Weight, Weight Perceptions and Health-Related Quality of Life among a National Sample of US Girls

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Abstract

Objective—To examine associations between three weight indices (weight status, perceived weight, weight status perception accuracy) and HRQOL.

Methods—Data are for girls in the 2009 Health Behaviors in School-Age Children survey, a nationally representative sample of students in grades 5-10 during the 2009/10 school-year (n=5,018). Controlling for sociodemographics, multivariate linear regressions examined associations between self-reported weight status (Underweight/Normal/Overweight/Obese), perceived weight (how children categorize their weight), weight status perception accuracy (Underestimate/Accurate perception/Overestimate) and dimensions of HRQOL including physical, emotional, social, and school functioning.

Results—While obesity was only associated with poor physical and emotional HRQOL, perceptions of being overweight were associated with worse physical, emotional, school and social HRQOL. Further, girls who overestimated their weight reported poorer HRQOL than those with accurate weight perceptions. Associations of perceptions of being overweight and weight status overestimation with poor HRQOL despite, in most instances, the absence of associations between weight status and HRQOL, suggest that weight status perceptions may not merely be a mediator of a weight status-HRQOL association, but a significant independent correlate of poor HRQOL.

Conclusion—These findings raise the issue of whether there is a need to prioritize intervention efforts to promote better HRQOL by re-defining the population of girls most at risk. Parents, teachers and clinicians should be aware that, rather that overweight status, perceptions of being

overweight (accurately or not) are associated with a poor HRQOL among girls. Future research should examine the potential negative effect of using specific body image terminologies on adolescents' psychological health.

Keywords

Weight status; Weight perceptions; Health-related quality of life; Girls

Introduction

Adolescent obesity has increased over the past two decades, with approximately one-third of United States (US) adolescents classified as overweight or obese.[1,2] The clinical, behavioral, and psychosocial consequences of obesity are well documented and include cardiovascular risk, chronic diseases, problem behavior, discrimination,[3] peer victimization,[4] teasing[5,6] and social isolation.[7] These outcomes have generally been examined separately, with studies focusing on physical, psychological, social or behavioral outcomes.[8]

Heath-Related Quality of Life (HRQOL) has been proposed as a comprehensive assessment of the impact that health status has on physical, mental, and social functioning.[9] Overweight/ obese adolescents, particularly girls, experience a lower HRQOL than adolescents who are normal-weight.[8-11] In fact, youth who are the most severely obese experience a quality of life similar to that of youth with a chronic condition, such as cancer.[11,12]

Although the association of overweight/obesity with poor HRQOL has been repeatedly documented in clinical samples of youth who are severely obese,[13-16] evidence for an association in population-based samples remains inconclusive. In fact, research examining the association between obesity and HRQOL is scarce. Out of 22 studies included in a review by Tsiros,[17] only six examined HRQOL among a population-based, non-clinical sample of youth.[8,9,18-21] Findings were inconsistent, especially with respect to the psychosocial dimensions of HRQOL, with only one study pointing to an association of overweight/obesity with mental health[19] (however, in this study HRQOL was reported by the parents, not the adolescents), and one study showing an association between overweight/ obesity and social functioning.[9]

A possible hypothesis for the inconsistent association of overweight/obesity with HRQOL may be that perceived weight and weight status perception accuracy are more appropriate predictors of HRQOL. Prior research among Dutch adolescents suggests that body weight perception, rather than self-reported or measured weight status, is more strongly associated with adolescent well-being.[22] Given the increased stigmatization of overweight/obesity in the last few decades, perceptions of being overweight may be related to more psychological distress than perceptions of being about the right weight. Thus, the purpose of this study is to examine associations between weight status, perceived weight, and weight status perception accuracy, with HRQOL among a national sample of US girls.

Methods

Sample & Procedures

The U.S. Health Behavior in School-Aged Children (HBSC) survey is conducted every 4 years on a nationally representative, school-based sample. The survey is part of a collaboration with more than 40 countries coordinated by the World Health Organization. More information on methods and procedures can be found at www.hbsc.org.[23] A three-stage stratified clustered sampling, with classes as the sampling units, was used to select a nationally representative sample of students in Grades 5–10 during the 2009/2010 school year. African-American and Hispanic students were oversampled to provide better population estimates for these minorities. Trained research assistants administered self-report questionnaires within classrooms; respondents' anonymity was ensured throughout the data collection process. The Institutional Review Board at the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development approved the 2009/2010 survey.

