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Trajectories of Body Mass and Self-Concept in Black and White Girls: The Lingering Effects of Stigma

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Abstract

As a stigmatizing condition, obesity may lead to the internalization of devalued labels and threats to self-concept. Modified labeling theory suggests that the effects of stigma may outlive direct manifestations of the discredited characteristic itself. This article considers whether obesity's effects on self-concept linger when obese youth enter the normal body mass range. Using longitudinal data from the National Growth and Health Study on 2,206 black and white girls, we estimated a parallel-process growth mixture model of body mass linked to growth models of body image discrepancy and self-esteem. We found that discrepancy was higher and self-esteem lower in formerly obese girls compared to girls always in the normal range and comparable to chronically obese girls. Neither body image discrepancy nor self-esteem rebounded in white girls despite reduction in body mass, suggesting that the effects of stigma linger. Self-esteem, but not discrepancy, did rebound in black girls.

Keywords

children and youth, mental health, obesity, self-concept, stigma

Among the many problems associated with the U.S. obesity epidemic, some of the most troubling are its prevalence and consequences among children and adolescents. Recent figures estimate that over 30 percent of those ages 2 to 19 are now overweight or obese (i.e., exceed the 85th age and gender percentiles on body mass index ([BMI]; Ogden et al. 2010). Obesity in children and adolescents is associated with myriad physical health problems, such as hypertension and Type II diabetes, and may have a long-term impact on life chances (Lavizzo-Mourey 2007; Puhl and Brownell 2001). In addition to the physical health ramifications, excess weight can also have psychological effects.

Obesity represents a stigmatizing condition, a "deeply discrediting" characteristic marked by rejection and social isolation (Goffman 1963:3). Contemporary theories of stigma emphasize that people bearing discreditable characteristics internalize the devalued label and suffer harm to their self-concept (Phelan, Link, and Dovidio 2008). Moreover, one extension of the stigma perspective—modified labeling theory (MLT; Link 1987; Link et al. 1989)—implies that stigmatized attributes are internalized to such an extent that their effects may outlive direct manifestations of the discredited characteristic itself (cf. Link and Phelan 2001). This potential raises a question of both theoretical and substantive importance: Do

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the effects of stigma linger when obese adolescents enter the normal BMI range?

Self-concept is central to psychological well-being as well as to a range of adaptive behavioral, educational, and social outcomes (Craven and Marsh 2008). To date, there is scarce longitudinal evidence of the dynamic interplay between body mass and the various dimensions of self-concept during adolescence. Several prospective studies have investigated the relationship between body mass and self-esteem (e.g., Hesketh, Wake, and Waters 2004; Strauss 2000), but many past approaches have been limited by not considering the dual trajectories of these physical and psychological states. Therefore, this article examines how distinct patterns of body mass gain or loss are associated with trajectories of two aspects of self-concept, body image discrepancy and self-esteem, among white and black girls.

To address the potential lingering effects of stigma, we will focus on self-concept trajectories of youth who transition from obese to the normal BMI range through the course of adolescence. MLT suggests that if obesity is a stigmatizing and internalized characteristic, then obese youth—whether they slim down or not—should demonstrate self-concept trajectories distinct from youth who have never experienced obesity. Furthermore, because previous research has found different subcultural weight ideals, this effect should be most pronounced among white girls, who are most susceptible to the stigma of high body mass (Ricciardelli and McCabe 2001). Finding lingering consequences of past obesity would have both theoretical and practical implications. On the theoretical side, it would suggest that MLT give more attention to modifiable characteristics, such as body weight, in addition to more enduring conditions, like mental illness and HIV/AIDS. Related to practice and policy, it would imply that weight loss intervention efforts directed at children and adolescents should give attention to self-concept, as weight loss alone may not be enough to restore self-worth.

BACKGROUND

Stigma, MLT, and Obesity

Developed by Link and colleagues (Link 1987; Link et al. 1989), MLT emphasizes how stigmatized people internalize devaluating societal messages and live in the continued expectation of discrimination. Though the prejudices of other people may be *anticipated*, no direct action by others is necessary to produce harm. Rather, a sense of propriety and worth—deeply embedded from early socialization—is transgressed, injuring self-concept.

Especially noteworthy about MLT is that it emphasizes labels attached to enduring conditions. This is likely a by-product of its original subject matter: Mental illnesses are typically "controlled," not eradicated or reversed. But what of conditions that are *not* immutable? The theory offers few explicit statements about transitory conditions. Consider obesity: While much scientific evidence shows that overweight and obesity in childhood is associated with overweight and obesity in adolescence and adulthood, a subset reenter the normal range during adolescence (Mustillo et al. 2003; Wardle et al. 2006). Thus, despite the stigma associated with adolescent obesity (documented below), we might expect that threats to self-concept are allayed if young people are on a weight-loss trajectory.

Nevertheless, weight gain and loss are by nature gradual processes, and so changes in self-concept are also likely slow. Social psychological theory and evidence suggests that even binary types of role change (e.g., a romantic breakup or a marriage) beget an ongoing process of identity modifications and renegotiations (Burke 2006; Ebaugh 1988). In the case of people actively trying to detach themselves from stigmatized labels, existential, interactional, and cultural barriers prevent a sudden turnabout in self-concept, ensuring that identity change is marked by residual effects of past roles (Howard 2008). For weight change—clearly a nonbinary transformation—this identity lag phenomena might be even more pronounced.

