal-weight child. Given that mothers in this study already had an overweight/obese child, they may also show concern for their normal-weight child. It is also possible that a family history of obesity may prompt mothers to be concerned about their children's weight regardless of whether their children are still normal weight or already overweight or obese (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). A second aim was to determine if greater weight- and adiposity-discordance among siblings was associated with a greater difference in maternal concern. We hypothesized that the more discordant siblings were in their BMI z-score and adiposity, the greater the difference would be in mothers' concern about their children's weight. A third aim was to assess, in a subsample of sibling pairs, the accuracy of maternal self-report versus measured child heights and weights. We hypothesized that mothers would more accurately report heights and weights for their normal-weight child than for their overweight/obese child. A final analysis assessed the relationship between maternal concern

about child weight in conjunction with actual child weight status on the difference between maternal-reported and measured height, weight, and corresponding BMI z-score. We hypothesized that mothers who showed greater concern about their child's weight would show greater accuracy in self-reported measures than mothers who were unconcerned about their child's weight.

Methods

Design and Sample

This cross-sectional study is part of a larger experimental study that aimed to examine eating behaviors of weight-discordant siblings (Kral et al., 2012). Caregivers were asked to participate in a telephone screening interview, complete a series of questionnaires, and have their children's anthropometric measures assessed. The study sample included 47 same-sex sibling pairs (53% female; 55% full siblings) between 5 and 12 years of age and their biological mothers living in the greater Philadelphia area. Families were recruited through advertisements and flyers placed in local newspapers, online (Craigslist), pediatricians' offices, and local grocery stores. Children from all racial/ethnic backgrounds were eligible to participate in the study. Families who met the initial screening criteria for sibling weight discordance and food preferences by phone were invited for an onsite screening at the Center for Weight and Eating Disorders during which siblings' height and weight were measured. To be included, siblings must have the same biological mother, be weight discordant; be of the same sex; and meet the age criteria (younger child: between 5 and 8 years of age; older child: between 9 and 12 years of age). For additional details regarding inclusion criteria, see Kral and colleagues (Kral, et al., 2012). Children were excluded from the study if they had serious medical conditions or were taking medications known to affect food intake and body weight; developmental or psychiatric conditions; and food allergies.

During the telephone screening, mothers were asked to self-report their children's height and weight using estimates, available data from recent visits to the pediatrician's office, or measurements collected at home. For Aim 3, only children whose mothers provided self-reported child height and weight were included in the analysis. BMI z-scores and child weight status for children were derived from maternal-reported measures. Maternal-reported heights and weights were available for 31 normal-weight children and 30 overweight/obese children. Fifty of those children were sibling pairs (i.e., 25 pairs). Participants for whom maternal-reported height and weight data were not available did not differ significantly in child weight ($P = 0.08$), BMI z-score ($P=0.68$), maternal BMI ($P=0.32$), or the frequency with which mothers did or did not express concern for child weight ($P=0.27$) when compared to participants for whom these data were available. Children for whom maternal-reported data were available, however, were significantly taller than children for whom these data were not available (138.5 ± 2.4 vs. 131.6 ± 1.8 cm; $P=0.02$).

The study was approved by the Institutional Review Board of the University of Pennsylvania. Mothers and children ages 7 years or older were asked to provide voluntary consent (mothers) and assent (children) to participate in the study by signing the assent and consent forms.

Measures

Maternal concern for child weight—Maternal concern for child weight was derived from the Child Feeding Questionnaire (CFQ) (Birch et al., 2001), which measures parental attitudes, beliefs, and practices about child feeding and obesity proneness. The ‘maternal concern about child weight’ subscale assesses mothers’ concerns about the child’s risk of being overweight and is composed of the following three questions: 1) “How concerned are you about your child eating too much when you are not around her?”, 2) “How concerned are you about your child having to diet to maintain a desirable weight?”, and 3) How concerned are you about your child becoming overweight?” Response options ranged from “unconcerned”, “a little concerned”, “concerned”, “fairly concerned” to “very concerned” on a 1 to 5 scale. The questionnaire has been widely used in pre-adolescent children (Boles et al., 2010; Burrows, Warren, & Collins, 2010; Payne, Galloway, & Webb, 2011; Webber, Cooke, Hill, & Wardle, 2010) and has shown good psychometric properties (Birch, et al., 2001). Specifically, scores for internal consistency for the ‘maternal concern about child weight’ subscale ranged between 0.75 (Birch, et al., 2001) to 0.77 (Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). The Cronbach’s α for the subscale in the current sample was 0.93. Additionally, data by Spruijt-Metz *et al.* (2002) showed that the ‘maternal concern about child weight’ subscale explained 15% of the variance in total fat mass in both African American and Caucasian children after correcting for lean mass and daily energy intake. Mothers completed a separate questionnaire for each child on separate visits, which were scheduled at least one week apart. For analyses, we dichotomized the mean for the subscale ‘maternal concern about child weight status’ into “unconcerned” (1 – 1.9 = “unconcerned”) or “concerned” (2.0 = “a little concerned” to 5.0 = “very concerned”).