Of the girls who completed the questionnaire (N=6,136), 16.35% did not report their height and/or weight and 1.2% did not report their weight perception. These respondents were excluded from analyses; the final sample included 5,018 girls.

Measures

Weight status—BMI was computed from girls' self-reported height and weight, which provide adequate estimates for actual height and weight in population-based epidemiological studies.[24,25] BMI-for-age percentiles were derived using the CDC 2000 growth chart.[26] Weight status based on BMI-for-age percentiles were as follows: underweight if BMI was less than the 5th percentile, normal weight if BMI was between the 5th and the 85th percentile; overweight if BMI was between the 85th and the 95th percentile; and obese if BMI was equal to or greater than the 95th percentile.

Perceived weight—Girls were asked "do you think your body is…?" Response options included 1) much too thin, 2) a bit too thin, 3) about the right size, 4) a bit too fat, and 5) much too fat. Response options 1 and 5 were combined with 2 and 4 respectively to yield "too thin" and "too fat" categories, because very few students reported extreme options (5%).

Weight status perception accuracy was computed by comparing weight status and perceived weight. Girls were classified as accurate weight perceivers if their perception of their weight status corresponded to their weight status (e.g., perceived weight status about the right size and normal weight status). They were considered to have underestimated their weight if their perceived weight was lower than their weight status (e.g., perceived weight status about the right size and overweight), and overestimated their weight if their perceived weight was greater than their weight status (e.g., perceived weight "too fat" and normal weight status).

HRQOL—We measured four dimensions of HRQOL including physical (self-reported health), emotional (psychosomatic symptoms, global well-being and life satisfaction), social (social engagement; parental support, and family relationships) and school (classmate

support; school engagement; academic achievement; and school demands) functioning (Table 1). All measures have been proven valid and reliable in other epidemiological studies or in previous HBSC surveys.[27-29] For all measures, higher values indicate better HRQOL.

Sociodemographic characteristics included grade, race/ethnicity (White/Black/Hispanic/Other), and Family Affluence Scale, an indicator of girls' socioeconomic status that was constructed from questions about family wealth and categorized into tertiles. A review[23] indicated that the scale has good content and external validity.

Analysis

All analyses were conducted using Stata 11 to adjust for the cluster-based sampling design of HBSC. Weights were applied to provide nationally representative estimates. Complete case analyses were conducted because missing values for all variables were less than 5%. Descriptive statistics were computed for all variables. Bivariate statistics examined the association of weight indices with measures of HRQOL. Logistic and linear regression models were then fitted to obtain adjusted estimates of these associations. To account for multiple testing, we applied a Bonferroni adjustment and considered results significant at $p < .01$. For each measure of HRQOL, three models were fitted, all controlling for socio-demographics: Model 1 examined the association between *weight status* and the HRQOL outcome; Model 2 examined the association between *perceived weight* and HRQOL, adjusting for weight status. Finally, model 3 examined the association of *weight perception accuracy* and HRQOL. For models that exhibited a potential mediating effect of body image, a Sobel test was computed to confirm mediation.

Results

Sample characteristics

Approximately half of the sample were non-Hispanic Whites and of medium family affluence. Respondents were almost equally distributed across grades. Most girls were of normal weight, 14.86% were overweight and 11.82% obese, based on self-reports. Sixty percent of respondents perceived their weight to be "about right," close to a third perceived themselves as "too fat" and less than 10% as "too thin." Most respondents had accurate perceptions of their weight status, but about 17% each underestimated or overestimated their weight status. Significant differences in weight status, perceived weight and weight perception accuracy were noted by race/ethnicity, grade and family affluence (Table 2). Obesity was more prevalent among Black and Hispanic girls compared to Whites; among younger girls (grades 5 & 6) compared to older ones; and among girls of low affluence.

Sixty percent of respondents perceived their weight to be "about right," close to a third perceived themselves as "too fat" and less than 10% as "too thin." These perceptions also differed by race/ethnicity and grade: More Black and Hispanic girls, and older girls (grades 8-10) perceived themselves as "too thin" compared to White and younger girls.

Most respondents had accurate perceptions of their weight status, but about 17% each underestimated or overestimated their weight status, with significant differences by socio-demographics: Black and Hispanic girls were twice as likely to underestimate their weight

status as White girls; young girls and those of low family affluence were also more likely to underestimate their weight status.