There is evidence that this process may differ by subgroup, particularly with regard to race/ethnicity (Anglin, Link, and Phelan 2006). Black women, for instance, are more accepting than white women of a range of body types (Lovejoy 2001) and in their evaluations of obese people (Hebl and Heatherton 1998). They also suffer far less of a self-esteem penalty due to heavy body mass (Averett and Korenman 1999). As to why these differences exist, Lovejoy (2001:249) argues that "to counteract their stigmatization in the larger society, Black women may develop particularly strong positive self-valuations as well as alternative standards for valuing their appearance and character." Hence, which characteristics are stigmatizing, susceptibility to stigma, and responses to stigmatizing labels may differ for black girls and white girls.

In light of these considerations, obesity offers an important area to consider MLT's applicability to nonpermanent stigmatizing conditions, as body mass in adolescence is changing as well as discrediting.[1] Hence, we propose a "lingering" hypothesis in which the effects of obesity on self-concept may remain even after individuals return to the normal BMI range. We expect a smaller impact on self-concept within subgroups that are more accepting of larger body size (e.g., black girls) and less of a propensity for any consequences to linger after body mass is lost.

The MLT framework anticipates some form of stigma internalization as a link between societal messages and self-concept. This poses some conceptual challenges, as the internalization of stigma is often inferred rather than measured directly, and being part of a disparaged group does not necessarily imply an internalization of stigma and threats to well-being. At the same time, few people embrace "fat pride," obese people themselves tend to exhibit antifat stereotypes, and overweight persons tend to blame themselves (Puhl and Brownell 2003). In view of the fact that people embodying stigmatized conditions may—but do not necessarily—internalize stigma, it is necessary to observe the change in several self-concept outcomes related to stigma processes.

Testing the Lingering Hypothesis with Two Aspects of Self-Concept

Accordingly, this study will focus on two outcomes: (a) people's evaluations of their own body in relation to their idea of a preferred body as an indication of internalization and (b) self-esteem as a manifestation of that internalization. We use discrepancy rather than body image itself because the discrepancy between perceived and ideal body types is an indication of cultural beliefs that have been internalized (Bessenoff and Snow 2006).

Recent self-concept research has emphasized a multidimensional conceptualization that brings together particular dimensions of self-concept that are specifically related to relevant outcomes (Marsh, Craven, and Martin 2006). Body image, as one component of physical self-concept, and self-esteem, as a measure of global self-worth, are distinct components of self-concept involved in navigating the developmental challenges of adolescence and related to the stigma associated with obesity (Craven and Marsh 2008; Strauss 2000). Examining both physical self-concept and global self-worth is particularly important in the current study, as self-concept may become increasingly multidimensional during the preadolescent to adolescent stages of development (Marsh et al. 2007; Wigfield and Eccles 2002). Higher body mass consistently predicts negative body evaluations, particularly among girls (Puhl and Latner 2007). Initial levels of body image also remain important for later evaluations even as weight or physical attractiveness changes (Rosenblum and Lewis 1999). This enduring effect provides empirical support for the lingering hypotheses described below. Similarly, recent longitudinal research demonstrates a negative prospective relationship between obesity and self-esteem (e.g., Loth et al. 2011; O'Dea 2006). A potential limitation, however, is that prospective epidemiological designs often use a single point estimate as an indicator of early obesity exposure, but this approach overlooks whether the obesity is chronic or of recent incidence and whether BMI is rising or declining.

If high body mass is associated with greater body image discrepancy, then we will conclude weight-based stigma has been internalized. Similarly, if weight-based stigma has been internalized, we expect to find sustained decrements to self-esteem among those with higher body mass. If obesity stigma lingers, *youth who enter the normal BMI range after being in the obese range will continue to have more body image discrepancy compared to those who were never overweight or obese* (Hypothesis 1). Furthermore, *youth who enter the normal BMI range after being in the obese range will continue to experience lower levels of self-esteem compared to youth who were never overweight or obese and similar to those who are chronically obese* (Hypothesis 2). The consequences of adolescent obesity are particularly salient among girls. The vast majority of studies linking adolescent obesity to emotional harm—whether long-term or confined to adolescence—indicate that the process is more robust for girls than for boys (e.g., Al-Mamun et al. 2007; Merten, Wickrama, and Williams 2008). Hence, this study focuses on girls.

DATA AND METHODS

Sample

This research utilizes data from the National Heart, Lung, and Blood Institute's (NHLBI) Growth and Health Study (GHS). GHS is a longitudinal, multisite study of 2,379 females, age 9 or 10 at baseline,

assessed annually over a 10-year period starting in 1987. Sites included Berkeley, California; Cincinnati, Ohio; and Washington, D.C. Participants were primarily recruited through local public and parochial schools and a health maintenance organization; however, the Washington, D.C., site supplemented through area Girl Scout troops as well. The study included females whose parents reported them as either black or white and within two weeks of their 9th or 10th birthday. Parental and child consent was obtained, and data were collected annually either at the local site or in the child's home. Extensive details of the data collection effort can be found elsewhere (NHLBI GHS Research Group 1992). Attrition over the 10-year study period was extremely low, with approximately 89 percent of the baseline respondents participating in the final year of the study. There were no differences in BMI, body image, or self-esteem based on attrition status.

