Generational Shift in Parental Perceptions of Overweight Among School-Aged Children

WHAT'S KNOWN ON THIS SUBJECT: There is a generational shift in social norms related to body weight among adult population; little is known about the secular change of paternal perceptions of their child's weight.

WHAT THIS STUDY ADDS: A shift in body norms toward heavier weight statuses exists among parents of children, presenting a vast challenge to family-based childhood obesity prevention. Primary care providers can play a more active role in identifying the children with increased weight.

abstract

BACKGROUND: Parental perceptions of child’s weight status may influence family readiness to foster healthy behaviors. This study investigated the generational shifting of parental perceptions about children's weight.

METHODS: Data were collected in the NHANES 1988–1994 (n = 2871) and 2005–2010 (n = 3202). Parents, mainly mothers, were asked whether they considered their child, ages 6 to 11 years, to be overweight, underweight, or just about the right weight. The Centers for Disease Control and Prevention 2000 growth chart was used for reference. We ran Poisson regression to estimate the probability ratio between the 2 surveys for parents perceiving their child as overweight after controlling for actual weight.

RESULTS: The 10th percentile of BMI z scores for children who were parentally perceived as overweight shifted with statistical significance from 84th percentile of reference population in the early survey to 91st percentile of reference population in the recent survey (P < .05). The mean z score of children parentally perceived as overweight also increased between surveys with the largest increase among children from poor families (from 1.60 [SE: 0.20] to 1.98 [0.08], P < .05), followed by African Americans (from 1.65 [0.09] to 2.02 [0.05], P < .05). The probability of overweight/obese children being correctly perceived as overweight by the parents declined by 24% between surveys (probability ratio = 0.76 [95% confidence interval: 0.67–0.87]).

CONCLUSIONS: Overweight/obese children were less likely to be perceived as overweight in the recent survey compared with peers of similar weight but surveyed 10+ years earlier. The declining tendency among parents to perceive overweight children appropriately may indicate a generational shift in social norms related to body weight.

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KEY WORDS
NHANES, BMI, obesity, overweight, social norms, children, parental perception

ABBREVIATIONS
CDC—Centers for Disease Control and Prevention
CI—confidence interval
PIR—poverty income ratio
PR—probability ratio

Dr. Zhang conceived of and designed the study, acquired, and interpreted the data, drafted the article, and critically revised it. Dr. Zhang had full access to all of the data in the study, takes responsibility for the integrity of the data and the accuracy of the data analysis; Drs Hansen, Duncan, Tarasenko, and Yan assisted in designing, analyzing, and interpreting the data and revising the manuscript; and all authors approved the final manuscript as submitted.

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The prevalence of obesity increased from 7% in 1980 to nearly 18% in 2012 among children ages 6 to 11 years in the United States. Multiple determinants contribute to obesity and are targeted in obesity prevention and control programs, but have yielded only modest results. Parent failure to recognize the overweight status of their child, and maternal misperceptions in particular, may be one reason for the less than satisfactory results of pediatric obesity prevention and control. Parental perceptions of their child’s weight may influence family readiness to foster healthy behaviors. Parents play a crucial role in establishing children’s eating behaviors through food availability and modeling. Emerging evidence suggests that parental perceptions of child weight is implicated in children’s health behaviors, such as healthy eating and active living, and whether a parent would elect to have their child participate in an obesity prevention intervention.

Correlates of parental perceptions of their child’s weight include child weight status, age, gender, and parental education level. However, few studies have assessed the broader social context that as childhood obesity rates have increased over time, parental perceptions of their child’s weight may have also changed. It has been observed among adults that as obesity prevalence increased, the perceived “normal” weight increased. In line with social comparison theory, in which individuals assess their weight status in relation to others rather than against an absolute scale, the shifting of perceived normal weight could lead to an increase in parental misperceptions of their child’s actual weight status. Research demonstrates an increasing trend in misperceptions of weight status among adult populations. However, to the best of our knowledge, no studies have examined trends related to parental perceptions of child weight status. Thoroughly examining the evolution of parental perceptions can yield instructive information for fine-tuning strategies for childhood obesity prevention. Hence, the purpose of the current analyses is (1) to examine the generational shifting of parental perceptions of the weight status of their child, and (2) to identify the subpopulation among which the shifting occurs most noticeably.

