Changing Bodies:
Weight Management Behaviors among American Adolescents

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Introduction

Increasingly, those writing on the 'epidemic' of obesity in both the popular and the medical press are leading a call for public health programs that focus on obese children and teens (Adair and Gordon-Larsen, 2001; Strauss and Pollack, 2001). At the local, state, and federal level, programs have been implemented to try to encourage healthy eating and an active lifestyle among youth (Jones et al., 2003; Centers for Disease Control and Prevention, 1997). However, little is known about the current prevalence of weight control and body management behaviors among American adolescents. Even less is known about differences in these behaviors among adolescents by gender, age, social class, race and ethnicity, or about the individual-level developmental and psychological correlates of such behaviors (Striegel-Moore et al., 2000).

Using data from the National Longitudinal Study of Adolescent Health (Add Health), this paper examines the patterning of weight management behaviors among US adolescents by social groups, and analyzes individual-level developmental and psychological factors that predispose teens to engage in body management behaviors. The paper addresses the following four research questions:

1. What are the types and prevalence of weight management behaviors among American adolescents? Do weight management behaviors differ by gender?

2. What is the age patterning of these behaviors?

3. Does the prevalence of weight management behaviors differ by race / ethnicity or social class?

4. Controlling for the social patterning of these behaviors, what are the individual-level developmental and psychological correlates of weight management behaviors?

Background

The increase in the percentage of Americans in the general population who are overweight is well documented (Moran, 1999; Young and Nestle, 2002). Obesity is a concern for medical and public health professionals because of associated disease and morbidity. Studies have shown that obesity can lead to lifelong physical and emotional difficulties (Carpenter et al., 2000; Moran, 1999).

Obesity appears to be a lifelong problem; those who are obese as children tend to become obese teens, who in turn tend to become obese adults (Moran, 1999). Eating and exercise habits that are formed in the teen years often persist into adulthood (Goodman and Whitaker, 2002). Recent literature highlights the fact that the prevalence of obesity is rising in every age group, with childhood and teen obesity an increasing research focus (Moran, 1999; Strauss, 2000). Studies show that obesity has increased in adolescents since the 1960's; some estimate that up to one quarter of adolescents may be at risk for obesity (Boutelle et al., 2002).

Several studies have examined the social patterning of obesity among adults and adolescents. Using the Add Health data, Goodman et al (2003) show that race, gender, and socio-economic status (as measured through income and parental education) are all associated with obesity. Using the Household Component of the 1996 Medical Expenditure Panel Survey, Haas et al (2003) look at race, social class and health insurance correlations with obesity. They show that lower class Hispanic and Blacks are particularly vulnerable to obesity.

Treatments for obesity usually involve a combination of weight loss goals, dietary change, and physical activity management. In order to design effective treatment programs, it

is essential to know which groups are at risk for obesity, and to understand current patterns of physical activity. While there is some literature that focuses on the prevalence of extreme body management behaviors (such as starvation or bingeing and purging) among teens with eating disorders, little is known about the body management behaviors of average teenagers. Social scientists do not know if weight management behaviors are socially patterned, and they do not know what predisposes individuals towards body changing behavior.

Previous attempts to study dieting behavior among adolescents have shown that often dieting is often linked to perceived rather than actual obesity, and that dieting may be linked to depression at the individual level (Pesa et al., 2000). Attempts to measure dieting have met with mixed success, though. For example, Roberts et al. (2001) found that teenage girls tend to overestimate their dieting behavior. Using a definition of dieting that includes any restriction on food intake, Rafiroiu et al. (2003) found that only 37% of teens were NON-dieters. Lowry et al. (2002) found that although females were less likely to be overweight than boys, they were more likely to report dieting behavior.

Although the teenage struggle to cope with a changing body through puberty is on the one hand intensely personal, social factors may also contribute to rates of weight management behaviors. Just as obesity is socially patterned, by gender, race / ethnicity and social class, so too may weight management behaviors be socially patterned. At the individual level, psychosocial issues (in particular, coping with puberty, depression, and body image) may further contribute to body management behaviors.

This paper will test the argument that while weight management and body control behaviors in adolescence are usually seen as personal endeavors, their types, prevalence, and frequency of occurrence may be socially patterned.

Data and Research Methods

This study is based on data from the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a longitudinal, nationally representative survey of adolescents in grades 7-12, which was designed to explore the causes, correlates, and consequences of the health-related behaviors of adolescents in the United States. Add Health is funded by the National Institute of Child Health and Human Development (NICHD), and seventeen other federal agencies.

Add Health is a school-based study. Using a sampling frame of all high schools in the United States, provided by Quality Education Data, Inc, a stratified sample of 80 high schools was chosen. The sample was stratified to ensure that the schools chosen are representative of high schools within the United States with respect to: region of the country; urbanicity; school type (private and public); racial and ethnic composition; and school size. Seventy percent of the original sample of high schools agreed to participate; those who did not agree to participate were replaced with similar schools. In addition, one junior or middle school sending students to each high school that did not have the lower grades was included to represent the younger ages targeted in the study. The total sample included 132 schools.