Assessment of maternal and sibling height, weight, and adiposity—All anthropometric measurements were recorded in duplicate; the mean was used for statistical analyses. All staff who performed the measurements were trained by a certified anthropometrist and followed measurement techniques described in Lohman *et al.* (1988). Siblings’ and mothers’ height and weight were measured at a screening visit with participants wearing light clothing and having their shoes removed. Body weight was measured on a digital scale (Tanita BWB-800, Arlington Heights, IL; accurate to 0.1 kg) and standing height was measured on a wall-mounted stadiometer (Veder-Root, Elizabethtown, NC; accurate to 0.1cm). Child age- and sex-specific BMI percentiles and z-scores were calculated and siblings were classified as normal-weight (BMI-for-age 5–84th percentile), overweight (BMI-for-age 85–94th percentile), or obese (BMI-for-age 95th percentile) (Ogden et al., 2002). We defined weight discordance as one sibling being of normal weight and the other being overweight or obese. In order to facilitate recruitment, 5 sibling pairs were enrolled in the study where the BMI of the heavier sibling fell within 2% of the 85th BMI-for-age percentile. For the purpose of this analysis, we excluded the 5 heavier siblings who did not formally meet the BMI-for-age percentile criterion for overweight. Maternal BMI was calculated as weight (kg) divided by height (m) squared. Mothers were classified as normal-weight (BMI 18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), or obese (≥ 30 kg/m²) (Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: executive summary, 1998).

Siblings' body composition, waist circumference, and skinfold thickness were determined during a separate 4th study visit after assessing siblings' eating behaviors during the 3 prior weekly visits. Siblings' percent body fat and fat-free mass (FFM; kg) was determined by dual-energy x-ray absorptiometry (Hologic Discovery Wi/QDR Series Bone Densitometer, Bedford, MA). Their abdominal waist circumference was measured by placing a non-stretch, retractable fiberglass tape (Gulick II Model 67020, Country Technology, Inc., Gays Mills, WI; accurate 0.1cm) at the level of the umbilicus, and measured at the end of a normal expiration.

Siblings' skinfolds were measured at the biceps, triceps, suprailiac, and subscapular sites using a skinfold caliper (Holtain Tanner/Whitehouse Skinfold caliper; accurate 0.2mm) and following the procedures outlined by Lohman and colleagues (Lohman, et al., 1988).

Analytic Strategy

Data were analyzed with the SPSS (Version 19; SPSS Inc., Chicago, IL) and SAS (Version 9.2.; SAS Institute, Cary, NC) software. We used the Shapiro-Wilk test in conjunction with distribution plots, summary statistics, and regression diagnostics to examine the normality of distribution of continuous variables. All variables, except for maternal concern about child weight, were normally distributed. When computing BMI z-scores from maternal-reported child heights and weights, we identified one implausible score (<-4 or >5) (Committee, 1995), which was excluded from the analysis. We used paired t-tests to compare normal-weight and overweight/obese siblings on all continuous demographic and anthropometric measures.

We used chi-square analysis to compare frequencies of maternal concern about child weight (unconcerned/concerned) between normal-weight and overweight/obese siblings. General linear model regression analysis further assessed the influence of maternal race and ethnicity on the relationship between maternal concern about child weight (concerned/unconcerned) and child weight status (normal-weight vs. overweight/obese) by adding these variables as covariates to the model. Independent student t-tests were used to compare maternal concern about child weight (continuous variable) between overweight and obese children (Aim 1).

