

MATERNAL INFLUENCES ON BODY SATISFACTION IN BLACK AND WHITE GIRLS AGED 9 AND 10: THE NHLBI GROWTH AND HEALTH STUDY (NGHS)¹

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ABSTRACT

Obesity, an important risk factor for cardiovascular disease, is more prevalent in the U.S. among Black than White women. Tolerance for obesity may be learned in childhood before weight gain begins. Greater tolerance for or approval of heavy daughters' body build and eating habits among Black mothers compared to White mothers could result in higher levels of body satisfaction in heavy Black daughters compared to heavy White daughters. This paper reports cross-sectional data from the National Heart, Lung, and Blood Institute (NHLBI) Growth and Health Study on maternal reactions to daughters' body build and eating habits and on daughters' body satisfaction for 1,652 Black and White female parent/guardians and their daughters, aged nine and ten years at baseline. Results showed that Black mothers were less tolerant than White mothers of body build and habits among moderately heavy daughters, but Black mothers were more tolerant than White mothers of the build and habits of their heaviest daughters ($p < 0.001$). However, maternal disapproval of their build and habits had little effect on daughters' body satisfaction (2.2% of variation explained). Black girls had higher body satisfaction scores than White girls ($p < 0.01$). While body satisfaction scores decreased with increasing body mass index, they decreased less for Black girls than for White girls. The largest proportion of variation in daughters' body satisfaction (21.0%) was explained by race, body mass index, household income, and a race-body mass index interaction.

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INTRODUCTION

Obesity is an important public health problem in American Black women (1). It is associated with their higher rates of coronary heart disease, in part through its positive relationship with risk factors such as blood pressure (2), plasma triglyceride,

and very-low-density lipoprotein cholesterol (VLDL-C) levels (3). The cross-sectional NHANES II survey (1976-1980) showed no significant Black-White difference in body mass index (BMI) in girls up to age 11. However, 12- to 20-year-old Black girls and women had a significantly higher BMI than White girls and women. Furthermore, relative weight for Black women was progressively greater than for White women at ages 21-45, 46-65, and over 65 (4).

A number of studies have shown racial differences in behavioral factors associated with obesity. Examinations of body build and satisfaction in adult Black Americans suggest that, relative to Whites, they report more favorable attitudes toward their appearance, primarily as a result of less concern with fatness (5-7). Other studies have shown more permissive attitudes toward obesity among Black women (8,9) and less restrictive attitudes toward eating (10). The Centers for Disease Control telephone survey of 33,459 women found that half of Black women and one-third of White women were moderately overweight (self-reported BMI greater than or equal to 25 kg/m²). Among these moderately overweight women, 52% of Blacks and 73% of Whites considered themselves overweight. Severely overweight Black women (self-reported BMI greater than 30 kg/m²) were also less likely than White women to consider themselves overweight. These Black-White differences in body satisfaction were not associated with educational level (11).

Tolerance for an obese body build may be learned early in life before weight gain begins. While obese White adults do not differ from normal weight adults with respect to personality type or traits (12), they have been found to differ on a number of learned attitudes related to body weight and body image (13). Stunkard and Mendelson have described a pattern of body image disparagement among obese adults with childhood or adolescent onset obesity, which was learned in family environments characterized by parental criticism (14,15). Other investigators have found similar negative self-appraisals to be more characteristic of obese than normal weight individuals (16,17).

Mothers are important role models and teachers for their young daughters. Tinsley (18) reviewed the literature on childhood acquisition of health attitudes and underscored the importance of the mother, childhood cognitive constraints in the understanding of health issues, and the effects of parenting styles on the development of children's health attitudes. Spitzak (19) has suggested that both parents exert considerable influence on their children's physical appearance and eating habits, but that their methods differ in that "mother criticizes, father compliments." Striegel-Moore and Kearney-Cooke (20) surveyed 1,276

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TABLE 1
 Daughter-Reported Questionnaire Items Summed to Form Daughter Body Satisfaction Score with Factor Loadings ($N = 1,652$)

	Factor* Loading
1. How happy or unhappy are you with your present weight?	.711
2. How happy or unhappy are you with the way your body looks?	.670
3. How happy or unhappy are you with these parts of your body?	
How happy are you with:	
A. Your waist	.793
B. Your stomach	.770
C. Your arms	.623
D. Your breasts	.558
E. Your hips	.798
F. Your legs	.725
G. Your behind	.686