Measures

BMI. The Quetelet Index (kg/m^2) was assessed at each wave with each respondent wearing either a paper hospital gown or a T-shirt and socks. Weight was measured on uniform Health-o-Meter electronic scales, and height was obtained through a custom portable stadiometer. We model BMI as a continuous variable, but we use the Centers for Disease Control and Prevention (CDC) BMI-for-age 85th and 95th percentile cut points as reference values for overweight and obesity, respectively.

Body image discrepancy. Participants were presented at each wave with a series of nine drawings of age-similar female bodies ranging from extremely thin to quite obese and were asked to circle the body that most closely resembled their own body as well as their ideal body. Each is coded from 1 to 9. This figure scale, originally designed for adults (Stunkard, Sørensen, and Schulsinger 1983) with validity scores of .71 to .75 (Cohn et al. 1987), was modified to more accurately represent adolescent race-neutral female bodies (Field et al. 2004). For body image discrepancy, we calculated the difference between the respondent's actual and preferred body (Gardner 2002). A positive discrepancy score indicates a preference for a thinner body, while a negative score indicates a preference for a heavier body.

Self-esteem. The Harter Self-Perception Profile (Harter 1982) was administered every other year to participants, with the Self-Perception Profile for Children used in the first four years and the Self-Perception Profile for Adolescents used in the latter years of the study. This widely used, validated, and reliable profile contains six subscales measuring feelings. The Global Self-Worth subscale, comprising six items, was used to measure children's general feelings about themselves and had Cronbach's alpha scores of .73 to .82 (Harter 1982). Items were averaged to form a scale ranging in value from 1 to 4. A higher score on the scale indicates a higher level of self-esteem.

Age at menarche. Participants were asked at each interview to report their age at menarche. In cases where they reported different ages at different waves, we used the earliest age reported to create a time-invariant covariate.

Demographic variables. We used a rounded value for age based on proximity of birthday to day of the interview, and race was defined by participant's self-identification and parent's concordant determination. Approximately 381 participants were the same age at two waves, in which case we randomly selected one wave to include. Additionally, we dropped all observations in which girls indicated they were currently pregnant. While we lost individual observations from these two exclusions, we did not lose any participants.

Analytic Models

To test the hypotheses, we used parallel-process models consisting of a growth mixture model (GMM) on BMI linked with latent growth curve models (LGCMs) of body image discrepancy and self-esteem. The GMM is an extension of the LGCM that identifies distinct subgroups of growth trajectories and allows individuals to vary around subgroup-specific mean trajectories (Muthén 2004). Conventional growth modeling estimates a single mean intercept and slope for each individual and variance parameters around that mean intercept and slope. The GMM relaxes the assumption that all individuals are drawn from a single population with common parameters by using latent tra-

jectory classes that are modeled as categorical latent variables and allow for different subgroups of trajectories to vary around different means with different forms (Jung and Wickrama 2008). The results are separate intercepts, slopes, and variance parameters for each subgroup. Based on previous research, we expect to find four trajectory classes, of which the group that is heavy in childhood only will be used to test our hypothesis about the lingering effects of stigma (Mustillo et al. 2003).

While unconditional LGCMs are typically estimated prior to adding covariates, the GMM is estimated with covariates even in the initial stages (Muthén 2004). Finding the optimal number of classes is based on measures of fit (e.g., Bayesian information criterion [BIC] and adjusted BIC), parsimony, interpretability, and theoretical justification (Jung and Wickrama 2008). An entropy statistic ranging from 0 to 1 assesses classification quality, with values closer to 1 representing good classification quality (Muthén and Muthén 2002). We estimated models with between one and six classes, comparing fit measures after each one.

Another consideration for fitting the model is that the effects of covariates and the variance parameters can be fixed or allowed to vary across trajectory classes. Freeing the parameters did not improve the fit or the interpretability of the model, nor were there significant differences among those parameters across classes, so we fixed the effects of race and the residual variances across classes. Finally, we allowed age at menarche to predict class membership and race to predict the intercepts, slopes, and quadratics within each class in addition to class membership. With race in the model, the mean intercept, slope, and quadratic parameters can be interpreted as the means for white girls, while the intercept, slope, and quadratic parameters for race can be interpreted as the difference from the mean white trajectory for black girls. In this model, the slope is interpreted as the change in BMI for a one-unit increase in time.

While we model BMI as a GMM because we suspect distinct subgroups, we model body image discrepancy and self-esteem with typical LGCMs, as we do not have reason to suspect distinct subgroups of these characteristics based on theory or previous studies. In essence, we model growth curves of body image discrepancy and self-esteem within each subgroup of BMI trajectory to compare the intercept, slope, and quadratic of body image discrepancy and self-esteem across trajectory classes of BMI (see Figure 1). If the effects of stigma linger, we expect body image discrepancy in the childhood-limited group to remain high even after these girls enter the normal weight range. Similarly, we expect the self-esteem trajectory in the childhood-limited group to remain low even after these girls enter the normal weight range. Further, we expect the intercept and slope of the childhood-limited group to resemble the intercept and slope of the chronically obese in both models. We first ran the GMM separately to determine the optimal number of classes. Then, we estimated unconditional LGCMs on discrepancy and self-esteem next. For the LGCMs, we examined two measures of fit (root mean square error of approximation [RMSEA] and comparative fit index [CFI]) that reflected the success of the model in balancing explanatory power and parsimony. For the CFI, values greater than or equal to .98 were considered acceptable (Bentler 1990), and for the RMSEA, adequate fit was indicated by <.08 and good fit by <.02 (Browne and Cudeck 1993). Next, we ran joint models, first regressing BMI trajectory class on discrepancy trajectories and then on self-esteem trajectories.