For Aim 2, we determined if greater weight- and adiposity-discordance among siblings was associated with a greater difference in maternal concern about child weight. We computed within-pair difference scores for maternal concern about child weight, age, BMI z-score, and percent body fat. We subtracted, for each measure, the score of the normal-weight sibling from the score of the overweight/obese sibling. Positive difference scores indicated that the overweight/obese sibling scored higher on a given measure compared to his/her normal-weight sibling. Negative difference scores indicated that the overweight/obese sibling scored lower compared to his/her normal-weight sibling. A difference score of zero indicated no difference between siblings (Rovine, 1994). We then used Pearson's correlation and linear regression analysis to assess the relationship between difference scores in maternal concern about child weight and difference scores in BMI z-scores and percent body fat. The influence of differences in siblings' age on both outcome measures was also examined by adding this variable as a covariate to the regression model.

We further assessed the accuracy of maternal-reported versus measured child heights and weights. For this analysis, we used paired t-tests that compared normal-weight and overweight/obese siblings on all maternal-reported and measured values and difference scores (maternal-reported value – measured value) for all outcomes. We used Pearson's correlation analysis, correlating maternal BMI with the difference scores for sibling height and weight to determine if maternal weight status influenced the accuracy of maternal-reported child height and weight.

We used general linear model regression analysis to assess the relationship between difference scores in maternal-reported and measured heights, weights, and BMI-z scores, maternal concern (concerned/unconcerned), and actual child weight status (normal-weight vs. overweight/obese). The interaction between maternal concern and child weight status was tested in all models.

Descriptive statistics are presented as means ($\pm$ SDs) for continuous variables or as frequencies or percentages for categorical variables. Reported *P* values are 2-sided and *P* < 0.05 was considered significant for all tests.

Results

Child and Maternal Characteristics

The majority of child participants were African American (~68%) and approximately one fifth of the sample was Hispanic (Table 1). Overweight/obese siblings differed significantly from normal-weight siblings in all anthropometric measures including height, height-for-age z-score, weight, weight-for-age z-score, BMI, BMI z-score, BMI-for-age percentile, body fat (%), fat-free mass, waist circumference, and skinfold thickness, respectively.

Maternal characteristics are depicted in Table 2. Approximately half (45%) of the mothers were married, 38% of mothers had a college/graduate degree, and approximately ¾ of them had household incomes >\$25,000. Ninety percent of mothers were considered either overweight or obese.

Maternal Concern about Child Weight

When dichotomizing maternal concern about child weight into 'unconcerned' and 'concerned', 17.1% of mothers stated to be unconcerned about their overweight/obese child's weight, while 80.4% of mothers were unconcerned about their lean child's weight (Chi-square statistic=29.4; *P*<0.001). The relationship between maternal concern about child weight and child weight status remained statistically significant when adding maternal race and ethnicity as covariates to the model (beta $\pm$ SE: 0.56 $\pm$ 0.1; *t*=5.07; *P*<0.0001). When analyzing maternal concern about child weight as a continuous variable using independent student t-tests, mothers expressed significantly greater concern for obese than for overweight children (4.1 $\pm$ 0.3 vs. 2.7 $\pm$ 0.3; *P* = 0.001).

Difference score analysis of sibling BMIz and body fat and maternal concern for child weight

Sibling differences in BMI z-score ($\beta \pm \text{SE}$: 1.1 ± 0.4 ; $t=2.9$; $P=0.01$) and percent body fat ($\beta \pm \text{SE}$: 0.09 ± 0.02 ; $t=4.2$; $P<0.001$) were significantly associated with sibling differences in maternal concern about child weight, even when adjusting for sibling differences in age. Figure 1 depicts the association between difference scores in maternal concern about child weight and difference scores in sibling BMI z-score and percent body fat. Together these findings indicate that the greater the within-sibling discordance in BMI and adiposity, the more concerned mothers were about their overweight/obese child's weight.