* Loading on the first factor which accounted for 50% of the variance. No other factors were retained.

parents (89% White) of children aged 2 to 16 and found that about one-third had tried to influence their child's appearance. Parent gender was not associated with differences in parental ratings of child physical attractiveness or satisfaction with child eating or exercise habits. However, more mothers than fathers reported that they had done something (excluding weight control) to improve the child's appearance, that they praised their child's appearance, and that they were pressured by others to improve the child's appearance. Parent attitudes and behaviors related to child physical appearance changed after the age of five, becoming less favorable for grade school children and adolescents. Parental body image satisfaction and their evaluations of their child's body image and eating habits were unrelated. Little attention has been given in past studies of parental influence on child health attitudes to possible racial differences in maternal opinions and behavior that might influence the early development of body image and satisfaction in obese young Black and White girls.

We hypothesized that racial differences in maternal behavior and the effect of these differences on the body satisfaction of heavy daughters is an important factor in the development of the large Black-White differential in adult female obesity. Black mothers in the National Heart, Lung, and Blood Institute (NHLBI) Growth and Health Study (NGHS) were expected to be more tolerant than White mothers of their daughters' heavy body build and eating habits, and less likely to try to control their daughters' eating or exercise behaviors. White mothers were expected to be more concerned about obesity and to try more often than Black mothers to control the type or amount of food their heavy daughters ate or their exercise habits. It was also expected that mothers' efforts to influence daughters' build would vary by daughters' body mass index.

We hypothesized that a corresponding Black-White difference in daughter body satisfaction would result from the predicted differences in maternal treatment. Heavy Black girls would show higher levels of body satisfaction than heavy White girls due to less frequent maternal criticism and fewer attempts to control their eating or exercise habits. This difference was expected to increase with daughters' body mass index.

METHODS

Population

NGHS is a longitudinal cohort study initiated by the National Heart, Lung, and Blood Institute. Two thousand three hundred seventy-nine girls (1,166 Whites and 1,213 Blacks)

aged nine and ten were enrolled in 1987-1988 at three clinical centers. Families were excluded from the study if parental consent and information on family structure and demographics were not obtained or if the family planned to move out of the study area within twelve months. Girls were examined annually on a battery of measures including weight, height, maturation stage, fat distribution, dietary intake, physical activity, and blood pressure; and biennially on serum lipids and psychosocial factors such as self-esteem, stress, coping strategies, attitudes and beliefs about body build, and family environment (21).

This paper will examine data from 1,652 nine- and ten-year-old NGHS girls, living with a female parent/guardian who returned the required study questionnaire at the time of the baseline examination. About 95% of female parent/guardians were the girls' natural mothers. The number of cases included in each analysis varied slightly due to missing questionnaire items.

Measurements

A daughter body satisfaction score (ranging from 9 to 36) was obtained by summing responses to nine self-reported questionnaire items. Questionnaire items and factor loadings (22) for the daughter body satisfaction score in the total sample are presented in Table 1. Factor loadings are coefficients which vary between 0.00 and ± 1.00 and indicate an item's degree of association with an underlying common factor. Separate factor analyses for the body satisfaction items were also computed by race, and the same factors were found for Blacks and Whites with similar item factor loadings. Results by race are available upon request.

Seven NGHS body satisfaction questions were taken from the weight concern factor of the Body Esteem Scale (23). Since the weight concern factor includes only lower body parts, girls were also asked to rate their satisfaction with two upper body items (breasts and arms) from the same scale for a total of nine body satisfaction questions. The Body Esteem Scale has been validated in young adult populations (24) but has not been used in pediatric populations. Some wording and answering format changes were necessary for use with nine- and ten-year-old children. Items were answered in a four-choice check-off format which ranged from "Very Happy" to "Very Unhappy." A higher score indicated a higher degree of satisfaction.

