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Parental Perceptions of Their Adolescent's Weight Status: The ECHO Study

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Abstract

Objectives—To assess the correlates of parental classification of adolescent weight status.

Methods—Measured adolescent weight status was compared to parent self-report perception data (n=374 dyads) using multivariate analyses with interactions to identify characteristics associated with inaccurate parent classification of adolescent weight status.

Results—Adolescent weight status was underestimated by 31% of parents. College-educated parents were more likely to underestimate the weight of their male adolescents (OR=1.95) and overweight adolescents (OR=4.0). Non-college-educated parents were 8.92 times as likely to misclassify overweight adolescents, regardless of the sex of the child.

Conclusions—Parental perception may play a role in supporting adolescent's healthy weight-related behaviors.

Keywords

parent perceptions; adolescent weight; overweight; underestimate; weight discordance

Parents play an important role in helping their children maintain a healthy weight by creating a healthy environment as well as by establishing normative behavior that supports healthy eating and activity behaviors.¹ Parents not only need to help their children establish healthy habits early in life, but also need to recognize that adolescents, particularly those who are overweight, may need additional support in modifying their eating and activity patterns. Research suggests that among overweight adolescents, those who have parents involved with behavior-modification weight-loss strategies are more successful than students without parental involvement.² Because 32% of children in the United States are

overweight or obese,³ parental involvement in establishing healthy habits is particularly urgent.

Research reports that parents who perceive their adolescent to be overweight are more likely to model healthy habits.^{4,5} Yet it has become increasingly evident that parents do not consistently recognize when or if their adolescent is overweight.⁴⁻⁸ Little is known about the characteristics of parents who underestimate their adolescent's weight and how those parental characteristics may influence their perceptions. It may be that parents who are overweight and unhappy with their weight may be more attentive to their adolescent's weight. Alternatively, parents who are overweight may be less likely to see weight issues developing in their adolescent and underestimate their adolescent's weight or be less willing to draw attention to an adolescent's weight in light of their own overweight status. Understanding what characterizes parents who underestimate their adolescent's weight may be an important step in developing strategies to motivate parents to respond appropriately to their adolescent's weight. The purpose of this manuscript is to examine the characteristics of parents who misclassify their adolescent's weight status. In particular, this article focuses on parents who underestimate their adolescent's weight and considers demographic characteristics (parent sex, race, level of education, qualifying for free or reduced lunch at school) parents' weight status, parents' satisfaction with their own weight status, and the age and sex of the adolescent.

METHODS

Data for this study came from the etiology of childhood obesity (ECHO) study, a longitudinal cohort study examining multilevel factors influencing obesity risk in adolescents. The conceptual model used in the ECHO research is described elsewhere.⁹ In summary, the study enrolled adolescent and parent dyads and collected data at (1) the individual adolescent and parent level including measured anthropometric data, demographics, and self-report data tapping attitudes, perceptions, and behaviors regarding weight, eating, and activity; (2) the home environment examining access and availability of foods and physical activity options in the home; (3) the adolescent's school environment and policies and practices supporting eating healthy foods and being active; and (4) the physical environment of neighborhoods surrounding the adolescent's school and home using geographical information systems. The data for this study were limited to the individual-level data from the parent and adolescent. The University of Minnesota's Institutional Review Board approved the study.

Sample and Recruitment

From June 2007 through March 2008, 375 parent/adolescent dyads were recruited from the membership of Health Partners (HP) health plan within the 7-county metropolitan area of Minneapolis, St. Paul, Minnesota. In order to recruit a sample representing both healthy and overweight adolescents and adults, recruitment was targeted to fill a 2 × 2 table crossing adolescent weight status (<85th percentile for sex/age vs ≥85th percentile for sex/age) with parent weight status as assessed through body mass index (BMI) (BMI <25 vs BMI ≥25). Additional goals were to recruit a sample including at least 20% racial and ethnicity minorities and to obtain a sample with a moderate amount of clustering by school.