Accuracy of Maternal-Reported vs. Measured Child Height and Weight

Table 3 shows maternal-reported and measured heights, weights, BMI z-scores, and the corresponding weight status for normal-weight and overweight/obese siblings. For overweight/obese siblings only, *maternal-reported* heights (mean $\pm$ SE maternal-reported: 142.0 ± 19.2 cm vs. measured: 145.7 ± 17.2 cm; $t=-2.2$; $P=0.03$) and weights (maternal-reported: 48.8 ± 19.2 kg vs. measured: 51.7 ± 19.0 kg; $t=-2.5$; $P=0.02$), but not the corresponding BMI z-scores (derived from maternal report: 1.63 ± 0.70 vs. measured: 1.64 ± 0.52 ; $t=-0.2$; $P=0.83$), were significantly lower compared to the *measured* values. These findings suggest that mothers had more difficulty with accurately reporting (and tended to underreport to a greater extent) their overweight/obese child's measures than their normal-weight child's measures. None of the difference scores (maternal-reported value – measured value) for height, weight, and BMI z-score between normal-weight and overweight/obese siblings were statistically significant (summary statistics reported in Table 3). In terms of weight status based on maternal-reported heights and weights, approximately one fifth of normal-weight siblings would have been classified as underweight (3.2%), overweight (6.5%), or obese (9.7%), while approximately 15% of overweight/obese siblings would have been classified as either underweight (3.7%), or normal-weight (11.1%).

For normal-weight children, the correlations between maternal BMI and the difference scores for height (Pearson correlation (r)= -0.004 , $P=0.98$) and weight ($r=0.16$, $P=0.40$) were not statistically significant. The same was true for overweight/obese children. The correlations between maternal BMI and the difference scores for height ($r=-0.33$, $P=0.13$) and weight ($r=-0.19$, $P=0.40$) were not statistically significant. This finding suggests that maternal weight status did not affect the accuracy with which mothers self-reported their children's height and weight.

Relationship between Difference Scores and Maternal Concern and Child Weight Status

Regarding the differences scores between maternal-reported and measured weight, neither the maternal concern about child weight-by-actual child weight status interaction ($\beta \pm \text{SE}$: -1.4 ± 4.4 ; $t=-0.3$; $P=0.74$), nor the main effects of maternal concern about child weight ($\beta \pm \text{SE}$: -0.6 ± 2.2 ; $t=-0.3$; $P=0.79$) or actual child weight status ($\beta \pm \text{SE}$: -1.9 ± 2.1 ; $t=-0.9$; $P=0.38$) were statistically significant. Regarding the differences scores between maternal-reported and measured height, neither the maternal concern about child weight-by-actual child weight status interaction ($\beta \pm \text{SE}$: -5.6 ± 7.8 ; $t=-0.7$; $P=0.48$), nor the main

effects of maternal concern about child weight (beta $\pm$ SE: 1.5 ± 3.9 ; $t=0.4$; $P=0.70$) or actual child weight status (beta $\pm$ SE: -0.8 ± 3.9 ; $t=-0.2$; $P=0.83$) were statistically significant. Regarding the differences scores between maternal-reported and measured BMI z-score, neither the maternal concern about child weight-by-actual child weight status interaction (beta $\pm$ SE: 0.4 ± 0.8 ; $t=0.5$; $P=0.62$), nor the main effects of maternal concern about child weight (beta $\pm$ SE: -0.5 ± 0.4 ; $t=-1.4$; $P=0.18$) or actual child weight status (estimate $\pm$ SE: 0.1 ± 0.4 ; $t=0.4$; $P=0.73$) were statistically significant. These results suggest that maternal concern about child weight did not predict the accuracy with which mothers self-reported their child's weight (and corresponding BMI z-score); a finding which was independent of the child's weight status (normal-weight or overweight/obese).

Discussion

This study showed that 83% of mothers with weight-discordant siblings expressed concern about their overweight/obese child's weight status. The data further showed that greater within-pair discordance for weight and adiposity was associated with a greater within-pair difference in maternal concern for child weight. When comparing maternal-reported child height and weight to measured values, we found that mothers significantly underreported these measures for overweight/obese, but not normal-weight, children. Maternal level of accuracy in self-reported measures was not significantly related to maternal BMI and whether or not mothers expressed concern about their child's weight even when controlling for siblings' actual weight status.