An in-school questionnaire was administered at each of the schools during either the fall of 1994 or the spring of 1995. The questionnaire was administered during one class period to all the students in the school (based on a roster provided by the school). The questionnaire was self-administered, on sheets which were then computer scanned. The in-school questionnaire was completed by over 90,000 students.

A first round of in-home questionnaires was administered between April and December 1995. The sampling frame for this part of the survey included all students on the rosters of the schools (including those students who did not complete the in-school questionnaire). In each school, students were stratified by grade and sex. Approximately seventeen students were chosen randomly from each strata, with approximately two hundred students selected from each of the pairs of schools. The core sample for Wave I contained 12,105 adolescents. In addition, the following groups were over sampled in Wave I: well-educated blacks; Chinese; Cubans; Puerto Ricans; the disabled; and certain sibling genetic pairs. Thus the total sample for the Wave I in-home questionnaire was 20,745 adolescents.

Most of the Wave I interviews were conducted in the adolescents' homes. The interviews took from one to two hours to complete. In order to insure confidentiality and to increase accuracy, researchers did not use paper questionnaires; the data were recorded straight into lap-top computers. The interviewers read the questions and entered the respondent's answers during the less sensitive sections of the questionnaire. During the more sensitive sections of the questionnaire, the respondents listened to pre-recorded questions through earphones and entered their answers directly onto the lap-top computers. Parents were also interviewed during the Wave I in-home interviews.

The sample for the Wave II in-home interview was composed of all the respondents to the Wave I in-home interview except for respondents who were in the 12th grade at Wave I, who were not followed up. Wave II in-home interviews took place from April through August 1996. The re-interview response rate (taking into account those who were not re-interviewed by design) was over 85%, resulting in a Wave II sample of 14,738 adolescents.

The Wave II interview was almost identical to the interview at Wave I (and was administered in the same fashion), except that it also included objective measures of weight and height. The dependent variables analyzed in this paper (body management behaviors) are all measured at Wave II, while some of the independent variables (including race / ethnicity and social class) are measured at Wave I.

Since the sample used for the analyses presented in this paper comes from Wave II, it is important to note the possible effects of attrition on the results. Because they were not followed up, the oldest adolescents in Wave I are not included in these analyses. Additional reasons for attrition could include the respondent moving or choosing not to answer the Wave II questionnaire for other reasons. It is hard to generalize about these reasons for attrition, and therefore hard to estimate the research effects. However, one potential reason for attrition that could affect research findings could be if the respondent was hospitalized (with clinical depression, an eating disorder, or other related illness) or was so ill (mentally or physically) that he / she could not answer the questionnaire. If this were the case, the study results would suffer from a systematic bias in that those with the most severe body management behaviors may be excluded from analyses.

Weight Management Behaviors

> *Research Question 1. What are the types and prevalence of weight management behaviors among American adolescents? Do weight management behaviors differ by gender?*

During the Wave II survey, Add Health respondents were asked questions about ways in which they tried to regulate or change their weight status. First, they were asked whether they were trying to lose weight, gain weight, or stay the same weight. Table 1 (below)

indicates that overall, the percentage of adolescents in Wave II who are trying to change their weight status is just over 50% (almost 54% of girls, and 51% of boys). However, there are striking gender differences, with 46% of adolescent girls reporting that they are trying to lose weight, while 31% of adolescent boys report that they are trying to gain weight.

Table 1 Attempts to Change Weight Status

Changing Weight Status	Girls	Boys
N =	6,833	6,469
Trying to Lose Weight	**46.2**	19.8
Trying to Gain Weight	7.5	**31.1**

Note: The results in this table, along with all others in the paper, are corrected for design effects. Unless otherwise specified, all tables in the text are based on N = 13,302 (all Wave II respondents for whom we have Wave I data, measured height and weight, subjective body image information, and information on race / ethnicity).

Most research shows that adolescent boys are actually at a higher risk of obesity than adolescent girls (Haas et al., 2003). Thus it is interesting that boys are more likely to be trying to GAIN weight than LOSE weight. As will be discussed later in the paper, I suspect that this tendency has to do with cultural norms that value large, muscular male bodies and small, slender female bodies. For the purposes of this paper, I will focus on the most common forms of body management behaviors (shown in bold in Table 1). The focus for girls will be on behaviors to lose weight, while the focus for boys will be on behaviors to gain weight[1].

Next, respondents were asked to list the methods by which they had been trying to lose, gain, or maintain their weight in the past seven days. Table 2 illustrates the prevalence of weight management behaviors among Add Health respondents (note that respondents

[1] Future work will focus on the boys who report trying to lose weight, and the girls who report trying to gain weight.

could list more than one behavior, and also that the behaviors could be enacted to maintain as well as to change weight status, thus the total percentage engaging in weight management behaviors exceeds 100%).