To be eligible for enrollment, adolescents were required to be current HP members, in grades 6 to 11 in the fall of 2007; residing in one of the randomly selected middle- or high-school districts included in the sample; have a parent willing to participate and be willing to allow their names and contact information to be sent from HP to the study team at the University of Minnesota for further eligibility screening, consent, and measurement. Only one parent/adolescent dyad per family was allowed to enroll. Parent/adolescent dyads were

excluded from eligibility if they planned to move from the area in the next 3 years, had a medical condition that affected their growth, were non-English speaking or otherwise had difficulty comprehending English, or had any other physical or emotional condition that would affect their diet/activity levels or make it difficult to complete measurements.

Recruitment was initiated at HP through invitation letters mailed to the homes. Letters were mailed to 4751 HealthPartners members inviting parents to contact the study team if interested for further eligibility screening. Once contact was made, interest in the study was confirmed, and a phone screening was conducted to determine provisional eligibility. Of those who were sent letters, 665 were not interested, 1107 were classified as out of sample (OOS), and 94 were considered “passive refusal” as they did not refuse, but were difficult to schedule or delayed. Of the 600 who were screened, 155 were ineligible. For those families successfully contacted and determined to be eligible ($n=445$, 12% eligibility/total letters-OOS), their phone contact information and names were forwarded to study staff at the University of Minnesota to begin the informed consent process. Three hundred seventy-four participants (10.3% enrollment rate) enrolled, or 84% of those eligible.

As recruitment proceeded, the composition of the enrolled sample was monitored with respect to parent and adolescent BMI and race/ethnicity. The enrolled sample ultimately included 33% parent/child dyads with an overweight parent and healthy-weight adolescent, 9% with a healthy-weight parent and an overweight adolescent, 32% with parent-adolescent concordance for healthy weight, and 26% concordant for overweight. Of these dyads, 27% represented racial or ethnicity minorities.

Measurement

Data were derived from a self-report parent survey, self-report adolescent survey, and direct measurement of height and weight of both the parent and adolescent.

BMI

Body weight and height of all participants were assessed at the General Clinical Research Center of the University of Minnesota and used to calculate BMI. Trained clinic staff measured the height of each adolescent and parent using a Shorr height board (Irwin Shorr, Olney, MD) and weight and body composition using a Tanita scale, which is a bioelectrical impedance device that assesses body weight, lean and fat mass (Tanita TBF-300A Body Composition Analyzer, Arlington Heights, IL). For the adolescent, BMI percentiles were derived from data from the Centers for Disease Control and Prevention growth charts.¹⁰ BMI percentiles were categorized as underweight ($\text{BMI} < 5^{\text{th}}$ percentile), healthy weight ($5^{\text{th}} \leq \text{BMI} < 85^{\text{th}}$ percentile), overweight ($\text{BMI} \geq 85^{\text{th}}$ percentile), and obese ($\text{BMI} \geq 95^{\text{th}}$ percentile). Underweight adolescents were dropped from this analysis ($n=6$). For the parents, healthy weight was categorized as $\text{BMI} \leq 25 \text{ kg/m}^2$, overweight as $25 < \text{BMI} \leq 30 \text{ kg/m}^2$, and obese as $\text{BMI} > 30 \text{ kg/m}^2$. For both parents and adolescents, the overweight and obese categories were combined to represent *overweight*.