In this study, 83% of mothers expressed concern about their overweight/obese child's weight, while only 20% of mothers expressed the concern for their normal-weight child's weight confirming our initial hypothesis. While these data are encouraging (i.e., the majority of mothers did express concern about their overweight/obese child's weight), 17% of mothers did *not* express concern about their overweight/obese child's weight. It is possible that many mothers may not recognize overweight or obesity in their children. Indeed most prior studies assessing single mother-child dyads showed that the majority of mothers perceived their overweight/obese child as normal weight (e.g., Al-Qaoud, et al., 2010; Boutelle, et al., 2004; de Hoog, Stronks, van Eijsden, Gemke, & Vrijkotte, 2012; Killion, Hughes, Wendt, Pease, & Nicklas, 2006). While perceptions of child weight status and concern about child weight status may represent two distinctly different concepts, our findings suggest that the presence of a normal-weight and an overweight/obese child in the same household may make the contrast in children's weight status more apparent, which in turn may increase mothers' awareness (and level of concern) about both of her children's weight. By having mothers complete a separate questionnaire for each child on separate visits, we aimed at increasing mothers' focus on each child and thereby isolating their concern for that child's weight as much as possible.

These findings have important clinical implications. Health care providers, including doctors, nurses, and nurse practitioners, play an important role in educating parents about their child's weight status (by, for example, reviewing their child's position on the Centers for Disease Control growth charts) and explaining health risks associated with excess adiposity in children. A recent study (Perrin, Skinner, & Steiner, 2012) reported that during

1999 through 2008, fewer than 25% of parents of overweight children reported having been informed about their child's weight status by a physician or health professional. It is also important for health professionals to inform caregivers that a family history of obesity, and maternal obesity in particular (Strauss & Knight, 1999; Whitaker, et al., 1997), predisposes their children to obesity, even children who may (still) be considered normal-weight and to address differences in growth patterns among ethnically diverse children (Cronk & Roche, 1982; Jung & Czajka-Narins, 1986).

Results further showed that the more discordant siblings were in their BMI z-score and adiposity, the more concern mothers expressed about their overweight/obese child's weight. This finding suggests that mothers may recognize excess weight in a child more readily if her other child is very lean. If true, this finding has important implications for practitioners in that mothers who present with children who are similar in weight status might be less likely to be concerned about child overweight and therefore may need additional counseling.

When comparing maternal-reported heights and weights to measured values, this study showed that mothers significantly underreported their heavier, but not their leaner, children's heights and weights. It is possible that mothers have more difficulty estimating or more commonly underestimate heights and weights of heavier children. With respect to children's weight, mothers may deliberately or subconsciously underreport their heavier children's measures in an effort to downplay their child's obesity risk. For adults, underreporting of weight is more frequently observed among overweight/obese than normal-weight individuals (Ciarapica, Mauro, Zaccaria, Cannella, & Polito, 2010; Lin, Deroo, Jacobs, & Sandler, 2011). It remains unclear as to why maternal-reported heights were significantly lower than measured heights for overweight/obese children. Of note, a similar, yet non-significant ($P=0.06$), trend in the same direction was seen for heights of normal-weight children. It is possible that mothers have difficulty to accurately estimate their children's heights, especially when children are heavier. In this study, for both sibling weight groups, maternal BMI did not influence the accuracy with which mothers reported their children's height and weight, although we observed a trend towards statistical significance for overweight and obese siblings. It is possible that the small range in BMI of mothers in this study and the small number of mothers from whom self-reported child heights and weights were available may have prevented us from finding significant associations. Of note, 90% of mothers in this study were considered overweight or obese, which reflects the high rates of adult overweight and obesity in the city of Philadelphia, especially among Black, Non-Hispanic (72%) and Hispanic (71%) adults (Philadelphia Department of Public Health, 2011). It is important to note that maternal-reported child height and weight does not provide information on whether mothers accurately identify an overweight/obese child as overweight/obese. However, the finding that mothers appeared to have more difficulty with reporting their overweight/obese, compared to their normal-weight, child's height and weight has important implications for public health initiatives and research that relies on maternal-reported data.

Of note, inaccuracy in maternal report of child height and weight would have resulted in 16% of normal-weight children being classified as overweight or obese and 15% of overweight/obese children being classified as underweight or normal-weight. Therefore,

maternal-reported child height and weight, if used to compute BMI-for-age percentiles and classify children's weight status, may lead to inaccurate classifications not only in overweight/obese, but also in normal-weight children.