Table 2 Body Management Behaviors

Body Management Behavior	Boys (N = 6,469)	Girls (N = 6,833)
Trying to Lose Weight	19.8	**46.2**
Diet	6.7	**22.2**
Exercise	32.6	**51.0**
Vomit	.2	**.7**
Pills	.2	**1.8**
Laxatives	.1	**.4**
Trying to Gain Weight	**31.1**	7.5
Diet	**3.3**	1.0
Exercise	**14.1**	2.7
Lift Weights	**18.0**	1.0
Food Supplements	**3.8**	.9
Steroids[2]	**0**	.1

Feminist theory and writing on eating disorders might lead us to believe that extreme body management behaviors are widespread, especially among adolescent girls (Pipher, 1995). However, we find that, while many adolescents are dieting or exercising to manage their weight, far fewer are engaging in more destructive and / or extreme behaviors such as vomiting or taking laxatives to lose weight or taking steroids to gain weight[3].

The next section of the paper examines the population-level patterning of gendered body management behaviors (those highlighted in bold in Table 2). I will first look for group-level differences in weight management behaviors by age, social class, and race /

[2] It is curious that the steroid use is reported as 0 for boys (and .1 for girls!). I suspect that some of the items the boys are calling 'food supplements' might fall under the technical definition of steroids. Boys may be reluctant to report steroid use, as it has received so much negative press. In some instances, they can be removed from sports' team participation for steroid use.

[3] It should be noted, however, that respondents were asked to list behaviors in the past seven days; thus there may be consistent under-reporting of extreme body management behaviors.

ethnicity. Next, I will examine the individual-level factors that are correlated with body management behaviors.

Population Level patterning of weight management behaviors

Research Question 2. What is the age patterning of these behaviors?

Age

Table 3 illustrates the distribution of female body management behaviors (to lose weight) by age (using laxatives is not included because the number of cases is too small). Table 4 illustrates the distribution of male body management behaviors (to gain weight) by age (using steroids is not included because the number of cases is too small).

Table 3 Female Body Management Behaviors By Age

Age Group	Try to Lose	Diet	Exercise	Vomit	Pills
14 and under	41.8	18.3	54.0	.8	1.4
15	47.6	20.7	59.0	.5	.7
16	47.3	22.5	54.8	.6	1.5
17	44.1	22.1	48.4	.4	2.0
18 and over	48.7	25.2	46.8	.7	2.5

Previous research has shown that girls at the last stage of adolescence are at highest risk for misperceiving their body, thinking they are fat when they are not (Godley, 2003). It appears that while some of the female body management behaviors follow this same pattern (showing a linear increase with age), not all do. Overall, girls who are 18 and over are significantly more likely than girls who are 14 and under to be trying to lose weight, but they are not significantly more likely than girls in the middle stages of adolescence to be trying to lose weight.

While rates of dieting to lose weight go up with age, rates of exercising to lose weight appear to go down after age 15. Rates of vomiting to lose weight are not significantly different across the age groups. Finally, girls who are 17 and older are significantly more likely than girls of younger ages to use pills to lose weight. Future research should investigate the patterning of these female body management behaviors into young adulthood.

Table 4 Male Body Management Behaviors By Age

Age Group	Try to Gain	Diet	Exercise	Lift Weights	Suppl.
14 and under	17.8	1.1	9.4	11.3	2.3
15	28.2	2.9	14.0	18.1	1.5
16	30.4	2.5	14.4	21.8	4.3
17	35.2	4.1	18.0	21.6	5.7
18 and over	32.3	4.0	15.3	18.8	5.2

For boys, body image misperception (the opposite of girls' body image misperception – boys tend to think they are too thin when they are not) is highest at mid-adolescence and goes down as they reach late adolescence and settle into their adult bodies (Godley, 2003). Male body management behaviors appear to follow this pattern, also. Rates of all the behaviors are highest at ages 16 and 17, and decline by age 18. There is a particularly sharp rise in the percent of boys who are trying to gain weight between ages 14 and 15. This rise is mirrored by similar rises in the percent of boys exercising and lifting weights to gain weight between ages 14 and 15. By age 18, there is an overall decline in boys practicing body management behaviors. Future work should examine whether this decline continues into young adulthood.

Thus, we find that overall girls' body management behaviors increase as they traverse adolescence and enter adulthood, while boys' body management behaviors appear to follow a developmental trajectory, becoming most prevalent at mid-adolescence and decreasing as

they enter adulthood. These empirical results find theoretical support in the feminist observation that adolescent boys grow into adult male bodies which are valued in our society, while adolescent girls grow into adult female bodies which are not (Grogan, 1999).

Not all body management behaviors among adolescents are consistent with these patterns, though. It may be that other factors that vary with age, such as having access to a car to go and buy diet pills or supplements, for example, also have an impact on behaviors.