Bivariate associations of weight indices with HRQOL

Overall, respondents generally reported good HRQOL on most measures (Table 3): Almost eight out of ten respondents perceived their health as good, reported being engaged in school and reported high academic achievement. More than half of respondents did not feel very pressured by schoolwork. Respondents also reported few psychosomatic symptoms and high classmate support, life satisfaction, social engagement, ease of communication with parents and satisfaction with family relationships.

Weight status indices were significantly associated with measures of HRQOL (Table 3). Girls who were overweight or obese, those who perceived themselves as "too fat," and those who overestimated their weight status reported lower HRQOL on most measures (non-significant associations include those of weight status with school engagement, academic achievement, and school demands; and those of weight status perception accuracy with academic achievement, classmate support and social engagement).

Multivariate associations of weight indices with physical and emotional functioning

In adjusted regressions (Table 4), *obesity* was associated with more psychosomatic symptoms and with worse global well-being and life satisfaction than normal-weight (Model 1). Furthermore, respondents who were overweight and those who were obese were 54% and 77% less likely to self-report their health as good. When *perceived weight* was added to the models, the associations of obesity with physical and emotional indicators (except self-perceived health) became non-significant (Model 2). In these models, perceptions of being "too fat," and "too thin," were associated with worse HRQOL. Finally, *overestimation of weight status* was associated with worse physical and emotional functioning for all indicators (Model 3).

Multivariate associations of weight indices with school and social functioning

In adjusted regressions (Table 5), *obesity* was not associated with most indicators of school and social functioning; it was only inversely associated with classmate support (Model 1). However, *perceptions of being "too fat,"* were associated with worse school and social functioning for all indicators, except academic achievement, after controlling for weight status (Model 2). Perceptions of being "too thin" were associated with worse classmate support, and less satisfaction with family relationships. In these models, obesity was no longer negatively associated with classmate support. Finally, *weight overestimation* was associated with poorer social functioning, namely worse parental communication and less satisfaction with family relationships (Model 3).

Mediation analysis

Sobel tests were conducted to confirm mediation in six models where the independent variable (weight status) was associated with the outcome (measures of HRQOL). Models included the association of overweight and obesity with self-perceived health, and the association of obesity with psychosomatic symptoms, global well-being, life satisfaction,

and classmate support (Tables 4 & 5). Significant Sobel tests indicated that body image mediated these relationships: the association of overweight with self-perceived health (Sobel test: -8.28; S.E: 0.17; p<0.001); and that of obesity with self-perceived health (Sobel test: -9.80; S.E: 0.24; p<0.001), psychosomatic symptoms (Sobel test: -8.16; S.E: 0.08; p<0.001), global well-being (Sobel test: -9.18; S.E: 1.20; p<0.001), life satisfaction (Sobel test: -7.09; S.E: 0.22; p<0.001), and classmate support (Sobel test: -4.42; S.E: 0.08; p<0.001).

Discussion

Overweight and obesity have consistently been associated with poor HRQOL among clinical samples of youth, but the evidence of an association in population-based samples has been less conclusive. This study hypothesized that, rather than weight status, perceptions of overweight might be more strongly associated with poor HRQOL. Our findings among a diverse, nationally representative sample of US girls confirm this hypothesis. Perceived weight status emerged as a stronger correlate of poor HRQOL than self-reported weight status when both variables were included in the same models. Perceptions of being too fat were associated with worse *physical*, *emotional, school* (except academic achievement) and *social* functioning. Furthermore, previously significant associations of obesity with physical and emotional indicators became non-significant in the presence of perceived weight status. Similarly, overestimation of weight status was associated with worse *physical*, *emotional* and *social* functioning.

Although, to our knowledge, no previous studies have examined the differential association of weight status, perceived weight status, and weight status perception accuracy with HRQOL among US adolescent girls, only one study has suggested that perceptions of being too fat and weight status overestimation may be linked to poor HRQOL among German adolescents.[30] These findings add to a growing body of literature showing that adverse psychosocial adjustment may be related to weight status perceptions rather than weight status.[31,32] For example, among a national sample of US girls, sexual risk behaviors, including early sexual debut and lower likelihood of condom use, were associated with perceptions of overweight rather than with overweight status.[33] In a cross-sectional analysis of early adolescents, weight status overestimation was also associated with alcohol, tobacco and drug use, binge drinking, depressive symptoms, and physical fighting.[32]

In our analyses, associations of perceptions of being too fat and weight status overestimation with poor HRQOL despite, in most instances, the absence of associations between weight status and HRQOL, suggest that weight status perceptions may not merely be a mediator of a weight status-HRQOL association, but a significant independent correlate of poor HRQOL. These findings raise the issue of whether there is a need to prioritize intervention efforts to promote better HRQOL by re-defining the population of girls most at risk, and therefore screening at-risk girls not just by weight status, but also by weight status perceptions. Given that a third of US adolescent girls perceive themselves as overweight, and that almost two out of ten girls overestimate their weight status, the potential social and economic toll of addressing poor HRQOL could be significant.