Parent Perception of Adolescent Weight

At the same clinic visit as the BMI measurement, parents and adolescents completed psychosocial questionnaires. Parent perception of their adolescent's weight was measured with a single question of “Do you consider your child who is enrolled in the study to be very underweight, slightly underweight, about the right weight, slightly overweight, or very overweight?” Very underweight and slightly underweight were combined, resulting in the 4 categories of underweight, healthy weight, overweight, very overweight (obese), consistent with other published literature.¹¹

Weight Discordance

Discordance was assessed among the 4 categories of parent perception of their adolescent's weight status and the 4 categories of the adolescent's measured weight status. The discordant cells were tagged as "yes" if the discordance represented an underestimate of the adolescent's weight. For example, discordance by underestimation of weight status was valued "yes" if the parent reported (1) the adolescent to be underweight when the child was a healthy weight, overweight, or obese; (2) parent reported the adolescent a healthy weight when the adolescent was overweight or obese; and (3) when the parent reported the adolescent to be overweight when the adolescent was obese. Few parents (n=10) overestimated their adolescent's weight (ie, reported their adolescent to be overweight when the adolescent is at a healthy weight) and were not considered in the discordant category as the intent of this analysis was to characterize parents who *underestimated* their adolescent's weight category.

Parent Weight Satisfaction

Parents were also asked about their level of satisfaction with their own weight status using one question. Parents responded to the question "How satisfied are you with your weight?" with 5 response categories ranging from very dissatisfied to very satisfied. The parent weight satisfaction question is from the Project EAT study and was originally developed for adolescents. The published literature supports that the question is associated with weight outcomes in the expected direction.¹² Very dissatisfied and dissatisfied were combined into one category, as were satisfied and very satisfied, resulting in 3 categories of dissatisfied, neutral, and satisfied.

Demographics

Data were collected from the both the parent and student survey tools. The parent survey provided information on the gender of the parent/guardian, education (college education versus not), if the family qualified for free or reduced cost lunch (yes/no), and race (white versus other). Adolescent sex and age were taken from the student survey. Both surveys were completed during the clinic visit at which the anthropometrics were measured.

Analytic Approach

The chi-square statistic was used to test for differences in study sample demographic characteristics by weight concordance status. The association of parent and adolescent characteristics with weight concordance status was calculated with logistic regression using generalized estimating equations. For weight concordance status, the response of interest was "underestimate" and the referent was "accurate." The interaction of adolescent weight status and parent college education and parent weight status also was tested by adding the cross product of each interaction into the model. Interaction terms were considered statistically significant when the z-statistic had a $P < 0.20$ given the sample size and to allow for a more exploratory stratification option. Models were stratified by the parent characteristic were run when a significant interaction was identified. All analyses were conducted using SAS v.9.1 of the SAS System for Windows.¹³

RESULTS

Sample Characteristics

There were 358 parent/adolescent pairs with complete data, excluding any adolescent who was underweight (n=6), parents who overestimated their adolescent's weight (n=10), and missing parental educational status (n=1). Table 1 shows that the study sample represented a largely white and well-educated sample. Over 80% of the parents who participated were

female, 87% reported white race, and 64% were college educated. Of those without college education, only 6 parents did not finish high school (1.68%), 25 had only a high school diploma or completed a GED (7%), and 98 (27%) had vocational school training or some college. There were no significant differences in college education by parent gender. Over 40% of the parent participants were overweight or obese. Only 43% of parents reported they were satisfied or neither satisfied nor dissatisfied with their weight status. Of those dissatisfied with their weight, 78% were overweight or obese. Nearly half of the sample of adolescents was male, with 32% of the adolescent sample overweight or obese.

Nearly one third (31%) of parents underestimated their adolescent's weight status. There were no significant differences by demographic characteristic of parents, parental weight status, or parental satisfaction with their weight between those parents who correctly classified their adolescent's weight and those who underestimated. However, significant differences in the discordance of weight status estimation was seen by adolescent gender and adolescent weight status. Parents of male adolescents and of adolescents who were overweight were more likely to underestimate their adolescent's weight (Table 1).