**METHODS**

**Study Population**

The study participants were children ages 6 to 11 years, who were proxy-interviewed in the NHANES III conducted during 1988–1994 or the continuous NHANES conducted during 2005–2010. Study participants were sampled through a complex, multistage probability design, and data were collected through interviews and physical examinations that include anthropometric measurements (eg, weight and height). A total of 3233 children from the 1988–1994 survey, and 3508 children from the 2005–2010 survey were selected for the current analyses. We excluded 436 individuals because of missing data on family income level. Because the primary goal of the current study was to examine the shifting of perceptions related to overweight children, we also excluded 114 children from the 1988–1994 survey and 104 children from the 2005–2010 who were underweight (BMI <5 percentile). A total of 2871 children in the 1988–1994 survey and 3202 children in the 2005–2010 survey were retained for the current analysis.

**Data Collection and Variable Definitions**

**Parental Assessment of Children's Weight Status**

NHANES interviews are conducted in English and Spanish by trained field staff. Questionnaires were administered in the home to a proxy respondent by using the Computer-Assisted Personal Interviewing system (in phase I of NHANES III, paper-and-pen method). Data for proxy’s assessment of child’s weight status were obtained from Household Youth Questionnaires for the 1988–1994 survey and were collected in the Early Childhood section of the 2005–2010 survey. Question wording was “Do you consider [child’s name] to be overweight, underweight, just about the right weight, or don’t know” in the year 1988–1994 and 2005–2008, and as “how do you consider [child’s name]’s weight? — overweight, underweight, about the right weight, or don’t know” in the year 2009–2010. The data on relationship (eg, mother, father, grandparent, etc) between proxy and sampled child were not available for the 2005–2010 survey. Hence, we were not able to differentiate proxies and did not exclude the children whose proxies were not mothers in the 2005–2010 survey. In the 1988–1994 survey, 89.7% of the proxies were mothers; hence, the term “parental” used in the current report at large refers to “maternal.”

**Directly Measured Weight Status**

Anthropometric data were collected in the Mobile Examination Center by trained health technicians using a standard protocol. Body weight was measured to the nearest 0.05 kg (Toledo 2181 Scale, Columbus, OH), and height to the nearest 0.1 cm with standardized measuring equipment (Holtain Height Stadiometer Holtain, Crymych, United Kingdom). All anthropometric data were reviewed for unusual and erroneous values. Values above the 99th percentile or below the first percentile for a particular age or age-gender group were flagged and reassessed. BMI was calculated in kg/m² then converted to a gender- and age-specific BMI percentile value and z score by using a computerized formula derived from the Centers for Disease Control and Prevention (CDC) 2000 growth charts (as the reference population). Participants...
Variables for Stratifications

Race/ethnicity was reported by participants and classified by NHANES as “non-Hispanic white,” “non-Hispanic black,” or “Hispanic American,” and “other.” Income was reported as a range for the previous calendar year. A poverty income ratio (PIR) was calculated by comparing the midpoint of the selected income range value to the appropriate poverty threshold. For this study, 4 categories of PIR were considered: “poor” (PIR <1.0), “near poor” (1 ≤ PIR < 2), “middle-income” (2 ≤ PIR < 4), and “high-income” (PIR ≥4).28