The association of perceptions of overweight, rather than actual overweight, with poor HRQOL may point to the increasingly pervasive effect of social norms related to weight-based stigma. Deviations from ideal body size, such as overweight/obesity, are likely to trigger discrimination and weight bias from peers. Studies have shown that girls who are overweight/obese are more subject to weight discrimination than overweight/obese boys. It has been reported[34] that the rates of weight discrimination in American society are close to or sometimes higher than the reported rates of racial discrimination, particularly among women. Women who are obese are at an especially increased risk of weight discrimination, with three times the risk of being discriminated against compared to male peers of similar weight.[34] Gender differences in discrimination against obese individuals are similarly observed among young people, with girls more likely than boys to discriminate against obese peers.[35] Given the extent of negative stereotypes and discrimination associated with obesity, girls who perceive themselves (accurately or not) as overweight may internalize weight-based stigma, leading to poor HRQOL.

Two other findings from this study are noteworthy. First, in the initial models that only included weight status, obesity was associated with worse *physical* and *emotional* functioning while overweight was only associated with poor *physical* functioning. None of the measures of weight status were associated with poor *school* or *social* functioning. These results confirm those from previous studies[36-38] showing that obesity was associated with more negative outcomes than overweight, suggesting that the greater the deviations from appearance ideals, the greater their effect on adolescents' well-being. The lack of an association between weight status and school/social functioning in these initial models may reflect the unique characteristics of our community-based sample. Although previous studies have documented associations of overweight/obesity with difficulties in physical,[9,11,13,14,39] psychological,[11,13,40] emotional,[11,41] social[9,11,14,41] and school functioning[11], these associations were mostly observed among clinical samples of obese youth, which may suffer from selection bias.[17] In fact, in community-based, rather than treatment-seeking, samples of youth, previous studies found no associations between overweight, obesity and psychosocial measures.[39] A possible reason for this observation may be that clinical samples of obese youth represent the most severe cases of obesity, which are associated with worse psychosocial adaptation than overweight. Given that obesity discrimination increases with BMI and is highest for the most severe cases, non-acceptance of girls who are overweight/ obese which leads to impaired school/social functioning may only be apparent in clinical samples of adolescent girls who are obese. This finding stands in contrast to the association of weight perceptions with poorer functioning on all HRQOL dimensions, thereby demonstrating the pervasive effect of perceptions on adolescent well-being.

Second, interestingly, girls' perceptions of being too thin were associated with poor emotional functioning and one indicator each of school (*poor classmate support*) and social (*poor satisfaction with family relationships*) functioning. Weight status underestimation, however, was not associated with poor HRQOL. While the adverse physical/medical consequences of obesity are well-established, the benefits of achieving accurate perceptions of weight status for overweight/obese girls for HRQOL or for prompting engagement in weight-reducing behavior are less definitive.[30]

These findings should be interpreted in light of the limitations and strengths of this study. One important limitation lies in the cross-sectional nature of the data that makes it difficult to test for the temporal sequence of these events. In this study, we hypothesized that overweight/obesity, perceptions of overweight and weight status overestimation among adolescent girls lead to a lower HRQOL. Although these assumptions are justified, we cannot completely rule out different causal directions. It is possible that girls who have a poor HRQOL may develop inaccurate weight status perceptions, and/or engage in unhealthy eating practices that could ultimately lead to weight gain. Both pathways have supporting theoretical evidence; longitudinal studies are therefore needed to test these relationships. Another limitation is the study's reliance on subjective measures of height and weight to compute BMI. Although these measures are adequate estimates of actual height and weight,[24] objective measurements would provide a stronger argument for these relationships. However, despite a potential bias for girls to under-report weight, the effect of their perceptions of their weight status was still quite robust.