Research Question 3. Does the prevalence of weight management behaviors differ by race / ethnicity or social class?

Race / Ethnicity

Measures of self-reported race and ethnicity collected during Wave I of the Add Health study were used to create a five-category race / ethnicity variable: White, Black, American Indian, Asian, and Hispanic. The frequency distribution of this variable for the sample is shown below. I code all those who report that they are Hispanic as Hispanic regardless of the race(s) they selected. I then code non-Hispanics according to the race they selected, if they only selected one race. For respondents who selected more than one race, I choose the race they identified as their 'major' race. Table 5 illustrates the race / ethnic distribution of the whole sample (there are no significant gender differences in the race/ ethnic distribution of the samples).

Table 5 Racial / Ethnic Distribution of Sample

Race / Ethnicity	Frequency	Percent
White	7358	55.31
Black	2850	21.42
American Indian	113	0.85
Asian	930	7.00
Hispanic	2051	15.42
Total	13,302	100.00

Note: It should be noted that the racial distribution of the sample does not reflect the 'true' national distribution (since certain groups were over-sampled). However, all of the analyses correct for these design effects; therefore, the results are nationally representative with respect to race.

Tables 6 and 7 illustrate the distribution of body management behaviors by race/ethnicity, separately for boys and girls.

Table 6 Female Body Management Behaviors By Race / Ethnicity

Race / Ethnicity	Try to Lose	Diet	Exercise	Vomit	Pills
Overall	46.2	22.2	51.0	.7	1.8
White	45.8	22.7	55.8	.7	2.0
Black	44.6	16.6	44.5	.4	.9
Amer. Indian	27.2	13.4	38.9	.1	.6
Asian	38.8	20.8	50.6	.2	1.1
Hispanic	49.9	22.2	47.6	.7	.9

Table 6 shows that Black girls engage in body management behaviors at significantly lower rates than White girls. American Indian girls also have significantly lower rates of body management behaviors than White girls. Asians report lower rates of trying to lose weight overall, but fairly high rates of body management behaviors such as dieting and exercising.

Table 7 Male Body Management Behaviors By Race/ Ethnicity

Race / Ethnicity	Try to Gain	Diet	Exercise	Lift Weights	Suppl.
Overall	31.1	3.3	14.1	18.0	3.8
White	25.5	3.0	13.1	16.6	3.7
Black	42.8	3.5	18.9	27.2	4.1
Amer. Indian	22.7	0	14.7	17.7	2.0
Asian	31.7	3.7	16.7	16.2	3.2
Hispanic	27.2	1.4	12.9	16.3	4.3

Table 7 shows that Black boys have the highest rates of body management behaviors. Almost 43% of Black boys are trying to gain weight, and 27% report lifting weights to gain weight. Black boys have significantly higher rates of trying to gain weight than any other racial / ethnic group. The only weight gaining behavior where Blacks do not report the highest rates is taking food supplements; Hispanics have the highest rates there, but the differences are not statistically significant.

Thus it appears that for both boys and girls the racial / ethnic patterning of body management behavior matches the patterning of body image misperception (Godley, 2003). Black girls misperceive their bodies less, and try to manage them less, than girls of other races; Black boys misperceive their bodies more, and try to manage them more, than boys from other racial / ethnic groups.

Several authors have noted that both the importance of and the idealizations of body images for men and women vary by race / ethnicity (Lovejoy, 2001; Pope et al., 2000). They argue that the idealized thin female body is more important for White girls than for Black girls, and the idealized muscular male body is more important for Black boys than for White boys. These data appear to support this literature, with Black adolescent boys working hardest to gain weight and White adolescent girls working hardest to lose weight.

Social Class

The next section examines the patterning of body management behaviors among adolescents by social class. Social class can be operationalized in two different ways using the Add Health data, both based on variables measured at Wave I. The first measure is household income, as reported by the parent. The second variable is the highest education recorded in the household, reported either by the parent or the child. Since not all parents filled out the parental questionnaire, and not all of those who filled out the questionnaire answered the income questions, using the income variable restricts the sample to 10,414 adolescents (5,131 boys and 5,283 girls). To avoid potential non-response bias, therefore, this paper uses parents' education as a proxy for social class.

Resident parents were asked to report on the highest education they and their partners had received; adolescents were also asked to report on the highest level of education of their resident mother figure and their resident father figure. I use the parental response to the education question if it is available (this data is available for 87 percent of my sample, creating much less of a problem with non-response bias than the income variable). Otherwise, I use the adolescents' response to the education level of the resident parents. If there is more than one resident parent, I compare their education, and use the highest level of education in the household to create the household education variable. The sample distribution of this variable is shown in Table 8.