Interestingly, the data further showed that, contrary to our initial hypothesis, maternal concern about child weight did not predict the accuracy with which mothers self-reported their children's weight, a finding which was independent of the children's actual weight status. This finding has important implications for clinical practice in that nurses should educate caregivers about their children's weight status and obesity risk regardless of whether or not caregivers show concern. Even caregivers who state that they are concerned about their child's weight may not recognize or be able to accurately report excess weight in their children.

Because of the greater risk for obesity and obesity-related diseases among minority populations (Cossrow & Falkner, 2004; Ogden, Carroll, Kit, & Flegal, 2012), it is of great importance to examine maternal perceptions about child weight status in minority families. Hence, besides the unique discordant sibling design and study sample (same-sex, weight-discordant siblings), the inclusion of a high percentage of minority children is considered a strength of this study.

Limitations and Implications for Future Research

The study had several limitations. One, mothers in this study showed a limited range in BMI and the majority of mothers were overweight or obese. Because of that, we were unable to conclusively determine the extent to which a mother's own weight status may have influenced the outcomes. Future research which includes mothers with a range in BMI is needed to fully determine the extent to which maternal weight status may affect their concern for their children's weight. Second, maternal-reported heights and weights were available for only a subsample of child participants, which may have decreased the statistical power for this analysis. Also, this study could not distinguish between mothers who used estimates, available data from recent visits to the pediatrician's office, or measurements collected at home to self-report their children's height and weight. Third, the study would have been strengthened by asking mothers to classify their children's weight status in addition to report their children's height and weight.

Implications for Public Health Nurses

The findings from this study have important implications for public health nurses. One, nurses should measure heights and weights of children, determine children's BMI-for-age percentiles using the Centers for Disease Control and Prevention (CDC) age- and sex-specific growth charts, and communicate children's corresponding weight status and health risk to their parents/caregivers. Second, it may also be helpful to inquire with the parent/caregiver if they have a family history of obesity and, if so, to point out the increased obesity risk for their children even if children are (still) of normal weight. Lastly, for families with an overweight or obese child, nurses play an important role in providing parents/caregivers with resources about obesity prevention and treatment programs that may be available in their community.

In conclusion, about one fifth of mothers of weight-discordant siblings stated to not be concerned about their overweight/obese child's weight. Mothers also significantly underreported their overweight/obese, but not their normal-weight, child's height and weight. These findings illustrate the need for health professionals to educate caregivers about the obesity risk of their children.

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Figure 1.

Relationship (slope and 95% confidence bands) between the within-pair difference scores (score of overweight/obese sibling – score of normal-weight sibling) in maternal concern for child weight and within-pair difference scores in sibling BMI z-score (Panel A) and percent body fat (Panel B).

Table 1

Demographic and anthropometric characteristics of weight-discordant sibling pairs(N = 47 pairs)

Characteristic	Normal-Weight Mean ($\pm$ SD) or n (%)	Overweight/Obese ^a Mean ($\pm$ SD) or n (%)
Age (years)	8.8 $\pm$ 2.3	9.2 $\pm$ 2.2
Race		
African American	32 (68)	28 (67)
Caucasian	4 (9)	4 (10)
Native Hawaiian or Pacific Islander	0 (0)	0 (0)
Multiracial	9 (19)	9 (21)
Unknown	2 (4)	1 (2)
Ethnicity		
Hispanic	9 (19)	9 (21)
Non-Hispanic	26 (55)	23 (53)
Unknown	12 (26)	15 (32)
Height (cm)	131.4 $\pm$ 14.9	141.2 $\pm$ 16.2 *
Height-for-age z-score	0.06 $\pm$ 0.9	1.11 $\pm$ 0.9 ***
Weight (kg)	29.0 $\pm$ 8.9	47.8 $\pm$ 18.3 ***
Weight-for-age z-score	-0.04 $\pm$ 0.7	1.8 $\pm$ 0.7 ***
BMI (kg/m ²)	16.4 $\pm$ 1.4	23.0 $\pm$ 4.9 ***
BMI z-score	-0.02 $\pm$ 0.5	1.70 $\pm$ 0.5 ***
BMI-for-age percentile	49.3 $\pm$ 20.0	93.1 $\pm$ 5.4 ***
Weight status		
Normal-weight	47 (100)	--
Overweight	--	21 (50)
Obese	--	21 (50)
Body fat (%)	19.2 $\pm$ 4.4	31.9 $\pm$ 8.7 ***
Fat-free mass (kg)	22.0 $\pm$ 7.0	30.0 $\pm$ 10.4 **
Waist circumference (cm)	57.4 $\pm$ 6.0	75.1 $\pm$ 15.2 ***
Skinfold thickness (mm)		
Biceps	5.6 $\pm$ 1.8	13.1 $\pm$ 5.9 ***
Triceps	9.9 $\pm$ 3.1	19.2 $\pm$ 6.9 ***
Subscapular	7.4 $\pm$ 2.2	16.6 $\pm$ 7.3 ***