It is also important to mention any potential negative consequences to participants when asked if they perceive themselves as "fat". Studies examining the impact of research on participants usually focused on more extreme weight-related behaviors, such as eating disorders[42] or risky weight control, [43] and older adolescents. Only one article was identified that examined the impact of body image research, albeit on undergraduate women.[42] Three different measures of body image were included, including subjective body perception (asking women to subjectively rate their body, from *much too thin* to *much too fat*). Results indicated that while body image and eating disorder research were not distressing for the vast majority of participants, some exceptions occurred. Women who stated that they were *a bit too fat* and those who stated that they were *much too fat* experienced significantly more negative reactions that women who stated they were *about the right size*. Several alternative methods exist for inquiring about body image, including asking adolescents their perceptions of their weight, as to whether they believe they weigh too little, just the right amount, a little too much, or a lot too much. Older children and adolescents may also be asked what they think is a healthy weight range for their body. While these methods should be considered in studies on body image, more research is also needed on the costs and benefits of research questions on the participants [44] and particularly to determine the risk of using specific terminologies (e.g., "too fat") on adolescents' psychological health and well-being.

Despite these limitations, this study has several strengths. First, these analyses were based on a representative sample of US adolescent girls with varying weight status, which enabled the examination of the association of weight indices with HRQOL across different sub-groups, rather than only focusing on clinical samples with the most extreme cases of obesity. Other notable strengths include the use of a multidimensional index and validated measures of HRQOL, the investigation of relationships that have been tested infrequently, and the comparison of the differential effect of several weight indices including weight status, perceived weight status, and weight status perception accuracy on HRQOL.

Conclusion

These findings have implications for public health and clinical practice. Current research and screening practices have been concerned about HRQOL mostly among clinical samples of girls seeking treatment for obesity or an associated condition. Our findings suggest that, rather than weight status, perceived weight status and weight status misperceptions – especially of being too overweight or obese – are associated with poor HRQOL among the general population of adolescent girls. Our findings therefore suggest the importance of also assessing poor HRQOL among girls who perceive themselves as too overweight or obese, or who overestimate their weight status.

Future research should investigate mechanisms that could further our understanding of the differential association of weight indices with poor HRQOL. For example, how do the relationships between perceived weight status, weight status perception accuracy and HRQOL develop over time? Which develops first, poor HRQOL or perceptions of being too overweight or obese and weight status overestimation? Given that perceptions of being too overweight or obese and weight overestimation are increasingly widespread among girls, key indicators of the HRQOL of this population are essential to provide a generalized assessment of its well-being and ultimately guide preventive services. Clinicians should also sensitively evaluate adolescents' perceptions of their weight status, by asking them, for example, whether they weigh too little, just the right amount, a little too much, or a lot too much, or asking them what they believe is a healthy weight range for them.

Acknowledgments

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Table 1
Items of the Health-Related Quality of Life index

Domain	Subdomain	Item	Categorization
Physical	Self-perceived health (Ravens-Sieberer 2009)	Would you say your health is…? *(Please mark one circle)* ('Excellent' to 'Poor'; 1–4)	Dichotomized: 1.Good (excellent/good) 0.Poor (fair/poor)
Emotional	Psychosomatic symptoms (Ravens-Sieberer 2009)	In the last 6 months: how often have you had the following…? *(Please mark one circle for each line)* ('About every day' to 'Rarely or never'; 1—5)	Continuous: Mean of 8 items Range: 1; 5 α=.81
		a. Headache	
		b. Stomach-ache	
		c. Back ache	
		d. Feeling low	
		e. Irritability or bad temper	
		f. Feeling nervous	
		g. Difficulties in getting to sleep	
		h. Feeling dizzy	
	Global well-being (Ravens-Sieberer 2010)	Thinking about last week…('Never' to 'Always'; 1 – 5)	Continuous: Items were summed; Rasch person parameters (PP) were assigned to each possible sum score; PPs were transformed into values with a mean of 50 and a standard deviation (SD) of 10 Range: -3.540 ; 125.376 α=.82
		a. Have you felt fit and well?	
		b. Have you felt full of energy?	
		c. Have you felt sad?	
		d. Have you felt lonely?	
		e. Have you had enough time for yourself?	
		f. Have you been able to do the things that you want to do in your free time?	
		g. Have your parent(s) treated you fairly?	
		h. Have you had fun with your friends?	
		i. Have you got on well at school?	
		j. Have you been able to pay attention?	
	Life satisfaction (Ravens-Sieberer 2009)	Here is a picture of a ladder. The top of the ladder '10' is the best possible life for you and the bottom '0' is the worst possible life for you. In general, where on the ladder do you feel you stand at the moment? *(Mark the circle next to the number that best describes where you stand)[0 – 10]*	Continuous: Range: 0-10
School	Classmate support	Here are some statements about the students in your class(es). Please show how much you agree or disagree with each one. *(Please mark one circle for each line)('Strongly disagree' to 'Strongly agree';* 1 – 5)	Continuous: Reverse coded Mean of 3 items Range: -2.54; 1.22
		a. The students in my class(es) enjoy being together	
		b. Most of the students in my class(es) are kind and helpful	
		c. Other students accept me as I am	
	School engagement	How do you feel about school at present? ('I like it a lot' to 'I don't like it at all'; 1– 4)	Dichotomized: 1.Like it (like it a lot/a bit) 0.Don't like it (not very much/not at all)