Table 1 presents descriptive statistics for the entire sample broken down by race and age group. In terms of BMI, both black and white females increased over time, with black girls increasing significantly more over time beginning at age 10. By age 13, the mean BMI for black girls was in the overweight range, where it remained through age 17, while the mean BMI for white girls stayed in the normal range throughout. Perceived body size followed the same pattern, with black females choosing significantly larger bodies overall compared to white females at every age. Preferred body size increased slightly over time for both black and white girls but corresponded with a body in the normal weight range throughout. Black girls chose, on average, a slightly larger body compared to white girls (3.03 vs. 3.43 at age 9 and 3.30 vs. 3.80 at age 17). Additionally, black females also had significantly higher levels of self-esteem at

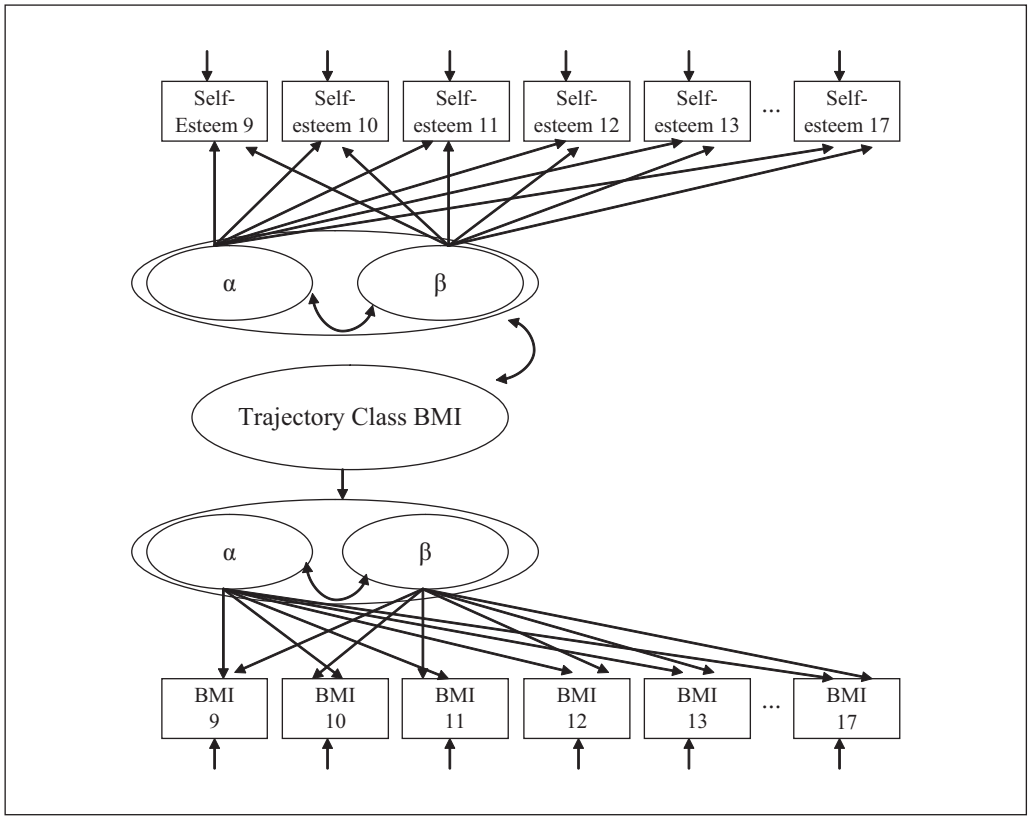

Figure 1. The Joint Probability Model of Self-Esteem and Body Mass Index

each age when compared to white females, with white females generally decreasing in self-esteem over time and black females increasing slightly.

RESULTS

BMI Classes

We estimated GMMs with between one and six classes and determined the four-class model to be the best fitting, when considering fit measures, theory, parsimony, and interpretability.[2] As shown in Table 2, class 1, containing approximately 4.9 percent of the sample based on the model estimates and posterior probabilities, can be characterized as the childhood-limited group, such that the mean BMI started off well into the obese range at age 9 (intercept = 24.83; CDC 95th percentile at age 9 = 21.80) and essentially stayed flat during late childhood and adolescence, as the slope and quadratic parameters were not significantly different from 0 (slope = –0.26, *ns*, and quadratic = 0.07, *ns*). In other words, while the mean BMIs for both white and black girls in this trajectory started in the obese range, they ended in the normal BMI range, just below the cutoff for overweight at age 17.