Table 8 Sample Distribution of Highest Education in the Household*

Highest Education in The Household	Frequency	Percent
Less than High School	1681	12.64
High School Graduate	3364	25.30
Some College	3320	24.97
College Grad. Plus	4933	37.10
Total	13,298	100.00

Freq. Missing = 4

* Measured at Wave I, Parent or Child Reported

Tables 9 and 10 illustrate the distribution of body management behaviors by highest education in the household, separately for boys and girls.

Table 9 Female Body Management Behaviors By Highest Education in the Household

Hi. Ed. In Household	Try to Lose	Diet	Exercise	Vomit	Pills
Average	46.2	22.2	51.0	.7	1.8
Less than High School	49.4	22.4	44.6	.8	2.1
High School Graduate	48.0	21.7	51.1	.8	2.1
Some College	45.3	21.0	55.5	.4	1.7
College Graduate +	42.5	22.0	55.2	.5	1.1

For girls, parental education appears to be negatively related to trying to lose weight. Girls in households where the highest education is high school or less are more likely to report trying to lose weight than girls in households where the highest education is college graduate or above. Education is positively related to one form of trying to lose weight, though: exercising. Significantly more girls in households with some college education or above report exercising to lose weight than girls in households with a high school education or below (at p=.001). Among the girls, there is no relationship between social class and dieting, vomiting, or using pills to lose weight.

Table 10 Male Body Management Behaviors By Highest Education in the Household

Hi Ed. In Household	Try to Gain	Diet	Exercise	Lift Weights	Suppl.
Average	31.1	3.3	14.1	18.0	3.8
Less than High School	32.8	2.0	15.9	16.9	3.8
High School Graduate	27.1	2.5	11.2	16.6	3.1
Some College	28.3	2.8	15.0	18.7	4.2
College graduate +	28.5	3.7	15.0	19.4	3.9

For boys, there appears to be no patterning of body management behaviors by education level of the household. It appears that trying to gain weight is negatively related to parental educational status, but none of these class differences is statistically significant. Lifting weights to gain weight is positively related to education. Boys in households with some college education or above are significantly more likely to lift weights to gain weight than those in households with high school education or below. There is no obvious patterning of dieting, exercising, or taking food supplements to gain weight by education.

Thus it appears that education is related to certain methods of body management – specifically, exercising to lose weight for girls and lifting weights to gain weight for boys. However, the educational variations do not appear to be as salient as the race / ethnicity patterns for body management behavior, and they are not consistent across gender.

Individual-level Analyses

The next section of the paper examines individual-level models of body management behaviors among adolescents, with controls for the social groupings of age, race/ ethnicity and social class (operationalized through parental education). I draw on literature from developmental psychology to guide my analyses.

Research question 4. Controlling for the social patterning of these behaviors, what are the individual-level developmental and psychological correlates of weight management behaviors? Is puberty related to body management behaviors? Is comparative puberty related to body management behaviors? Is self misperception related to body management behaviors?

Developmental psychologists stress that adolescence is a time of rapid physical and emotional change. Some argue that it is completely 'normal' for teenagers to attempt to modify, control, and transform their bodies during puberty, as they try to cope with natural physical changes (Pope et al., 2000). Such an argument would lead us to expect that adolescents who are just beginning to undergo, or are currently undergoing pubertal development, will be more likely to practice body management behaviors than those who have completed puberty.

To examine the relationship between pubertal change and body management behaviors, I use age and pubertal status measured in Wave II. Since I am using the Wave II measures, with Wave II dependent variables, these will be correlational, rather than predictive, models. Male pubertal development was measured with the following questions:

> "As people reach adolescence, their bodies begin to change. The next set of questions ask (stet) about those changes.
> How much hair is under your arms?
> How thick is the hair on your face?
> Is your voice lower now than it was when you were in grade school? "

The response categories for the first and the last question ranged from 1 to 5, with 5 being the most advanced stage of physical development. The response categories for the second question ranged from 1 to 4, with 4 being the most advanced stage of physical development. To develop a male pubertal development score, I sum the responses to these questions. The minimum score is 3, and the maximum is 14. The distribution of the male pubertal development score for my sample is shown in Table 11. Notice that 131 boys are

missing information on the male pubertal development score (they either refused to answer or answered 'don't know' to one or more of the pubertal development questions).

Table 11 Male Pubertal Development Score

Total Score	Frequency	Percent
3	188	2.97
4	211	3.33
5	403	6.36
6	574	9.06
7	730	11.52
8	1041	16.42
9	1014	16.00
10	1004	15.84
11	629	9.92
12	285	4.50
13	152	2.40
14	107	1.69
Total	6338	100.00

Freq. Missing = 131

Most of the boys fall in the middle of the pubertal development score range, with scores of 7 through 10. The mean score is 8.41, with a standard deviation of 2.40. Since the sample is, on average, about 16, this finding is consistent with previous research which demonstrates that typically boys don't reach full sexual maturity until later in adolescence.