Analytic Procedures

With appropriate weighting and nesting variables, we used SAS (version 9.3, SAS Institute, Inc, Cary, NC) to calculate the weighted study populations and associated SEs for each socio-demographic stratum separately for both surveys. The analyses were conducted in 3 steps. First, we assessed the trend in mismatch between parentally perceived and directly measured body weight status (Fig 1). This step was conducted with all children, including normal weight, overweight, and obese children. Secondly, we calculated and compared the means, medians, skewness, and kurtosis of the distribution of age- and gender-standardized BMI z scores of parentally perceived overweight children to assess the overall shift of the z score distribution between the years 1988–1994 and 2005–2010 (Fig 2). We also tried to assess the shifting of the minimum BMI z scores (threshold) for being parentally perceived overweight. Theoretically, the very end of the left tail of the z score distribution should be used to estimate the parental threshold for perceiving their child as overweight. However, relatively small sample sizes for the end of the distribution precluded us from making a stable estimation. Therefore, we used the 10th percentile of the BMI z score distributions from both surveys to estimate the shift in parental thresholds of BMI z score and the percentile (against the reference population) for perceiving their child as overweight. The differences in means of z scores among children parentally perceived as overweight were further examined by the socio-demographic stratum (ie, boys and girls; whites, African Americans, and Hispanics, and others; poor, near poor, middle, and high income) to identify the subpopulation experiencing the most shifting (Fig 3). The second step was conducted among parentally perceived overweight children only. Shifting mean and median of z scores among children parentally perceived as overweight may be driven by an increasing average body weight among the entire child population.15 Therefore, in the third step of analyses, we controlled for the BMI z score to assess the probability ratios (PRs; 2005–2010 over 1988–1994) of being parentally perceived as overweight between the 2 surveys for children with the same BMI z scores (Table 1). The third step was conducted among directly measured overweight children only. The PRs were used to measure the parental tendency to perceive their child as overweight among actually overweight/obese children. We combined the data from the 1988–1994 and 2005–2010 surveys and created a dummy variable to compare the parameters of 2 surveys. Modified Poisson regression was used to do multivariable adjustment.29 In addition to the dummy variable, child’s BMI z score, gender, race/ethnicity, age, and family income level were included in the multivariable adjusted models whenever appropriate.

RESULTS

Figure 1 highlights the mismatch between parental perceptions and children’s BMI level calculated from directly measured body weight and height. More than three-quarters of parents interviewed in the 2005–2010 survey perceived their overweight children as “about the right weight,” 83% for boys (Fig 1B) and 78% for girls (Fig 1E). The changes between 1988–1994 and 2005–2010 were statistically significant for both genders (P < .01), but relatively smaller for boys (from 78% to 83%; Fig 1B) than for girls (from 61% to 78%; Fig 1E). Roughly one-third of the parents perceived their obese child as about the right weight in the 2005–2010 survey (Fig 1C and F), but in the 1988–1994 survey, only 21% of parents perceived their daughters as about the right weight (Fig 1F). The gender-specific mismatch of parental perceptions existing with the 1988–1994 survey diminished in 2005–2010. For example, in the 1988–1994 survey, 21% of the parents with overweight boys and 39% of the parents with overweight girls perceived their children as overweight. In the 2005–2010 survey, these figures declined to 16% for boys and 22% for girls. The BMI z score distributions among parentally perceived overweight children (unweighted n = 486 in the 1988–1994 survey, and n = 546 in the 2005–2010 survey) were presented in Fig 2. Compared with that of the 1988–1994 survey, the distribution of z scores for the children surveyed in 2005–2010 skewed negatively (skewness = −0.96 for 1988–1994 and −1.20 for 2005–2010), and was less flat (Kurtosis = 1.83 for early and 3.67 for recent). The threshold z score for being parentally perceived as overweight increased significantly from 0.96 in 1988–1994 survey to 1.35 in 2005–2010 survey (P < .05). The BMI...
percentile corresponding to the threshold z score for being parentally perceived as overweight was 84th of 2000 CDC growth chart in 1988–1994, and increased to 91st in 2005–2010. Both the mean and median of the distribution shifted toward the right tail. However, no statistically significant shifting was observed for the 90th percentile. The peaked distribution indicates that perceptions regarding what is overweight were becoming converged at the population level. When the study population was stratified by demographic stratum (Fig 3), the largest increase in z scores between the 2 surveys occurred among perceived overweight children from poor families (from 1.72 [95 confidence interval (CI): 1.51–1.92] to 2.04 [1.98–2.10], P < .05), followed by African Americans (1.69 [1.58–1.80] to 2.03 [1.94–2.12], P < .05). African American children who were parentally perceived as overweight had the highest mean z scores compared with their peers from other races/ethnicities.

Overall, the probability of overweight/obese children being correctly perceived as overweight by parents declined by 16% (PR = 0.84 [95% CI: 0.75–0.95]), from 0.51 (0.45–0.56) in 1988–1994 to 0.44 (0.45–0.53) in 2005–2010 (Table 1). After adjustment for z score, the probability of accurately being parentally perceived as overweight declined further by 24% in 2005–2010 when compared with 1988–1994 (PR = 0.76 [0.67–0.87]). The relative decrease was greater for girls (PR = 0.72 [0.60–0.86]) than for boys (PR = 0.83 [0.69–0.99]).