Class 2 was the "normal" weight class, with 77.3 percent of girls in this class. This subgroup started with a mean intercept in the normal BMI-for-age range (intercept = 15.96, $p < .01$), with a steady increase during late childhood and early adolescence that tapered off in mid- to late adolescence (slope = 1.06, $p < .01$; quadratic = –.04, $p < .01$). Hence, the girls in this trajectory class began the study in the normal BMI range based on CDC criteria and remained in the normal BMI range throughout the follow-up period. Class 3 was the chronically

Table 1. Means and Standard Deviations of Key Variables by Age

	BMI		Self-worth		Identity		Menarche	
	White (48.99)	Black (51.01)	White (48.99)	Black (51.01)	White (48.99)	Black (51.01)	White (48.99)	Black (51.01)
9	17.59 (2.91)	18.13 (3.45)	3.17 (.58)	3.16 (.64)	3.42 (1.06)	3.79 (1.08)		
10	18.00 (3.29)	19.17 (4.14)	3.16 (.60)	3.10 (.67)	3.52 (1.06)	3.86 (1.04)		
11	18.81 (3.64)	20.23 (4.58)	3.19 (.62)	3.21 (.62)	3.56 (1.07)	3.88 (1.01)		
12	19.69 (3.95)	21.46 (4.96)	3.16 (.61)	3.20 (.61)	3.62 (1.07)	3.90 (.99)		
13	20.78 (4.12)	22.65 (5.30)	3.06 (.62)	3.20 (.62)	3.70 (1.01)	3.92 (1.00)		
14	21.44 (4.18)	23.52 (5.79)	2.96 (.67)	3.18 (.65)	3.85 (1.01)	4.02 (1.05)		
15	22.23 (4.32)	24.51 (6.11)	2.94 (.68)	3.19 (.67)	3.90 (1.07)	4.07 (1.12)		
16	22.79 (4.65)	25.05 (6.56)	2.98 (.70)	3.26 (.65)	4.02 (1.21)	4.21 (1.38)		
17	22.90 (4.53)	25.48 (6.77)	3.03 (.72)	3.29 (.63)	4.14 (1.31)	4.29 (1.52)		
Total	22.42 (5.81)		3.15 (.65)		4.00 (1.25)		11.97 (1.40)	
Range	11.17–50.07		1–4		1–9		7–16.7	

Note: BMI=Body Mass Index. Standard deviations in parentheses.

obese group, with 4.9 percent of girls in this class. These girls began the study at about the same BMI level as the girls in Class 1 (intercept = 24.95, $p < .01$) but continued to increase in BMI at a rapid pace (slope = 1.86, $p < .01$; quadratic = 0.04, *ns*). These girls began the study in the obese range and remained in the obese range for the duration of the study (CDC 95th percentile at age 17 = 29.50).

Last, Class 4 was the adolescent-onset group, with 12.9 percent of girls in this class. Specifically, girls in this class began the study in the overweight range for BMI but close to the border of the normal range for age (intercept = 20.25, $p < .01$; CDC 85th percentile at age 9 = 19.1), then moved well into the obese range during the follow-up period (slope = 1.80, $p < .01$; quadratic = –.04, *ns*). In other words, the girls in this trajectory class were slightly overweight during childhood but then rapidly increased in BMI during early adolescence, entering the obese range around age 13. In all classes, black girls had a higher slope compared to white girls, but the increase tapered off over time (slope = .33, $p < .01$; quadratic = –.04, $p < .01$). Also, in all classes, the residual variance components were significantly different from zero, indicating significant variability within class around the intercept, slope, and quadratic estimates.

In terms of the regression coefficients for race and age at menarche predicting class membership, results showed that blacks were more likely to be in the obese ($b = 1.52$, $p < .01$) and adolescent-onset ($b = .40$, $p < .05$) groups compared to the normal BMI group. Age at menarche was negatively associated with being in the childhood-limited ($b = –.56$, $p < .01$) and adolescent-onset groups (–.25, $p < .01$), such that older age at menarche was associated with a decreased likelihood of being in those classes, compared to the normal BMI class. Fit of this model was acceptable, with entropy = .88.

Body Image Discrepancy and Self-Esteem

After fitting the GMM to the BMI data, we next ran unconditional LGCMs on body image discrepancy and self-esteem (results not shown) followed by models conditioned only on race. In terms of body image discrepancy (Table 3), at age 9, girls preferred, on average, a body that was half a figure smaller than their own body (intercept = .50, $p < .01$). Mean discrepancy was relatively flat between ages 9 and 13 and then increased between ages 14 and 17 (slope = –.05, $p < .01$; quadratic =.01, $p < .001$). There were no significant racial differences in body image trajectory, and there was significant residual variance around the intercept, slope, and quadratic parameters.

As for self-esteem (Table 3), results showed that on a scale of 1 to 4, white girls began the study with a mean self-esteem level of approximately

Table 2. Latent Growth Mixture Model of Body Mass Index (BMI) in 9- to 17-Year-Old Black and White Girls (N = 2,206)

	Childhood Limited (4.9%)		Normal Range (77.3%)		Chronically Obese (4.9%)		Adolescent Onset (12.9%)	
Variable	*B*	*SE*	*B*	*SE*	*b*	*SE*	*b*	*SE*
BMI means								
Intercept	24.83***	.98	15.96***	.11	24.95***	.84	20.25***	.74
Slope	−.26	.47	1.06***	.45	1.86***	.33	1.80***	.24
Quadratic	.07	.22	−.04***	.49	.04	.04	−.04	.03
Race								
Intercept	−.27	.14	−.27	.14	−.27	.14	−.27	.14
Slope	.33***	.06	.33***	.06	.33***	.06	.33***	.06
Quadratic	−.04***	.07	−.04***	.07	−.04***	.07	−.04***	.07
Residual variance								
Intercept	5.28***	.63	5.28***	.63	5.28***	.63	5.28***	.63
Slope	.88***	.09	.88***	.09	.88***	.09	.88***	.09
Quadratic	.01***	.01	.01***	.01	.01***	.01	.01***	.01
Coefficients								
Race	.62	.32	(reference group)		1.52***	.38	.40*	.18
Age	−.56***	.09			−.15	.09	−.25***	.06
Fit measures								
Entropy	.88							
LL	−9544.36							
BIC	51706.33							
Adjusted BIC	51582.42							

Note: LL = Log-Likelihood; BIC = Bayesian information criterion.
*p < .05. **p < .01. ***p < .001.