Multivariate Analysis

Table 2 presents the results from the multivariate analysis, accounting for clustering by school. Parental characteristics including parent weight status, satisfaction with their own weight status, mother or female guardian versus father or male guardian, race or parental education were not significantly associated with misclassification of adolescent weight status. Adding adolescent-level characteristics, the odds of misclassification was 1.65 (95% CI=1.04–2.62) times as high for parents reporting about their boys as compared to parents reporting on their girls holding all other factors constant. The odds of weight discordance status was 5.23 (95% CI=3.04–9.01) times as high for parents of overweight compared to parents of healthy-weight adolescents, holding all other factors constant. In testing for interactions, there was no significant interaction between parent and adolescent weight status, but parent's level of education by adolescent weight status met the a priori criteria of $P < 0.20$, with the z-statistic = -1.40 , $P = 0.16$.

Stratified Models

Analysis stratified by parent college education revealed consistent relationships with adolescent sex and overweight status (Table 3). Among parents who were college graduates, parents of male adolescents were 1.95 (95% CI=1.12–3.40) times as likely to misclassify their adolescent's weight status compared to parents of female adolescents. College-graduate parents of overweight adolescents were 4.09 (95% CI=2.18–7.69) times as likely to misclassify adolescent weight status compared to college-graduate parents of healthy-weight adolescents. Among those with less than a college education, the sex of the adolescent was not related to weight discordance status, but weight discordance status was 8.92 (CI=3.07–25.94) times as high for parents of overweight adolescents compared to parents of healthy-weight adolescents.

DISCUSSION

The purpose of this study was to explore the relationship between parental perception of their adolescent's weight and actual weight status by parent and adolescent characteristics. Although previous research has documented that parental underestimation of their adolescent's weight status is prevalent in younger ages,¹⁴ this research confirms that it also exists in adolescence.

Our findings were generally consistent with other studies in the literature with younger children. A recent review article found that in nearly all of the studies, less than 50% of parents were able to correctly classify their child as overweight.⁴ May and Donahue reported that only 21% of the mothers in their study accurately classified their overweight child as overweight.⁵ Further, a study from Project EAT (Eating among Teens) found similar differences by adolescent overweight status and by sex of the adolescent.⁶ In contrast to the Project EAT study, which found that overweight parents were more likely to underestimate their child's weight, parental weight status was not significantly associated with weight discordance in the ECHO sample.

In our research, an apparent gender bias toward underestimating boys' weights whereas being more accurate with girls' weights was seen in parents with a college education, but was not present among parents without a college education. Parents with more education may not see weight issues the same in boys as girls. Although boys that are heavier may be seen as strong, husky, or having a more athletic build, parents of girls appear to be evaluating their size more accurately. We explored the degree to which parents overestimated their daughter's weight (ie, the girl was of a healthy measured weight, but the parent estimated that she was overweight). Fewer than 2% (n=4) of the parents overestimated their daughter's weight category, and 3 out of 4 of those were college educated. Further work is needed with a larger sample size to understand the direction of possible gender bias, particularly among the more educated.

Although an adolescent gender bias was not seen with parents with lower educational levels, they were more than 8 times as likely to underestimate their adolescent's weight. This did not appear to be an artifact of racial or ethnic differences in acceptance of body shape or size as we controlled for race and ethnicity in our models. Health messages from trusted sources may be needed to target lower-socioeconomic status families to increase awareness of adolescent weight and risk for overweight and obesity.

A recent intervention study demonstrated that it is possible to change the accuracy of parental classification of their child's weight status.¹⁴ When provided with a child health report consisting of the child's BMI and classification along with general dietary and physical activity recommendations, parents were more likely to correctly classify their child's weight status.¹⁴ Parental education may be directed to being more proactive with their child's health care provider to conduct weight screenings, establishing a more accurate assessment of boys' weights as they mature and increasing parents' understanding of the risk of developing excess body fat during adolescence. Early childhood efforts to help parents recognize and support healthy body weights may be necessary, but not sufficient for preventive treatment throughout development. As adolescents' bodies mature, parental estimation of a healthy weight may become more challenging; therefore, efforts to enhance parental education and awareness should continue throughout adolescence.