Female pubertal development was measured with the following questions:

> "As people reach adolescence, their bodies begin to change. This next set of questions ask (stet) about those changes.
> 1. Breast Development
> 2. Curviness (body becomes more curved)"

The response categories for these questions ranged from 1 to 5, with 5 being the most advanced stage of physical development. To develop a female pubertal development score, I sum the responses to these questions. The minimum score is 1, while the maximum score is 10. The distribution of the female pubertal development score for my sample is shown in

Table 12. Notice that 108 girls either refused to answer or answered 'don't know' to one or more of the pubertal development questions.

Table 12 Female Pubertal Development Score

Total Score	Frequency	Percent
2	139	2.07
3	153	2.28
4	498	7.41
5	628	9.34
6	1462	21.74
7	1240	18.44
8	1344	19.99
9	616	9.16
10	645	9.59
Total	6725	100.00

Freq. Missing = 108

Relative to the boys, the majority of girls score higher on their pubertal development score. The mean pubertal development score for girls is 6.85, with a standard deviation of 1.88. These relatively higher scores reflect the finding that girls tend to reach full sexual maturity before boys.

I was worried about the possible endogeneity of the curviness question in terms of measuring female pubertal development (perceptions of curviness may be related to perceptions of weight status and body image). Thus I also use the following two variables, which ask about menarche and age at menarche, to measure female pubertal status.

"Have you ever had a menstrual period (menstruated)?"

"How old were you when you had your very first menstrual period?"

The menarche status question is obviously a less precise measure of pubertal status (and contains much less variation, as over 93% of the sample has reached menarche in Wave II) than either the pubertal development score or age at menarche. Age at menarche, used in

conjunction with current age (I subtract age at menarche from current age to get a measure of 'years since menarche') is a more precise measure, and avoids the possible problem of endogeneity of the curviness question. The female developmental models that follow use the female pubertal development score; results using the other measures of female development are substantively the same.

Developmental psychologists who incorporate social context in their theories stress the importance of peers for adolescents' self perception. They would argue that regardless of their actual pubertal status, adolescents who felt that they were 'behind' their peers in terms of pubertal development might be more likely to worry about and to try to control their bodies. Comparative puberty is also measured in Wave II, and I include these measures in my developmental models. The comparative puberty variable for males was calculated from the following question:

"How advanced is your physical development compared to other boys your age?"

Respondents were able to answer "younger than most", "younger than some," "about average," "older than most," and "older than some." The distribution of this variable for the male sample is shown in Table 13 (from the original sample, 83 boys refused to answer or answered 'don't know' to this question).

Table 13 Male Comparative Puberty Scale

Physical Development Compared to Peers	Frequency	Percent
Younger than most	785	12.29
Younger than some	714	11.18
About average	2488	38.96
Older than some	1592	24.93
Older than most	807	12.64
Total	6386	100.00

Freq. Missing = 83

Just under 40 percent of boys consider their physical development to be about average with respect to their peers. Just over 40 percent feel that they are older than their peers in terms of physical development, but only 13 percent feel they are older than most.

The comparative puberty variable for females was calculated from this question:

"How advanced is your physical development compared to other girls your age?"

Again, the respondents were able to answer "younger than most", "younger than some," "about average," "older than most," and "older than some." The distribution of this variable for the female sample is shown in Table 14 (from the original sample, 59 girls refused to answer or answered 'don't know' to this question).

Table 14 Female Comparative Puberty Scale

Physical Development Compared to Peers	Frequency	Percent
Younger than most	686	10.13
Younger than some	788	11.63
About average	2697	39.81
Older than some	1787	26.38
Older than most	816	12.05
Total	6774	100.00

Freq. Missing = 59

The distribution of female comparative puberty is remarkably similar to the distribution of male comparative puberty. Just under 40 percent of girls consider their physical development to be about average with respect to their peers. Almost 50 percent feel that they are older than their peers in terms of physical development, but only 12 percent feel they are older than most. It is important to stress that I control for age and for actual physical development (using the scores described above) in the models that include perceived relative puberty.

Psychologists are also interested in how body image and self perception affect individuals' propensity to practice body management behaviors. Using measured data on body mass index and weight perception, I created two dichotomous variables to measure two different types of body misperception[4]. The first variable captures individuals who think they are too fat when they are not – they are actually either normal or underweight (according to CDC BMI-for-age by gender guidelines). The second variable captures individuals who think they are too thin when they are not – they are actually either normal or overweight (according to CDC BMI-for-age by gender guidelines). Table 15 presents the distribution of these variables, separately by gender.