3.24 (p < .01) and black girls with a mean of approximately 0.10 points lower (p < .01), comparable to national averages (Harter 1982; Strauss 2000). During late childhood and adolescence, white girls tended to decline in self-esteem (slope = –.06, p < .001), but the decline tapered some in later adolescence (quadratic = .003, p < .05). Black girls tended to increase in self-esteem over time compared to white girls (slope = .07, p < .01). All residual variance components were significant, indicating significant variability around the mean intercept, slope, and quadratic. Fit of this model was good, with RMSEA = .02 and CFI = .98.

Joint Models

Tables 4 and 5 present the intercept, slope, and quadratic terms for body image discrepancy and self-esteem trajectories, respectively, within each BMI class. For our key group of interest, the childhood-limited group, girls had a mean discrepancy of 1.74 (p < .01) at age 9, and discrepancy remained flat during the first part of the follow-up period but then increased slightly in later adolescence (slope = –.37, *ns*; quadratic = .05, p < .05). In the normal BMI group, white girls began with a mean discrepancy of .29 (p < .01), and discrepancy remained flat during the first part of the follow-up period and then increased slightly in later adolescence (slope = –.02, *ns*; quadratic = .01, p < .01). The initial discrepancy was higher in the childhood-limited group compared to the normal BMI group and the increase in discrepancy was higher in the childhood-limited group.

Girls in the chronically obese class began the study with a discrepancy of 2.08 (p < .01), declined in discrepancy until around age 14, and then discrepancy increased to age 17 (slope = –.29, p < .01;

Table 3. Latent Growth Curve Models of Body Image Discrepancy and Self-Esteem for Black and White Girls Ages 9 to 17 (N = 2,206)

	Body Image Discrepancy		Self-Esteem	
Variable	*b*	*SE*	*b*	*SE*
Means				
Intercept	.50***	.04	3.24***	.02
Slope	−.05***	.02	−.06***	.13
Quadratic	.01***	.002	.003*	.002
Race				
Intercept	−.11	.06	−.10**	.04
Slope	−.04	.02	.07***	.02
Quadratic	.001	.003	−.003	.002
Residual variance				
Intercept	.97***	.07	.16***	.04
Slope	.08***	.01	.03**	.008
Quadratic	.001***	.00	.000***	.000
Fit measures				
RMSEA	.03		.02	
CFI	.99		.98	
BIC	36534.85		19244.686	
Adjusted BIC	36468.13		19177.965	

Note: RMSEA = root mean square error of approximation; CFI = comparative fit index; BIC = Bayesian information criterion.

quadratic = .05, $p < .01$), similar in pattern to the childhood-limited group. In the adolescent-onset group, the mean discrepancy at age 9 was below the discrepancy level of the childhood-limited group and above the level of the normal BMI group (intercept = 1.46, $p < .01$), remained flat to age 12, and then increased gradually to age 17 (slope = –.15, *ns*; quadratic = .03, $p < .05$). Across classes, black girls had a lower initial discrepancy (intercept = –.31, $p < .01$) but no difference in trajectory over time. The residual variance components for intercept and slope of discrepancy were reduced but continued to be significant, while the quadratic variance remained the same. The entropy of the model was acceptable at .89.

In the self-esteem model (Table 5), girls in the childhood-limited group had a mean self-esteem of 2.98 ($p < .01$) at age 9, which remained flat during the follow-up period (slope = –.003, *ns*; quadratic = .001, *ns*). In the normal BMI group, girls began with a mean self-esteem score of 3.27 ($p < .01$), but self-esteem decreased over time (slope = –.06, $p < .01$; quadratic = .003, *ns*). Girls in the chronically obese class began the study with a self-esteem level about the same as the childhood-limited group (intercept = 3.02, $p < .01$) with a flat slope (slope = –.01, *ns*; quadratic = –.01, *ns*). Hence, the self-esteem trajectory for the girls in the childhood-limited group was similar to the self-esteem trajectory for the girls in the chronically obese group. Last, in the adolescent-onset group, the mean self-esteem at age 9 was below the self-esteem level of normal BMI group but above the childhood-limited and chronically obese groups, (intercept = 3.19, $p < .01$). The slope coefficient, while negative and larger than the slope coefficient for the normal BMI group, was not significant, most likely because of the smaller n for this group and increased sampling variability.