As with all research, there are strengths and limitations to report. Important strengths in the current study included objectively measured body composition data on both adult and adolescent participants, sampling approach to maximize the diversity of the sample given the population, and all data collection conducted at one time point. The primary limitation of this study was the use of cross-sectional data, in that the causality of relationships cannot be inferred. In addition, although some racial/ethnic and economic diversity was present, the results may not be generalizable to a specific racial and ethnic group outside of the North American middle class. Despite these limitations, our findings were consistent with and expand the current literature and identify an important avenue for intervention.

Given the escalating trends in overweight and obesity among adolescents in the United States, it is important that parents be able to correctly identify if their adolescents are overweight or obese. Such recognition may help to motivate and help educate families to provide a healthy home environment and to promote healthy behavior changes.

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Table 1

Sample Description and Bivariate Associations Between Parental and Child Characteristics and Parental Estimation of Child Weight Status

	Total N=358 (%)	Concordant n=246 (69%) (%)	Discordant n=112 (31%) (%)
Parent			
Female	81.82	82.1	80.4
Race			
White	86.8	87.4	84.8
Other	13.2	12.6	15.2
Weight status			
Healthy	41.62	44.31	35.71
Overweight/Obese	58.38	55.69	64.29
College education	64.1	64.2	63.1
Parent weight satisfaction			
Dissatisfied	57.54	58.13	56.25
Neither	18.99	19.11	18.75
Satisfied	23.46	22.76	25.00
Adolescent			
Receive free or reduced-cost lunch	16.0	15.0	18.8
Male *	48.2	43.1	58.0
Age(mean(SD))	14.0 (1.7)	14.0 (1.7)	14.9 (1.9)
Weight status *			
Healthy	67.6	79.3	42.0
Overweight/Obese	32.4	20.7	58.0

*
P<0.05

Table 2

Multivariate Logistic Regression Using Generalized Estimating Equations for Parent and Child Characteristics Associated With Weight Discordance Status

	Model 1		Model 2	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Parent Characteristics				
Overweight or Obese	1.25	0.63–2.50	1.25	0.63–2.50
Female	0.97	0.79–1.19	1.00	0.84–1.19
White race	1.16	0.50–2.70	1.16	0.50–2.70
College education	1.22	0.72–2.08	1.22	0.72–2.08
Receive Free/Reduced-Cost Lunch	1.07	0.48–2.42	1.07	0.48–2.42
Weight Satisfaction				
Satisfied	Ref		Ref	
Dissatisfied	0.67	0.29–1.53	0.67	0.29–1.53
Neutral	0.68	0.30–1.54	0.68	0.30–1.54
Adolescent Characteristics				
Male			1.65	1.04–2.62
Overweight or Obese			5.23	3.04–9.01
Age			0.98	0.85–1.12

Table 3

Stratified Multivariate Logistic Regression Using Generalized Estimating Equations for Parent and Adolescent Characteristics Associated With Weight Discordance

	<u>College Education</u>		<u>Less than College Education</u>	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Parent Characteristics				
Overweight or Obese	1.14	0.51–2.54	1.59	0.40–6.31
Female	0.97	0.79–1.19	1.06	0.76–1.48
White race	0.69	0.18–2.65	1.33	0.46–3.86
Receive Free/Reduced-Cost Lunch	1.05	0.30–3.61	0.97	0.30–3.18
Parental Weight Satisfaction				
Satisfied	Ref		Ref	
Dissatisfied	0.48	0.18–1.26	1.30	0.32–5.38
Neutral	0.42	0.16–1.09	2.07	0.57–7.61
Adolescent Characteristics				
Male	1.95	1.12–3.40	1.15	0.47–2.83
Overweight or Obese	4.09	2.18–7.69	8.92	3.07–25.94
Age	1.10	0.92–1.32	0.79	0.61–1.03