Three maternal influence scores were obtained by summing responses to questionnaire items: (a) a score for mother and daughter-reported maternal disapproval of daughter's body build and eating habits (ranging from 3 to 12), (b) a score for self-

TABLE 2
Questions Summed to Form Maternal Influence Scores
with Factor Loadings (N = 1,652)

Daughter-Reported Items:	Factor* Loading
A. DISAPPROVES OF DAUGHTER'S BODY BUILD AND EATING HABITS SCORE (Factor 1)	
1. Do you think your mother (or female guardian) likes your present weight?	.653
2. Have any of these people ever told you that you are too fat? Your mother?	.673
Mother-Reported Items:	
3. Do you ever tell her that she is eating too much?	.731
4. Does she ever complain that you nag her about what she eats?	.428
5. She eats too many snacks.	.548
6. In general, do you want her to eat less than she eats now?	.719
B. ATTEMPTS TO CONTROL EATING SCORE (Factor 2)	
Mother-Reported Items:	
1. Do you try to control what your child eats?	.813
2. Is she not allowed to eat as much as she wants?	.662
C. ATTEMPTS TO ENCOURAGE EXERCISE SCORE (Factor 3)	
Mother-Reported Items:	
1. Do you ever tell the child in NGHS that exercise is important?	.800
2. Do you try to get the child to exercise 3 or more times a week?	.774

* The first three factors accounted for 50% of the variance. No other factors accounted for an important amount of variation.

reported maternal attempts to control the amount or type of food daughters ate (ranging from 2 to 6), and (c) a score for self-reported maternal attempts to encourage exercise (ranging from 0 to 2). Higher scores indicated a higher degree of maternal influence. A total of ten maternal influence questionnaire items were included in maternal influence scores.

Maternal influence questionnaire items were adapted from the Berkeley Longitudinal Nutrition Study (BLNS) with minimal changes (25). Factor loadings (22) for each maternal influence questionnaire item in the total NGHS sample are presented in Table 2. Factor analyses computed separately by race produced very similar results in Blacks and Whites. Results by race are available upon request.

Race (Black or White) was defined by participant self-identification. NGHS girls came from racially homogeneous households. Household income was defined as income from all sources and answered in nine categories ranging from "less than \$5,000" to "\$75,000 or more." Daughters' body mass index (BMI) was defined as weight in kg/height in m squared. Maternal BMI was not available for approximately 500 mother-daughter pairs, and was not included in these analyses. Daughters' sexual maturation stage was a computed score combining pubic hair and areolar maturation stage. A girl was prepubertal if both pubic hair and areolar development were Garm stage 1, and pubertal if either of these was Garm stage 2 or higher (21).

Statistical Methods

Description of Key Variables by Race: Blacks and Whites were compared on mothers' and daughters' age; daughters' BMI, pubertal status, and body satisfaction score; and household income using means, standard deviations, and t-tests for contin-

TABLE 3
Summary Statistics by Race for Selected Mother and Daughter
Characteristics (N = 1,652)

Characteristic	Race		p
	White (N = 848)	Black (N = 804)	
1. Mean (SD) Daughter Age (Yrs.)	9.99 (0.56)	10.09 (0.56)	<0.001
2. Mean (SD) Maternal Age (Yrs.)	37.65 (5.55)	36.03 (6.78)	<0.001
3. Mean (SD) Daughter Body Mass Index (BMI)	18.00 (3.31)	19.33 (4.25)	<0.001
4. % Daughter Pubertal	32.8	64.1	<0.001
5. % in Household Income Categories:			
Less than \$10,000	6.8	25.5	<0.001
\$10,000-\$19,999	8.1	18.8	
\$20,000-\$39,999	31.5	30.4	
\$40,000-\$75,999 +	53.6	25.3	
6. Mean (SD) Daughter Body Satisfaction Score	27.54 (4.71)	28.62 (5.21)	<0.001

uous variables and proportions with chi-square tests or Wilcoxon tests for categorical measures.

Prediction of Maternal Influence Scores: Black mothers in the NGHS were expected to be more tolerant than White mothers of their daughters' heavy body build and eating habits, and to be less likely to try to control their daughters' eating or exercise behaviors. It was also expected that mothers' efforts to influence daughters' build would vary by daughters' BMI.

Because each maternal influence score could assume only a small number of levels, possible predictors were examined with the proportional odds model for ordinal categorical data, an extension of logistic regression. Under this model, the odds that a Black girl would have a higher score than a White girl were assumed constant for all levels of the score. A similar assumption was made for all predictor variables (26,27). These proportional odds assumptions were tested for each model fitted.

For each maternal influence score, the following covariates were tested: race, daughters' BMI, daughters' sexual maturation stage, household income, a race x BMI interaction, and a race x income interaction. The interaction of race with BMI or income was dropped if the p-values for these terms were greater than 0.05. All other terms were retained in all models. Race and sexual maturation stage were coded as binary variables (Black = 1, White = 0 and pubertal = 1, prepubertal = 0). Income was coded as a series of four binary variables (less than \$10,000 = 1, other = 0; \$10,000-\$19,999 = 1, other = 0; \$20,000-\$39,999 = 1, other = 0; \$40,000-\$75,000 or more = 1, other = 0). BMI was a continuous variable. To reduce potential problems with collinearity in fitting models involving interactions with BMI, the overall mean BMI value (18.65) was subtracted from individual BMI values, resulting in a score, k, representing units above or below mean BMI.