DISCUSSION

Using nationally representative data collected from parent interviews, mainly from mothers, the current study confirmed the observation from previous studies that a substantial percentage of parents falsely categorized their overweight children as being normal weight. We further observed that there was a secular increase in the BMI z score threshold for being parentally perceived as overweight. With BMI z scores under control, we estimated that there was a 24% decline in the tendency among parents to correctly perceive their overweight child as overweight, suggesting a generational shift in social norms related to children’s body weight.

There are multiple potential reasons underlying the declining tendency to perceive an overweight child appropriately. Parents may also lack an understanding of what “being overweight” means because of the potentially confusing nature of being overweight. The
assessments of body weight in children, in particular peri-pubertal children, is formidable because this group is continuously experiencing changes in body composition and size. Instead of setting thresholds for categorization, the BMI percentile is used to allow for comparison among children of the same gender and age. The definition of overweight is even more confusing. In 1994, the Expert Committee on Clinical Guidelines for Overweight in Adolescent Preventive Services recommended that children with a BMI $\geq 95$th percentile for age and gender should be considered overweight. In 2005, the Institute of Medicine purposely elected to define children with a BMI of $\geq 95$th percentile for age and gender as obese to convey the urgency of childhood obesity. The changes of being overweight took place between the 2 surveys used by the current study, and may explain a substantial amount of the confusion parents struggled with. Previous investigations conducted among low-income mothers who incorrectly perceived their overweight preschool children as about the right weight revealed that these mothers expressed a distrust of growth charts, and that the charts are ethnically biased and therefore invalid. There is also a possibility that parents were reluctant to admit that their child was overweight because of social pressure to maintain a lower weight, and the stigma attached to obesity. The findings of the current study are supported by the social comparison theory. The theory postulates that individuals assess themselves in relation to others rather than against an absolute scale. In the wake of the obesity pandemic, more and more parents may compare their child to peers or friends of their child to maintain a positive image of their own child. The numbers, mathematical calculations, and growth charts recommended by professional organizations or health professionals are more remote from parent's thoughts.

**FIGURE 2**

Shifting distribution of BMI z scores between the 2 survey periods. Parentally perceived overweight children ages 6 to 11 years, NHANES 1988–1994 and 2005–2010. BMI percentiles were calculated age-gender-specifically based on directly measured height and weight by using the CDC 2000 growth chart and excluding extreme values (i.e., $z$ score $>4$). The statistics were calculated by using SAS survey procedures with appropriate weighting and nesting variables; however, the histograms were generated without weighting and nesting variables by using PROC UNIVARIATE of SAS. The Kurtosis refers to “excess kurtosis.” The standard normal distribution has a kurtosis of 0, positive Kurtosis indicates a “peaked” distribution, and a negative one indicates a “flat” distribution. *P value for the difference between 2 surveys <.05.
than children of the same age, and are less likely to be used by parents as the reference. Hence, as the prevalence of pediatric obesity has tripled within decades, the socially accepted ideal body weight may also be shifting accordingly. Health-related behavior of school-aged children remains largely under the influence and control of their parents\textsuperscript{32}; however, a majority of obesity interventions are school based with limited parent involvement\textsuperscript{41}. Crucial to parental involvement in weight reduction or maintenance efforts among children is parental recognition of their child’s overweight status. This recognition and the associated health risks are the main driving force motivating parents to take action\textsuperscript{10,42,43}. Parents with accurate perceptions have a greater readiness to make weight related behavioral changes and are more effective in making it happen\textsuperscript{42,44}. Various recommendations and great efforts have been made to improve maternal perception and increase parental involvement and commitment\textsuperscript{45}; however, the declining tendency to appropriately classify overweight/obese children among parents revealed that the efforts have been unsatisfactorily successful.

### FIGURE 3
Mean BMI z scores by socio-demographic strata. Parentally perceived overweight/obese children ages 6 to 11 years, NHANES 1988–1994, and 2005–2010. BMI was calculated by using directly measured body weight and height. The \( P \) value of the \( t \) test for the differences between 1988–1994 and 2005–2010 were calculated by using weighted population. The lower and upper limits of the 95% CIs were calculated by using SAS survey procedures with appropriate weighting and nesting variables. The asterisk indicates that the difference between the 2 surveys was statistically significant. Due to the small sample sizes, the 95% lower CI for the high income group (unweighted \( n = 23 \)) in 1988–1994 was 1.04, smaller than the minimum value presented in the chart, which is 1.30.