Domain	Subdomain	Item		Categorization
	Academic achievement		In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?('Very good' to 'Below average'; 1 – 4)	Dichotomized: 1. Good (very good/good) 0.Average (average/below average)
	School efforts/demands		How pressured do you feel by the schoolwork you have to do? ('Not at all' to 'a lot'; 1 – 4)	Dichotomized: 1. None (not at all/a little) 0. Some (some/a lot)
Social	Social engagement (Aubrey 2007, Caccavale 2012)	a.	Number of male friends (0, 1, 2, 3_)	Continuous: Items were z-transformed; standardized (mean = 0; standard deviation = 1) and averaged Range: -2.27; 1.41 α=.70
		b.	Number of female friends (0, 1, 2, 3_)	
		c.	Number of days/week after school with friends (0 –5)	
		d.	Number of evenings/week with friends (0 –7)	
		e.	Number of days/week talk on phone, text message, oremail friends (0, 1–2, 3–4, 5–6, 7)	
		f.	How easy is it for you to talk with your best friend?('Very easy' to 'very difficult', 1–4)	
		g.	How easy is it for you to talk with same sex friends? ('Very easy' to 'very difficult', 1–4)	
		h.	How easy is it for you to talk with opposite sex friends? ('Very easy' to 'very difficult', 1–4)	
	Satisfaction with family relationships		In general, how satisfied are you with the relationships in your family? *(Mark one circle next to the number that best describes your feelings)* ('We have very bad relationships' to 'We have very good relationships'; 0 –10)	Continuous: Range: 0; 10
	Parental communication		How easy is it for you to talk to the following persons about things that really bother you? *Please mark one circle for each line)* ('Very easy' to 'Don't have or see this person' ; 1 –5)	Continuous: Reverse coded Mean of items Range: 0; 5

Note: All items were recoded such as higher values indicate better HRQOL.

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Table 2

Distribution of Weight Indices by Socio-Demographic Characteristics.

	Total Girls	Race/ethnicity				Grade						Family affluence		
		White	Black	Hispanic	Other	5	6	7	8	9	10	Low	Medium	High
	n=5018 %	n=2252 %	n=940 %	n=1212 %	n=586 %	n=492 %	n=771 %	n=977 %	n=977 %	n=920 %	n=881 %	n=1323 %	n=2287 %	n=1368 %
Weight status														
Underweight	5.29	5.09	5.347	4.448	6.579	14.81	9.546	5.374	2.601	1.508	1.839	4.888	5.615	5.054
Normal	68.03	72.50	56.24	62.38	72.03	58.70	61.62	70.82	71.6	71.28	70.42	59.14	68.6	74.7
Overweight	14.86	13.09	20.62	17.82	11.67	10.54	16.11	14.47	15.91	15.16	15.80	18.75	14.82	11.71
Obese	11.82	9.32	17.79	15.35	9.722***	15.96	12.73	9.339	9.891	12.06	11.94***	17.23	10.96	8.54***
Perceived weight status														
About right	60.15	62.21	57.24	57.29	58.3	65.19	62.04	62.98	58.42	57.25	57.43	54.88	61.25	62.80
Too thin	9.25	7.37	11.74	10.51	11.82	12.90	12.15	10.24	7.24	6.64	8.14	10.40	9.36	8.23
Too fat	30.59	30.42	31.02	32.21	29.88*	21.91	25.81	26.78	34.34	36.11	34.43***	34.72	29.39	28.97
Weight status perception accuracy														
Accurate	65.57	68.84	59.45	62.93	63.13	57.65	63.46	66.00	67.17	68.09	68.09	63.82	64.79	68.56
Underestimate	17.12	12.73	26.93	21.74	16.63	22.19	20.94	17.87	14.42	14.08	15.59	21.16	17.58	12.96
Overestimate	17.31	18.43	13.62	15.33	20.24***	20.17	15.60	16.13	18.41	17.84	16.32*	15.02	17.64	18.48**

* p < .05;

** p<.01;

*** p<.001

Table 3

Respondents' Health-Related Quality of Life by Weight Indices (means or weighted percents).