Coefficients from the logistic models were used to estimate the relative increase in the odds (odds ratio) for higher values of a predictor associated with the presence of a characteristic (e.g. Black versus White, an increase of ten units in BMI, or a higher income category compared to the lowest). For example, an odds ratio (OR) for race approximates how much more likely

TABLE 4
Response Levels and Distributions of Maternal Influence Scores by Race

Maternal Influence Score	Race				p
	White		Black		
	N	(%)	N	(%)	
1. Disapproves of Daughter's Build/Habits Scores: (N = 1,593)					
3-4	361	(44.0)	180	(23.3)	<0.001
5-6	302	(36.8)	301	(39.0)	
7-8	99	(12.1)	183	(23.7)	
9-10	41	(5.0)	85	(11.0)	
11-12	18	(2.2)	23	(3.0)	
Total	821		772		
2. Attempts to Control Eating Scores: (N = 1,623)					
2	53	(6.4)	40	(5.1)	<0.001
3	291	(34.9)	196	(24.8)	
4	316	(37.9)	316	(40.0)	
5	117	(14.0)	153	(19.4)	
6	56	(6.7)	85	(10.8)	
Total	833		790		
3. Attempts to Encourage Exercise Scores: (N = 1,624)					
0	42	(5.0)	71	(8.9)	<0.01
1	252	(30.3)	244	(30.8)	
2	537	(64.6)	478	(60.3)	
Total	831		793		

(or unlikely) it is for Black girls (coded 1) to have higher body satisfaction scores than White girls (coded 0). An odds ratio of 2.00 means that higher body satisfaction scores occur twice as often in Black girls than in White girls. An odds ratio of 0.50 means that high body satisfaction scores are half as frequent among Black girls compared to White girls. An odds ratio of 1.00 indicates that there is no racial difference (26).

When significant interactions between race and BMI were found, the odds ratio for race in Table 5 (representing OR at the mean BMI or k = 0.0 only) and the odds ratio for race × BMI were used to calculate predicted odds ratios for a range of BMI values. The predicted odds ratios, OR(k), for Blacks compared to Whites when BMI was k units above or below mean

BMI were calculated by $OR(k) = OR_1 \times OR_{12}^k$, where OR_1 is the odds ratio for race and OR_{12} is the odds ratio for the race × BMI interaction.

Prediction of Daughter Body Satisfaction Score: It was hypothesized that heavy Black girls would show higher levels of body satisfaction than heavy White girls due to less frequent maternal criticism and fewer attempts to control their eating and exercise habits. This difference was expected to increase with daughters' BMI.

To identify maternal influence factors affecting daughters' body satisfaction scores, each maternal influence score was tested separately in the following multiple linear regression model (27):

TABLE 5
Logistic Regression Odds Ratio (OR) and 95% Confidence Intervals (CI) for the Effects of Race, Daughters' Body Mass Index (BMI), Maturation Stage, and Household Income on Three Maternal Influence Scores (N = 1,516)

Predictors	Disapproves of Build/Habits Score			Control Eating Score			Encourage Exercise Score		
	OR	(95% CI)	p <	OR	(95% CI)	p <	OR	(95% CI)	p <
Race (Black = 1, White = 0)	1.92	(1.57, 2.36)	0.001	1.41	(1.15, 1.74)	0.001	0.78	(0.62, 0.99)	0.05
BMI*	1.44	(1.38, 1.50)	0.001	1.11	(1.08, 1.14)	0.001	1.04	(1.01, 1.07)	0.01
Maturation Stage (pubertal = 1, prepubertal = 0)	0.94	(0.76, 1.14)	ns	0.99	(0.81, 1.21)	ns	1.02	(0.81, 1.28)	ns
Household Income (thousand \$)									
10-19	0.78	(0.56, 1.10)	ns	0.91	(0.65, 1.29)	ns	0.59	(0.40, 0.86)	0.01
20-39	0.68	(0.51, 0.90)	0.01	1.04	(0.77, 1.39)	ns	0.72	(0.52, 1.00)	0.05
40-75+	0.62	(0.47, 0.82)	0.001	0.79	(0.59, 1.05)	ns	0.82	(0.59, 1.15)	ns
Race × BMI**	0.92	(0.87, 0.96)	0.001		ns			ns	

* Individual BMI values minus the overall mean (18.65). Multiplicative change in Black-White odds ratio associated with a gain of 1 unit of BMI.