Across classes, compared to white girls, black girls had a lower initial self-esteem (intercept = –.11, $p < .01$) and an increasing slope (slope = .09, $p < .01$). Hence, while white girls either remained flat on self-esteem trajectory over time or

Table 4. Joint Model of Body Image Discrepancy and Body Mass Index (BMI) Trajectory Classes in 9- to 17-Year-Old Black and White Girls (N = 2,206)

	Childhood Limited		Normal Range		Chronically Obese		Adolescent Onset	
Variable	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Means								
Intercept	1.74***	.35	.29***	.05	2.08***	.17	1.46***	.32
Slope	−.37	.22	−.02	.02	−.29***	.07	−.15	.12
Quadratic	.05*	.02	.01***	.002	.05***	.01	.03*	.01
Race								
Intercept	−.31***	.06	−.31***	.06	−.31***	.06	−.31***	.06
Slope	−.01	.03	−.01	.03	−.01	.03	−.01	.03
Quadratic	−.01	.003	−.01	.003	−.01	.003	−.01	.003
Residual variance								
Intercept	.64***	.08	.64***	.08	.64***	.08	.64***	.08
Slope	.07***	.01	.07***	.01	.07***	.01	.07***	.01
Quadratic	.001***	.00	.001***	.00	.001***	.00	.001***	.00
Fit measures								
Entropy	.89							
LL	−39815.829							
BIC	80232.175							
Adjusted BIC	79984.358							

Note: BMI intercept, slope, and quadratic coefficients omitted from this table. LL = Log-likelihood; BIC = Bayesian information criterion.
*p < .05. **p < .01. ***p < .001.

Table 5. Joint Model of Self-Esteem Trajectories and Body Mass Index Trajectory Classes in 9- to 17-Year-Old Black and White Girls (N = 2,206)

	Childhood Limited		Normal Range		Chronically Obese		Adolescent Onset	
Variable	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Means								
Intercept	2.98***	.18	3.27***	.03	3.02***	.15	3.19***	.18
Slope	−.003	.09	−.06***	.02	−.01	.08	−.09	.05
Quadratic	.001	.01	.003	.002	−.01	.01	.000	.007
Race								
Intercept	−.11**	.04	−.11**	.04	−.11**	.04	−.11**	.04
Slope	.09***	.02	.09***	.02	.09***	.02	.09***	.02
Quadratic	−.004	.003	−.004	.003	−.004	.003	−.004	.003
Residual variance								
Intercept	.14**	.04	.14**	.04	.14**	.04	.14**	.04
Slope	.02	.01	.02	.01	.02	.01	.02	.01
Quadratic	.000	.000	.000	.000	.000	.000	.000	.000
Fit measures								
Entropy	.90							
LL	−32637.554							
BIC	65875.624							
Adjusted BIC	65627.807							

Note: BMI intercept, slope, and quadratic coefficients omitted from this table. LL = Log-likelihood; BIC = Bayesian information criterion.
*p < .05. **p < .01. ***p < .001.

decreased, black girls increased in self-esteem across all groups. Adding the racial difference in slope estimate to the mean slope estimates in each class indicates that black girls in the childhood-limited trajectory increased in self-esteem more than girls in the normal range trajectory or the chronically obese trajectory. The residual variance for intercept of self-esteem was reduced slightly but continued to be significant, while the slope and quadratic variances were reduced from the LGCM of self-esteem and were no longer significant. The entropy of the model was acceptable at .90.

DISCUSSION

This study builds on the literature identifying obesity as a stigmatizing condition. As such, we anticipated that high body mass would threaten girls' self-concept during adolescence. On the basis of MLT, we expected that stigmatized traits become embedded in the psyche and thus have lingering effects on self-concept. Because both body mass and self-concept are dynamic conditions that can change during adolescence, our analysis treated them as intertwined trajectories. Much prior research has found that obese children and adolescents feel stigmatized and experience poorer body image and lower levels of self-esteem compared to normal-weight peers. In contrast, we were interested in what happens to the obese girls who entered the normal BMI range during adolescence. Though these girls had greater body image discrepancy and lower levels of self-esteem while obese, what happened when they entered the normal weight range?

Guided by that research question, our analyses supported hypothesis 1 among white and black girls: Youth who entered the normal BMI range after being in the obese range would continue to have greater body image discrepancy compared to those who were never obese. Black and white girls in the childhood-limited class had greater initial body image discrepancy at age 9 compared to girls in the normal-range trajectory and similar to girls in the chronically obese trajectory, providing evidence that they internalized a normative body as the ideal body and recognized that theirs was discrepant from the ideal. Even after exiting the stigmatizing condition, girls in this class continued to perceive their body as discrepant from the ideal.

Further, our analyses supported hypothesis 2 for white girls only: Youth who entered the normal BMI range after being in the obese range would continue to experience lower levels of self-esteem compared to youth who were never overweight or obese (and similar to the chronically obese). Girls in the childhood-limited class had lower initial self-esteem compared to girls in the normal BMI class and similar to the level of self-esteem of the chronically obese girls, providing evidence that they experienced the effects of stigma. The mean self-esteem trajectory for white girls in this class stayed flat, indicating no significant rebound. In both intercept and slope, the trajectory for the childhood-limited group resembled the chronically obese group among white girls, so while the girls in the former group slimmed down, their self-esteem was the same as it might have been if they remained obese. Black girls, on the other hand, did increase in this class, as they did in all classes, with a bigger increase in this group compared to the girls in the normal BMI group or the chronically obese group. Therefore, we conclude that the effects of stigma lingered for white girls but not for black girls. We temper that conclusion with the caveat that white girls in the normal BMI group were declining in self-esteem over time, so while the girls in the childhood-limited group did not rebound in a positive direction, they did not decline like the white girls in the normal BMI group either.