Measures of Health-Related Quality of Life	Total Girls	Weight Status				Perceived Weight Status			Weight Status Perception Accuracy		
		Under-weight	Normal weight	Over-weight	Obese	About right	Too thin	Too fat	Accurate	Under-estimate	Over-estimate
	n=5018	n=276	n=3357	n=792	n=593	n=2996	n=493	n=1529	n=3269	n=906	n=843
Weighted percents											
Self-perceived good health	77.21	85.34	82.68	67.61	54.13***	86.38	82.62	57.54***	77.43	82.35	71.29***
School engagement	78.17	84.85	78.19	76.77	76.81	80.97	80.56	71.97***	78.52	81.72	73.30**
Academic achievement	73.48	75.59	73.8	74.87	68.89	76.43	69.38	68.92***	74.46	73.26	69.98
Less school efforts/demands	56.97	60.44	55.79	61.58	56.51	59.51	53.36	53.09**	57.5	60.07	51.93*
Means (SE)											
Psychosomatic symptoms (*Range: 1; 5*)	3.77(.02)	3.91(.07)	3.80(.02)	3.72(.04)	3.65(.04)**	3.92(.02)	3.67(.07)	3.53(.03)***	3.82(.02)	3.79(.04)	3.58(.04)***
Global well-being (*Range: -3.540; 125.376*)	47.19(.30)	51.40(1.03)	47.64(.35)	45.96(.61)	44.24(.57)***	49.56(.34)	41.80(.77)	42.65(.32)***	47.70(.31)	44.50(.58)	48.00(.64)***
Life satisfaction (*Range: 0-10*)	7.46(.05)	7.85(.17)	7.53(.06)	7.22(.10)	7.18(.11)***	7.82(.06)	7.06(.13)	6.87(.08)***	7.58(.06)	7.39(.10)	7.06(.10)***
Classmate support (*Range: -2.54; 1.22*)	-0.04(.02)	0.14(.07)	-0.01(.03)	-0.13(.04)	-0.18(.05)***	0.05(.03)	-0.09(.05)	-0.20(.03)***	-0.04(.03)	-0.03(.04)	-0.06(.04)
Social engagement (*Range: -2.27; 1.41*)	0.07(.01)	-0.07(.04)	0.09(.01)	0.08(.02)	-0.02(.03)***	0.10(.02)	0.02(.04)	0.02(.02)***	0.08(.01)	0.08(.03)	0.02(.02)
Parental communication (*Range: 0; 5*)	3.61(.03)	3.84(.08)	3.62(.03)	3.52(.04)	3.54(.05)**	3.70(.03)	3.58(.07)	3.42(.03)***	3.62(.03)	3.64(.05)	3.50(.05)*
Satisfaction with family relationships (*Range: 0; 10*)	7.62(.07)	8.23(.15)	7.62(.08)	7.49(.12)	7.55(.15)**	7.94(.07)	7.46(.16)	7.05(.09)***	7.71(.07)	7.75(.14)	7.17(.12)***

*
 p < .05;

**
 p<.01;

***
 p<.001

Table 4

Association of Weight Indices with Physical & Emotional Functioning

	Self-perceived health (Good) OR (95% CI)	Psychosomatic symptoms B (SE); P-value	Global well-being B (SE); P-value	Life satisfaction B (SE); P-value
MODEL 1				
Weight status				
Underweight	0.82 (0.49; 1.36)	0.01 (.07); .976	1.23 (.96); .203	0.07 (.19); .698
Overweight	**0.46 (0.37; 0.58)**	-0.06 (.04); .136	-1.40 (.69); .044	-0.22 (.12); .056
Obese	**0.23 (0.17; 0.31)**	**-0.16 (.05); .001**	**-3.61 (.58); <0.001**	**-0.31 (.11); .006**
MODEL 2				
Perceived weight status				
Too thin	0.72 (0.53; 0.96)	**-0.26 (.07); <0.001**	**-3.26 (.76); <0.001**	**-0.77 (.13); <0.001**
Too fat	**0.28 (0.23; 0.34)**	**-0.36 (.04); <0.001**	**-6.99 (.50); <0.001**	**-0.88 (.11); <0.001**
Weight status				
Underweight	0.73 (0.45; 1.18)	0.02 (.07); .749	1.34 (.98); .177	0.16 (.19); .380
Overweight	**0.70 (0.55; 0.90)**	0.04 (.04); .323	0.40 (.67); .554	0.02 (.11); .856
Obese	**0.41 (0.31; 0.56)**	0.01 (.05); .860	-0.79 (.68); .247	0.08 (.12); .539
MODEL 3				
Weight status perception accuracy				
Underestimate	1.44 (1.09; 1.90)	-0.05(.04); .311	-0.12 (.66); .853	-0.18 (.10); .084
Overestimate	**0.68 (0.54; 0.86)**	**-0.25 (.04); <0.001**	**-3.43 (.55); <0.001**	**-0.56 (.11); <0.001**