** Change in odds ratio for Black versus White with a gain of 1 unit of BMI. Interactions were retained only if statistically significant.

- Daughter Body Satisfaction Score =
- Race
 - + Body Mass Index (BMI)
 - + Maturation Stage
 - + Income Categories
 - + Maternal Influence Score
 - + Race × BMI Interaction
 - + Race × Income Category Interaction
 - + Race × Maternal Influence Score Interaction
 - + BMI × Maternal Influence Score Interaction
 - + BMI × Race × Maternal Influence Score Interaction.

Maternal influence scores and interactions found to be statistically significant in these models were then combined in a single regression model predicting daughter body satisfaction score. Maternal influence factors not significant when all were considered jointly were dropped. Where maternal influence scores were found in preliminary models to interact with BMI, each score and its interaction were tested jointly using a two degree of freedom test. The amount of variation explained by all remaining maternal influence factors was compared to a third regression model containing only race, BMI, maturation stage, income, and race × BMI and race × income interactions, to assess how much maternal factors added to the predictive power of the simpler model.

Maternal influence scores and BMI were treated as continuous predictors in these models. Race, maturation stage, and income were coded as discussed above. Forward model selection procedures were used with main effects and lower level interactions tested before higher level interactions. Main effects for race, BMI, maturation stage, and income were retained in all models. Main effects or interaction terms contributing to significant higher order interactions were also retained.

When significant interactions between race and BMI were found, predicted body satisfaction scores for girls *k* units from the mean were calculated by intercept + *b*₁ + *k* × (*b*₂ + *b*₁₂) for Blacks and by intercept + *k* × *b*₂ for Whites, where *b*₁ is the estimate for the Black-White difference at the mean BMI (or *k* = 0.0), *b*₂ is the estimate for the change in body satisfaction per unit of BMI in Whites, and *b*₁₂ is the estimate for the Black-White difference in the change in body satisfaction per unit of BMI (race × BMI interaction).

When significant interactions between a maternal influence and BMI were found, predicted effects on body satisfaction were calculated for a range of BMI. Predicted effects of the maternal influence for girls *k* units above or below mean BMI were calculated by *b*₁ × score + (*b*₂ × *k* × score), where *b*₁ is the Table 6 estimate for the maternal influence score at the mean BMI (or *k* = 0.0) and *b*₂ is the estimate for the interaction of the score with BMI.

RESULTS

Of 2,379 NGHS girls, data for the current analysis were available from both mothers and daughters for 1,652 mother-daughter pairs (804 Black and 848 White). Girls whose mothers returned questionnaires were more often White (51.7% versus 42.6%, *p* < 0.001); more often from higher income households (27.2% versus 16.6% with \$50,000+, and 28.7% versus 41.9% with less than \$20,000; *p* < 0.001); more often from two-parent households (73.4% versus 26.6%, *p* < 0.001); and were more likely to have a parent with a college degree (26.8% versus 17.1%, *p* < 0.001) than girls whose mothers did not return the

TABLE 6
 Estimated Coefficients and Standard Error (S.E.) for Effects of Race, Daughters' Body Mass (BMI), Maturation Stage, Household Income, and Significant Maternal Influence Scores on Daughters' Body Satisfaction Score (*N* = 1,479, *R*² = .232)

Predictors	Daughter Body Satisfaction Score		
	Estimate	(S.E.)	<i>p</i>
Intercept	30.07	(0.73)	
Race (Black = 1, White = 0)	3.02	(0.69)	<0.001
BMI*	-0.33	(0.10)	<0.001
Maturation Stage (pubertal = 1, prepubertal = 0)	-0.51	(0.25)	<0.05
Household Income (thousand \$)			
10-19	-0.86	(0.82)	ns
20-39	-0.58	(0.67)	ns
40-75+	-0.42	(0.64)	ns
Disapproves of Build/Habits Score (3-12)	-0.41	(0.07)	<0.001
Race × BMI**	0.29	(0.06)	<0.001
Race × Income**			
10-19	0.07	(0.96)	ns
20-39	-1.41	(0.80)	ns
40-75+	-1.78	(0.80)	<0.05
BMI × Disapproves of Build/Habits Score**	-0.03	(0.01)	<0.05

* BMI minus overall mean of 18.65.