Table 15 Distorted Body Image, Wave II

Distorted Body Image N =	Girls 6,833	Boys 6,469
Think fat when not	**19.1**	5.1
Think thin when not	3.7	**11.1**

Table 15 confirms that girls are more likely than boys to think they are too fat when they are not, and boys are more likely than girls to think they are too thin when they are not. In Wave II, 19.1 percent of girls think they are fat when they are not, while 11.1 percent of boys think they are thin when they are not. It is important to note that while some boys think they are fat when they are not, and some girls think they are thin when they are not, it is much more likely that boys misperceive themselves to be too thin, while girls misperceive themselves to be too fat. Previous research has shown that this distorted body image variable

[4] I first created a continuous variable, and then changed it to a dichotomous variable to capture the latent propensity to misperceive one's body (details available from the author).

is correlated with high levels of depression and low levels of self esteem for both girls and boys (Godley, 2003).

I next investigate individual-level models of the most common body management behaviors for adolescent girls and boys. For girls, I focus on dieting and exercising to lose weight. For boys, I focus on exercising and lifting weights to gain weight. Results are shown in Tables 16 and 17 on the following pages.

Table 16 Logistic Regression Equations for Prediction of Girls Dieting to Lose Weight and Exercising to Lose Weight by Selected Individual and Social Factors

Independent Variables	Model I – Diet	Model II – Diet	Model III- Exercise	Model IV- Exercise
Age	.099***	.069**	- .063**	-.079**
	(.024)	(.024)	(.024)	(.024)
Female Sexual Maturity Rating	.080***	.078***	.066**	.065**
	(.022)	(.023)	(.023)	(.023)
Female Comparative Puberty	.265***	.236***	.210***	.195***
	(.045)	(.045)	(.037)	(.037)
Distorted Body Image	----	1.012***	-----	.577***
(think fat when not)		(.090)		(.089)
Race: White	Omit	Omit	Omit	Omit
Black	-.335**	-.242*	-.312**	-.271**
	(.107)	(.110)	(.105)	(.103)
American Indian	-.557	-.507	-.741*	-.722*
	(.376)	(.417)	(.338)	(.340)
Asian	.069	.022	.025	.007
	(.214)	(.207)	(.184)	(.183)
Hispanic	.080	.072	-.172	-.177
	(.165)	(.164)	(.120)	(.118)
Highest Educ. Level in HH: Less than high school	Omit	Omit	Omit	Omit
High School Grad	-.071	-.157	.101	.062
	(.145)	(.146)	(.135)	(.137)
Some College	-.118	-.174	.251	.227
	(.160)	(.159)	(.139)	(.141)
College Grad plus	-.059	-.142	.213	.179
	(.151)	(.149)	(.142)	(.141)
Constant	- 4.203	- 3.80	- .107	.123
	(.423)	(.414)	(.470)	(.475)
F	10.29***	17.78***	10.40***	12.37***
Prob. > F	.0000	.0000	.0000	.0000
N	6,717	6,717	6,717	6,717

Notes: Logistic regression coefficient estimates and (standard errors) shown.
All models corrected for design effects.
* significant at the .05 level
** significant at the .01 level
*** significant at the .001 level

Table 17 Logistic Regression Equations for Prediction of Boys Exercising to Gain Weight and Lifting Weights to Gain Weight by Selected Individual and Social Factors

Independent Variables	Model I – Exercise	Model II - Exercise	Model III – Lift Weights	Model IV – Lift Weights
Age	.912	.552	1.993***	1.639**
	(.710)	(.649)	(.555)	(.515)
Age-squared	- .026	- .015	- .059 **	- .048 **
	(.021)	(.020)	(.017)	(.016)
Male Sexual Maturity Rating	.076***	.072**	.063**	.059**
	(.020)	(.021)	(.019)	(.020)
Male Comparative Puberty	-.122**	-.104*	-.052	-.033
	(.048)	(.049)	(.040)	(.042)
Distorted Body Image		1.165***		1.144***
(think thin when not)	-----	(.112)	-----	(.112)
Race: White	Omit	Omit	Omit	Omit
Black	.552***	.520***	.751***	.732***
	(.122)	(.125)	(.114)	(.120)
American Indian	.304	.346	.277	.317
	(.563)	(.579)	(.557)	(.562)
Asian	.266	.251	.005	-.019
	(.195)	(.203)	(.195)	(.210)
Hispanic	.020	-.019	.085	.053
	(.163)	(.161)	(.144)	(.139)
Highest Educ. Level in HH:				
Less than high school	Omit	Omit	Omit	Omit
High School Grad	-.420**	-.412**	-.027	-.008
	(.170)	(.169)	(.139)	(.139)
Some College	-.036	-.042	.156	.163
	(.171)	(.172)	(.150)	(.154)
College Grad plus	-.060	-.047	.209	.232
	(.162)	(.162)	(.147)	(.145)
Constant	- 9.872	- 7.144	- 18.791	- 16.106
	(5.787)	(5.272)	(4.544)	(4.208)
F	5.54***	12.91***	7.31***	15.87***
Prob. > F	.0000	.0000	.0000	.0000
N	6,325	6,325	6,325	6,325

Notes: Logistic regression coefficient estimates and (standard errors) shown.
All models corrected for design effects.
* significant at the .05 level
** significant at the .01 level
*** significant at the .001 level

The female developmental model for dieting (Model I in Table 16) demonstrates that age, pubertal development, and comparative pubertal development are all positively related to the likelihood of an individual girl dieting to lose weight. Thus we see that as girls get older, and as they pass through puberty, they are increasingly likely to report dieting to lose weight. Controlling for their actual age and pubertal development, girls who perceive themselves to be more physically mature than other girls are also more likely to be dieting to lose weight. Black girls are less likely to diet than White girls, all other variables held equal, and there are no effects of class on dieting, controlling for the other independent variables. Thus it appears that for adolescent girls, dieting is part of 'growing up' and becoming young women.