Characteristic	Normal-Weight Mean ($\pm$ SD) or n (%)	Overweight/Obese ^a Mean ($\pm$ SD) or n (%)
Suprailiac	6.1 $\pm$ 2.1	15.4 $\pm$ 8.1 ***

^a Five children were excluded because they did not meet the BMI-for-age percentile cut-off for overweight/obesity; Paired t-test for continuous variables;

* $P < 0.05$,

** $P < 0.01$,

*** $P < 0.001$

Table 2

Demographic and anthropometric characteristics of mothers (N = 47)

Characteristic	Mean ($\pm$ SD) or n (%)
Age (years)	35.2 $\pm$ 6.1
Race	
African American	31 (66)
Caucasian	6 (13)
Native Hawaiian or Pacific Islander	1 (2)
Multiracial	6 (13)
Unknown	3 (6)
Ethnicity	
Hispanic	9 (19)
Non-Hispanic	22 (47)
Unknown	16 (34)
Marital Status	
Single	20 (42)
Married	21 (45)
Divorced, separated, or widowed	6 (13)
College degree or above (% yes)	18 (38)
Household income ^I	
< \$25,000	12 (25)
\$25,000 - \$50,000	20 (43)
> \$50,000	14 (30)
Height (m) ^I	1.66 $\pm$ 0.05
Weight (kg) ^I	91.6 $\pm$ 21.4
BMI (kg/m ²) ^I	33.3 $\pm$ 7.1
Weight status ^I	
Normal-weight	4 (8)
Overweight	12 (26)
Obese	30 (64)

^I Missing household income, height, weight, BMI, and weight status for one mother.

Table 3

Mean ($\pm$ SD) maternal-reported and measured heights, weights, BMI z-scores, and weight status for a subsample of normal-weight (NW; N = 31) and overweight/obese (OW/OB; N = 30) siblings.

Characteristic	NW sibling maternal- reported	NW sibling measured	t	P	OW/OB sibling maternal- reported	OW/OB sibling measured	t	P	NW sibling difference ^I	OW/OB sibling difference	t	P
Height, cm	128.3 $\pm$ 21.9	132.3 $\pm$ 16.6	-1.9	0.06	142.0 $\pm$ 19.2	145.7 $\pm$ 17.2	-2.2	0.03	-4.1 $\pm$ 11.6	-3.7 $\pm$ 8.6	-0.5	0.61
Weight, kg	29.2 $\pm$ 10.1	29.8 $\pm$ 10.1	-0.6	0.57	48.8 $\pm$ 19.2	51.7 $\pm$ 19.0	-2.5	0.02	-0.6 $\pm$ 5.7	-2.8 $\pm$ 5.8	1.6	0.12
BMI z-score	0.15 $\pm$ 1.22	-0.05 $\pm$ 0.50	0.9	0.39	1.63 $\pm$ 0.70	1.64 $\pm$ 0.52	-0.2	0.83	0.21 $\pm$ 1.29	-0.03 $\pm$ 0.59	0.9	0.36
Weight Status, n (%) ³												
Underweight	1 (3.2%)	0 (0%)			1 (3.7%)	0 (0%)						
Normal-weight	25 (80.6%)	31 (100%)			3 (11.1%)	0 (0%)						
Overweight	2 (6.5%)	0 (0%)			12 (44.4%)	14 (51.9%)						
Obese	3 (9.7%)	0 (0%)			11 (40.7%)	13 (48.1%)						

^IThe difference was calculated by subtracting, for each child, the measured value from the self-reported value.