** Interactions were retained only if statistically significant.

questionnaire. These two groups of girls did not differ significantly in age, percent of mothers working full-time, mean BMI, percent who were pubertal, mean body satisfaction score, or percent reporting that their mothers told them that they were too fat.

Description of Key Variables by Race

Descriptive statistics by race for selected mother and daughter characteristics are presented in Table 3. Black daughters had higher mean BMI than White daughters, and a higher percent of Black girls had started puberty at baseline. Forty-four percent of Black girls compared to fourteen percent of White girls came from families with less than \$20,000 in household income. When race alone was considered, Black girls had a slightly higher mean body satisfaction score than White girls.

Distributions of maternal influence scores and tests of the overall differences in the distributions by race are presented in Table 4. Based on race alone, Black mothers expressed more disapproval of daughters' build and eating habits and tried to control the amount or type of food their daughters ate more often than White mothers. White mothers reported encouraging their daughters to exercise slightly more often than Black mothers.

Racial, BMI, and Income Differences in Maternal Influence Scores

Odds ratios from logistic regression models for maternal influence scores are presented in Table 5 together with 95% confidence intervals (CI). As shown in Table 5, the effect of race on maternal disapproval of body build and eating habits depended on BMI. Figure 1 presents a plot of predicted Black-White odds ratios for disapproves of build and habits scores for

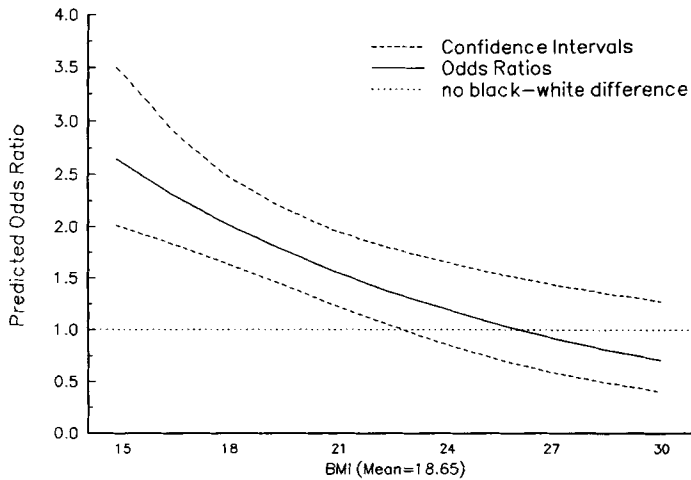


FIGURE 1: Predicted Black versus White odds ratios and 95% confidence intervals for maternal disapproval of daughters' body build and eating habits score by body mass ($N = 1,516$).

a range of BMI. It includes the OR for race at mean BMI ($k = 0.0$) presented in Table 5, as well as additional ORs, calculated as described earlier, for a range of BMI values above and below the mean BMI. Changes in the racial difference in maternal disapproval of daughter body build and eating habits with increasing daughter BMI are illustrated in Figure 1. Adjusted for BMI, Black mothers were more likely than White mothers to express disapproval of their moderately heavy daughters' build and habits ($BMI = 25$), but less likely than Whites to express disapproval of their very heavy daughters' build and habits ($BMI = 30$). For girls with $BMI = 25$, the Black-White odds ratio was 1.10; and for very heavy girls with $BMI = 30$, the Black-White odds ratio was 0.71. At a BMI of about 26, there was no racial difference ($OR = 1.00$), and Black mothers were about as likely as White mothers to disapprove of their daughters' body build and habits. In addition, mothers with household incomes over \$20,000 were less likely than those with household incomes under \$10,000 to express disapproval of their daughters' build and habits ($p < 0.01$). This trend with income was similar in Blacks and Whites. Daughters' maturation stage was not associated with maternal disapproval of their body build and habits.

Black mothers were more likely than White mothers to report that they tried to control the type or amount of food their daughters ate ($OR = 1.41$). The likelihood that mothers would try to do this increased with BMI ($p < 0.001$). Household income was not associated with maternal attempts to control daughters' eating. No significant Black-White differences were found in the associations of the control eating score with BMI or income.