The first female model for exercising to lose weight (Model III in Table 16) looks similar, except that age is negatively related to exercising for girls (all the other effects are the same).

Models II and IV in Table 16 include the effects of body image disturbance on girls' body management behaviors. Interestingly, body image disturbance has a significant and large positive effect on both dieting and exercising for girls, net of all other variables. Entering disturbed body image into the models does not change any of the effects of the other developmental variables, but substantially improves the fit of the models.

Controlling for age, puberty, comparative puberty, race and class, the odds of a girl who misperceives her body (thinks she is fat when she is not) dieting to lose weight are 2.77 times higher than the odds of a girl who does not misperceive her body dieting to lose weight. And controlling for these same variables, the odds of a girl who misperceives her body exercising to lose weight are 1.78 times higher than the odds of a girl who does not misperceive her body exercising to lose weight. Thus, we can conclude that body image

disturbance has a large additional positive effect on body management behaviors for girls, net of other developmental variables, race / ethnicity, and class.

For boys, the developmental model of exercising to gain weight (Model I in Table 17) shows no age effect. Pubertal development is positively related to exercising to gain weight. At all ages, boys who are more physically mature are more likely to report exercising to gain weight. Comparative puberty is negatively related to exercising to gain weight, though. Controlling for age and actual puberty, boys who perceive themselves to be more mature than their peers are less likely to exercise to gain weight. Black boys are significantly more likely than White boys to exercise to gain weight. Controlling for race, there is a slight negative class effect.

The developmental model for lifting weights to gain weight (Model III in Table 17) looks slightly different from the models for exercising to gain weight. Age has a curvilinear effect on lifting weights, and pubertal development has a positive effect. Again, Black boys are more likely than White boys to lift weights to gain weight, but this time there are no parental educational effects.

Introducing body image disturbance into the male models also improves their fit, while all other effects remain the same (Model II and Model IV in Table 17). Controlling for age, pubertal development, comparative puberty, race, and class, a boy who misperceives his body (thinks he is too thin when he is not) has odds of exercising to gain weight that are 3.21 times higher than a boy who does not misperceive his body. The odds of his lifting weights to gain weight are 3.14 times higher, net of these other variables. Thus we can conclude that while developmental and demographic variables do predict certain body management

behaviors among adolescents, body image disturbance has a significant additional impact both for boys and girls.

Individual-level models of body management behaviors for boys and girls thus illustrate the power of both individual development and social groupings to affect personal behavior. Not surprisingly, gender, age and pubertal development influence adolescents' decisions to engage in weight management activities. Controlling for these biological factors, race / ethnicity and sometimes social class also strongly impact individuals' propensity to manage their bodies. Finally, self-perception both in relation to peers (comparative puberty) and in relation to cultural norms (body image misperception) has a significant additional impact on body management behaviors.

Conclusion

This paper has explored the social patterning and individual-level correlates of body management behaviors among a nationally representative sample of US adolescents. Body management behaviors among adolescents are clearly socially patterned, and are intimately linked with gender, age, puberty, development and self-perception. As practitioners combat the 'obesity epidemic,' these research findings can be used to design better public health interventions for adolescents.

First, the paper suggests that certain groups of adolescents are less likely to be engaging in weight management behaviors (such as Black girls and White boys). These groups may benefit from a focused campaign encouraging physical activity.

Second, the paper suggests that more attention should be paid to boys. Despite the current focus on obesity, adolescent boys appear to be more concerned with bulking up than

with slimming down. Public health experts need to work with adolescent boys to educate and inform them about the dangers of obesity, and to discourage them from pursuing the 'large' male ideal at all costs.

Third, the paper suggests certain individual-level developmental attributes that affect weight management behaviors vary by gender. While young girls increase their weight management behaviors as they age, boys do not. Girls who perceive themselves to look older than their peers are more likely to try to control their body size, while boys who perceive themselves to look older than their peers are less likely to try to change their bodies. Girls are troubled by the physical changes that accompany womanhood, while boys embrace the physical changes that accompany manhood.

Finally, by far the most important individual-level predictor of body management behavior is self misperception. The campaign against obesity needs to start with promoting more accurate body perception among adolescent boys and girls. Interestingly, promoting accurate body perception is also the first goal of many eating disorder programs.

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