Control groups are: Normal weight (Weight status); About right (Perceived weight); Accurate perception (Weight perception accuracy). Models control for race/ethnicity, grade and family affluence. Results in bold are significant at p<.01. B, regression coefficient; CI, confidence interval; OR, odds ratio.

Table 5

Association of Weight Indices with School and Social Functioning [a,b,c]

	Classmate support	School engagement	Academic achievement	School demands	Social engagement	Parental communication	Satisfaction with family relationships
	B (SE); *P-value*	OR (95% CI)	OR (95% CI)	OR (95% CI)	B (SE); *P-value*	B (SE); *P-value*	B (SE); *P-value*
MODEL 1							
Weight status							
Underweight	-0.06 (.05); .248	1.32 (0.86; 2.02)	0.92 (0.50; 1.66)	0.94 (0.68; 1.32)	-0.04 (.04); .296	0.06 (.08); .406	0.10 (.18); .589
Overweight	-0.10 (.04); .025	0.97 (0.75; 1.24)	1.16 (0.90; 1.50)	1.25 (1.00; 1.56)	0.01 (.02); .920	-0.03 (.05); .441	-0.04 (.11); .702
Obese	**-0.17 (.05); <0.001**	0.94 (0.71; 1.24)	0.83 (0.61; 1.15)	0.95 (0.74; 1.22)	-0.08 (.03); .016	-0.04 (.05); .389	-0.05 (.14); .740
MODEL 2							
Perceived weight status							
Too thin	**-0.18 (.05); .001**	0.93 (0.68; 1.28)	0.72 (0.53; 0.96)	0.74 (0.53; 1.02)	-0.04 (.03); .175	-0.13 (.06); .056	**-0.53 (.16); .001**
Too fat	**-0.20 (.04); <0.001**	**0.60 (0.47; 0.77)**	0.73 (0.57; 0.93)	**0.76 (0.64; 0.90)**	**-0.10 (.03); <0.001**	**-0.24 (.04); <0.001**	**-0.82 (.09); <0.001**
Weight status							
Underweight	0.08 (.05); .141	1.26 (0.82; 1.94)	0.96 (0.54; 1.73)	0.99 (0.70; 1.41)	-0.05 (.04); .281	0.07 (.08); .407	0.13 (.18); .463
Overweight	-0.05 (.04); .258	1.16 (0.90; 1.51)	1.26 (0.95; 1.66)	1.34 (1.06; 1.70)	0.03 (.03); .191	0.04 (.05); .428	0.20 (.11); .084
Obese	-0.08 (.05); .097	1.22 (0.89; 1.69)	0.96 (0.67; 1.37)	1.07 (0.81; 1.40)	-0.03 (.04); .371	0.07 (.05); .123	0.33 (.15); .032
MODEL 3							
Weight status perception accuracy							
Underestimate	0.01 (.04); .984	1.20 (0.94; 1.53)	0.97 (0.79; 1.18)	1.01 (0.82; 1.23)	0.04 (.03); .113	0.03 (.05); .520	-0.03 (.12); .817
Overestimate	-0.04 (.04); .334	0.73 (0.56; 0.94)	0.80 (0.62; 1.03)	0.79 (0.63; 0.98)	-0.05 (.03); .133	**-0.14 (.04); .001**	**-0.60 (.10); <0.001**

Control groups are: Normal weight (Weight status); About right (Perceived weight); Accurate perception (Weight perception accuracy). Models control for race/ethnicity, grade and family affluence.
Results in bold are significant at p<.01. B, regression coefficient; CI, confidence interval; OR, odds ratio.