Black mothers were less likely than White mothers to report encouraging their daughters to exercise ($OR = 0.78$). The likelihood that mothers would encourage exercise increased with BMI ($p < 0.01$). Mothers with incomes in the two middle categories (\$10,000-\$19,000 and \$20,000-\$39,000) reported encouraging daughters to exercise less often ($p < 0.05$) than did mothers in the lowest income category. Maturation stage was not associated with maternal encouragement of exercise. No racial differences were found in the associations of the encourage exercise score with BMI or income.

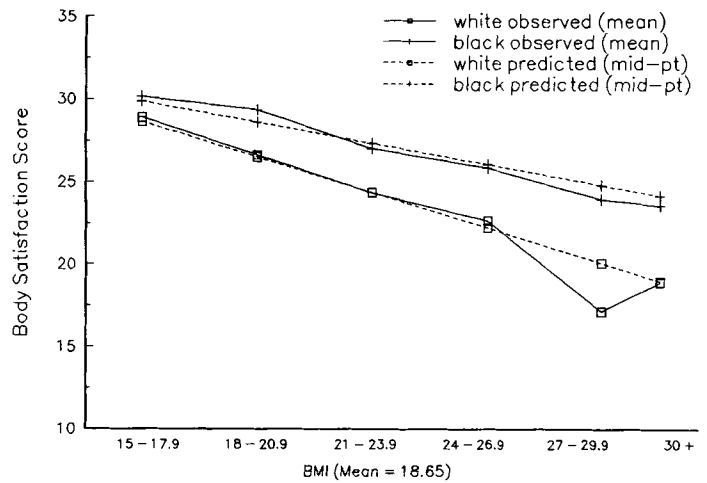


FIGURE 2: Observed and predicted daughter body satisfaction scores by body mass and race ($N = 1,495$).

Predictors of Body Satisfaction

A regression model without maternal influence factors was fitted predicting body satisfaction score from race, BMI, maturation stage, household income, and race \times BMI and race \times income interactions ($R^2 = 0.210$). Observed and predicted daughter body satisfaction scores, calculated as described earlier, are plotted by race and BMI in Figure 2. Observed mean body satisfaction scores were higher in Black girls than in White girls at all levels of BMI, except the thinnest. For all girls, average body satisfaction scores fell with increasing body mass index; however, the average decline with increasing BMI was not as large among Black girls as among White girls. At the mean BMI (18.65), predicted body satisfaction in Black girls was 2.7 units higher than in White girls. For White girls, body satisfaction decreased by 0.68 units with each unit of BMI, while for Black girls body satisfaction decreased by only 0.41 units with each unit increase in BMI. Among White girls, body satisfaction did not depend on household income ($p > 0.05$). Among Black girls, body satisfaction declined with increasing income ($p < 0.001$). Maturation stage had a non-significant effect on girls' body satisfaction ($-0.47, p > 0.05$).

Three linear regression analyses were then used to test the effect of each maternal influence factor on body satisfaction scores. The multiple linear regression model, as diagramed in the methods section, also contained terms for race, BMI, maturation stage, income, and interactions of maternal influence scores with race and BMI. Two-way interactions between race and maternal influence scores and three-way interactions between race, BMI, and maternal influence scores were non-significant. In no case did the effect of maternal influence on body satisfaction depend on race. Maternal attempts to control eating and to encourage exercise did not have significant influences on body satisfaction ($p > 0.05$). Maternal disapproval of daughter's body build and eating habits had a statistically significant effect on body satisfaction which depended on BMI ($p < 0.05$). Results for this model are displayed in Table 6. For heavier girls compared to thinner girls, body satisfaction decreased slightly more if their mothers expressed disapproval of their build and habits. An increase in BMI of 14 units was associated with an approximate doubling of the effect of maternal disapproval of build and habits on body satisfaction. The addition of maternal dis-

approval of build and habits to the model without maternal influence factors accounted for another 2.2% of the variance in body satisfaction.

DISCUSSION

The Nature of Body Satisfaction in Nine- and Ten-Year-Old Girls

These findings indicate that race and race-related factors such as BMI and household income are important in the prediction of self-reported body satisfaction in NGHS girls at baseline (28). Black girls had higher body mass indices and higher body satisfaction scores than White girls. Body satisfaction fell with increasing body mass index in all girls, but satisfaction decreased more rapidly with increasing BMI among White girls compared to Black girls. These findings are consistent with results in smaller studies of Black and White adult women (5-7,11), and add the information that Black and White girls at ages nine and ten already exhibit a similar pattern.