<table>
<thead>
<tr>
<th>Survey Period</th>
<th>Unweighted Sample Size</th>
<th>Probability of Being Parentally Perceived as Overweight</th>
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<tbody>
<tr>
<td></td>
<td>Parentally Perceived</td>
<td>Directly Measured</td>
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<td></td>
<td>Overweight</td>
<td>Overweight/Obese\textsuperscript{a}</td>
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<td></td>
<td>Probability</td>
<td>PR (95% CI)</td>
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<td>(95% CI)</td>
<td>Unadjusted</td>
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<td>Adjusted\textsuperscript{b}</td>
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<td>Overall</td>
<td>1988–1994</td>
<td>433</td>
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<td></td>
<td></td>
<td>0.51 (0.45–0.56)</td>
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<td></td>
<td>2005–2010</td>
<td>531</td>
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<tr>
<td></td>
<td></td>
<td>0.44 (0.43–0.53)</td>
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<tr>
<td>Boys</td>
<td>1988–1994</td>
<td>197</td>
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<tr>
<td></td>
<td></td>
<td>0.45 (0.35–0.55)</td>
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<td></td>
<td>2005–2010</td>
<td>286</td>
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<td></td>
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<td>0.43 (0.38–0.47)</td>
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<td>2005–2010</td>
<td>265</td>
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<td>0.45 (0.40–0.49)</td>
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\textsuperscript{a} BMI was calculated by using directly measured body weight and height. Overweight/obese was defined as age-gender-specific BMI equal to or greater than 85th percentile\textsuperscript{25}.  

\textsuperscript{b} The NHANES III (1988–1994) was used as the reference years. Modified Poisson regression was used to adjust for the BMI z score (in continuous format). Child’s gender, race/ethnicity, age, and family income level were also included in the multivariable adjusted models whenever appropriate\textsuperscript{29}.
The findings of the current report could also be examined from an alternative perspective. It is well established that overweight/obese children experience psychological distress, including poor self-esteem and depression. Increasing evidence indicates that it might be the perceived body weight rather than actual body weight that appears to be the potent force leading to psychological distress. An increasing percentage of parents classifying their overweight child as about the right weight may suggest a reduction in social pressure to lose weight, and that parents have become more receptive: more willing to admit the fact and receive help and take a more active role in family-based intervention. There are no family members more important than parents to children. Weight-related teasing from parents would have a devastating impact on a child’s psycho-emotional wellbeing. Weight-related teasing is less likely to occur among receptive parents. The parents’ attitude toward a child’s physical health and psychological development as well should be vigilantly protected and carefully maneuvered to enhance family-based childhood obesity prevention efforts.

The current study has limitations. Without data specifying the relationship between proxies and children in the 2005–2010 survey, we failed to focus on maternal perception exclusively. It may be more meaningful to examine the issue from the maternal perspective because mothers still take more responsibility for shopping and preparing food, and have a stronger influence on a child’s life style. The small sample sizes for several demographic strata prevent us from making definitive conclusions. The bias is also possible because of slight differences in wording for parental descriptions in the year 2009–2010. In spite of its cross-sectional nature, observations from different survey years are instructive for overall trends. However, more than 2 cross-sections may be necessary to assess generational shifting of social norms in a time-scale longer than the current study. The current study has its unique strengths as well. To the best of our knowledge, this is the first study using nationally representative samples with consistently high response rates (>85%) to investigate generational shifting of weight-related social norms from a parental perspective. The spectrum of participants, including 3 major ethnicities and other demographic diversity, gave us the ability to examine the issue among a diverse scope of children.

CONCLUSIONS
From the year 1988 to 2010, the probability of weight status being appropriately perceived by parents declined by 24% among overweight peri-pubertal children, presenting a vast challenge to family-based pediatric obesity prevention. Novel strategies should be developed to target parental recognition of their child’s weight status. Sensitive and culturally competent dialogues to encourage parental involvement are needed to unleash parental power. Frontline clinical care providers can play a crucial role in identifying children with unhealthy weight and assisting parents with appropriate family-based obesity prevention strategies. By alerting each parent whose child has a weight issue and providing evidence-based interventions, we can effectively reduce the burden of childhood obesity in the United States.

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