Taken together, these findings offer some important contributions to the study of adolescent obesity and stigma. Pertaining to MLT, these findings provide evidence of MLT's applicability to more transient conditions. MLT has typically been used in the context of mental illness, with several researchers suggesting it might apply to other conditions but few studies actually testing its applicability (cf. Link and Phelan 2001). The racial difference in the lingering effects of stigma on self-esteem also suggests that the context of stigma, or what constitutes a stigmatizing condition, may differ across subgroups and may be most pronounced among white girls; thus while MLT may be applicable to transient conditions, the internalization process specified in MLT may differ on the basis of individual characteristics or social context.

Although we believe these results support our hypotheses and extend MLT, this study has several limitations. Power was an issue, in that the normal-BMI group contained almost 80 percent of the sample. Sample size in each of the other three groups was low. To explore the robustness of our findings, we ran similar analyses in several different ways, including via standard growth models, lagged models, and outputting the predicted class membership from our final models and running additional models and tests. All alternative strategies yielded the same conclusions. That said, this study should be repeated in a sample that oversamples girls in the overweight and obese BMI ranges, as larger samples may yield more robust results. Further limitations include the limited range of data on the self-esteem scale and the relatively high BMI in the childhood-limited trajectory during adolescence. In terms of the limited range of data on the self-esteem scale, the means in all groups were relatively high, with only small amounts of change during the course of the study. This scale compression may be associated with underestimating the differences by trajectory class. As for the relatively high BMI in the childhood-limited group, a more ideal test of the lingering hypothesis would involve examining self-esteem trajectories among girls in the middle of the normal weight range toward the end of the study, which power limitations prevented us from doing. The girls in our childhood-limited group were very close to the threshold between normal and overweight BMI ranges.

Finally, in any analysis of dual trajectories, the possibility of reverse causation exists. In this case, we estimated the effects of BMI on self-concept, but the possibility exists that self-concept could have a causal influence on BMI trajectory rather than the other way around. Although we could not estimate reciprocal effects in this model, we ran additional analyses to investigate the issue of causal order and reciprocal effects. Specifically, we ran autoregressive cross-lagged models of BMI, discrepancy, and self-esteem and found that the lagged effects of BMI were significantly associated with later discrepancy and self-esteem, but the lagged effects of discrepancy and self-esteem did not predict later BMI. Hence, we have every reason to believe that the causal direction is from changes in BMI to changes in self-concept, consistent with our theoretical expectations.

In addition to the limitations, there are also questions left unanswered. For example, what are the long-term consequences of internalizing obesity stigma? The domains of health, educational attainment, social integration, and marriage are all potential outcomes for future inquiry. Additionally, MLT emphasizes exposure to and adoption of stigmatizing labels as a *process*, so future studies might examine longitudinal data in which there is variability in a stigmatizing condition, a relevant outcome, and some indicator of internalization. As Wright, Gronfein, and Owens (2000) mention, few studies have investigated the dynamics of label internalization and life chances with longitudinal data. This is a crucial consideration for obesity, given the potential modifiability of BMI trajectories. Recent evidence from a British cohort, for instance, shows that of obese 16-year-olds, nearly 40 percent are no longer obese by age 30 (Viner and Cole 2006). These BMI changes in the transition from adolescence to adulthood offer an important forum for clarifying the mechanisms by which labels are adopted, negotiated, renegotiated, shed, or transformed. The *timing* at which BMI trajectories are modified (midadolescence, late adolescence, transition to adulthood, early adulthood) may hold different capacity to redirect future life trajectories, contingent on their ability to shape identities and social networks.

Though pressing beyond adolescence will be important for building theories of developmental trajectories and life chances, the current article bears relevance for practice among teenagers and children. The lingering self-esteem and self-image disadvantage associated with obesity exposure—even when weight is lost—reinforces the importance of tailoring sensitive, nonstigmatizing interventions for children. Among at-risk youth, it may be optimal to address weight-related self-concept issues early on, as self-concept trajectories do not make sudden turnabout. With body mass labels becoming more visible in the public of consciousness, we expect that a better understanding of the relationship between self-concept and obesity will be an important consideration for helping youths in the obesity epidemic era.

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NOTES

1. A voluminous literature attests that obese persons represent the "last acceptable targets of discrimination" (Puhl and Brownell 2001:788). Interested readers can consult Puhl and Brownell (2001) for a thoughtful overview of this literature.
2. Bayesian information criterion (BIC) and adjusted BIC (ABIC) measures for one- to six-class models, respectively, are as follows: (1) BIC = 63075.93, ABIC = 63002.86; (2) BIC = 52051.21, ABIC = 51965.42; (3) BIC = 51844.50, ABIC = 51739.65; (4) BIC = 51706.33, ABIC = 51582.42; (5) BIC = 51614.09, ABIC = 514473.12; (6) BIC = 51610.79, ABIC = 51456.76. These suggest the five-class model as most appropriate, but close examination of the trajectories revealed that it split the chronically obese trajectory into two smaller trajectories, a somewhat obese and a very obese trajectory, each containing less than 3 percent of the sample. Given the small sizes of those groups and that we were not interested in distinguishing among different types of chronically obese girls, we chose the four-class model as the most appropriate.

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