However, in these analyses, race, BMI, maturation stage, and household income accounted for only 21.0% of the total variation in body satisfaction scores. This suggests that other factors may be important determinants of girls' body satisfaction at ages nine and ten. The addition of significant maternal influence factors to the above model raised R^2 from 0.210 to 0.232, accounting for only another 2.2% of the variance in body satisfaction. Girls' frame of reference for evaluating their bodies at these ages may have already expanded beyond their immediate families. As suggested by Tinsley (18), the development of body satisfaction in children should be described in detail and related to better known stages of cognitive, emotional, and social growth.

Racial, Socioeconomic, and BMI Differences in Maternal Influences

These results support earlier findings that mothers take an active interest in their child's body build and eating habits (19) and that they tend to be critical of school age children who are obese (20). The hypothesis that maternal behavior, as reported by mothers and daughters, provides attitudinal preparation for weight gain in Black girls found mixed support in this cross-sectional, baseline sample of mother-daughter pairs. Black mothers of moderately heavy girls were more likely than White mothers with daughters of similar BMI to express disapproval of their daughters' build and eating habits. However, for the heaviest daughters, Black mothers were less likely than White mothers to disapprove of their daughters' build and habits. This suggests that there may be more diversity in attitudes toward obesity in Black than in White mothers.

Racial differences which did not depend on BMI were found in maternal attempts to control daughters' weight-related habits. Black mothers were more likely than White mothers to try to control daughters' eating, but less likely to encourage them to exercise. Mothers of both races were more likely to try to control their daughters' habits if the daughters were heavy.

Income level had an independent effect on maternal disapproval of build and habits and encouragement of exercise which did not depend on race. In general, mothers in the highest income group were less likely to disapprove of their daughters' build and habits and less likely to encourage exercise than mothers in the lowest income group.

The cross-sectional analysis of NGHS baseline data reported here cannot indicate whether greater tolerance for daugh-

ters' obesity among Black mothers is a cause or an effect of daughters' body build. Subsequent analyses of follow-up data may help to answer this question.

Effect of Maternal Influence Factors on Body Satisfaction

Effects of maternal influence on body satisfaction at baseline were tested for three well-defined factors (disapproval of body build and eating habits, attempts to control eating, and attempts to encourage exercise). Results were significant only for mother- and daughter-reported maternal disapproval of daughters' body build and eating habits. The effect of this influence depended on BMI so that heavier girls had a larger drop in body satisfaction associated with maternal disapproval than thinner girls.

Maternal attempts to control the amount or type of food daughters ate or to encourage exercise had no significant effects on daughter body satisfaction scores. This result lends support to Tinsley's conclusion that parental punishment or control as a method of teaching health attitudes has limited effectiveness (18).

In general, the maternal influence scores tested were not important factors in the prediction of NGHS girls' body satisfaction scores at ages nine and ten. Race, BMI, income, and the interaction of race with BMI and income accounted for most of the explained variation in body satisfaction scores. The hypothesized importance of parental influences (18,19) and the suggested association of body image disparagement with parental criticism in childhood among obese individuals (14,15) are not supported by NGHS results at baseline.

The direction of the effect of maternal attempts to influence daughters' body satisfaction was as hypothesized. NGHS girls had lower body satisfaction scores when mothers expressed disapproval of their build and habits. However, because the effect of maternal disapproval was so small, the association of higher BMI with higher body satisfaction scores in Black girls compared to White girls was only slightly altered.

Maturation stage had a limited, marginally significant effect on girls' body satisfaction at ages nine and ten. The effect of girls' maturation stage on body satisfaction could be more important after age ten. The effect of household income on body satisfaction depended on race. Body satisfaction declined with increasing income among Blacks.

A limitation of this analysis is that missing maternal data for 657 NGHS mother-daughter pairs confined conclusions to a smaller cohort somewhat higher in socioeconomic status and with more two-parent families than all NGHS mother-daughter pairs at baseline. It should be noted that conclusions regarding the effects of maternal influence factors on body satisfaction were not altered by adjustment for income in these models. This offers some reassurance concerning the generalizability of these findings to a less selected population. However, the possibility that the effect of maternal influence factors in mother-daughter pairs with missing data was systematically different cannot be totally excluded.

We conclude that the racial differences in NGHS girls' self-reported body satisfaction found at ages nine and ten cannot be attributed to the mother- and daughter-reported maternal influences measured in this study. The analysis of follow-up data on this cohort of girls may further contribute to the understanding of the maternal role in the development of daughter body satisfaction.

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