

Current Research

Overweight Adolescent African-American Mothers Gain Weight in Spite of Intentions to Lose Weight

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ABSTRACT

Objective This study sought to determine how dietary patterns, self-esteem, depressive symptoms, and intention to lose weight were associated with body size among adolescent African-American mothers 1 year after delivery and with changes in body size over the next year.

Design Cross-sectional and longitudinal self-reported measures were collected 1 year after delivery. Weight and height were collected 1 and 2 years after delivery.

Subjects The subjects were 118 low-income, African-American adolescent mothers recruited after the birth of their first child.

Statistical analyses Multivariate analysis of covariance and multivariate regression analysis were conducted to exam-

ine predictors of body size 1 year after delivery and changes in body size over the next year. Analyses were adjusted for maternal age, education, breastfeeding history, and intervention.

Results One year after delivery, 33.0% of mothers were overweight (body mass index [BMI] \geq 95th percentile) and 23.7% were at risk for overweight (BMI \geq 85th and $<$ 95th percentile). Mothers consumed a daily average of 2,527 kcal and 4.1 high-fat snacks. A total of 11% of normal-weight mothers, 22% of mothers at risk for overweight, and 44% of overweight mothers reported intention to lose weight, $\chi^2=10.8$, $P<.01$. Average maternal BMI z score increased 0.13 (3.9 kg) between 1 and 2 years after delivery, $P<.01$. Dietary patterns, self-esteem, depressive symptoms, and intention to lose weight were not related to body size or increase in body size.

Conclusions One year after delivery, overweight among adolescent mothers was common and increased over time. Although nearly half of overweight mothers reported an intention to lose weight, their weight gain did not differ from that of other mothers, suggesting that they lack effective weight-loss behaviors, and may be good candidates for intervention. African-American adolescent mothers have high rates of overweight and snack consumption and may benefit from strategies to identify nutritious, palatable, affordable, and accessible alternatives to high-fat snack food.

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In the past decade, the prevalence of overweight (body mass index [BMI] \geq 95th percentile) has increased steadily among American youth and is a serious public health problem (1-5). Evidence shows that 22% of severely overweight children and adolescents have impaired glucose tolerance, an early sign of type 2 diabetes (6). In addition, overweight during adolescence increases the risk for multiple health problems during adulthood, including obesity, diabetes, sleep apnea, hypertension, and cardiovascular disease (7,8). The association between adolescent overweight and psychopathology, particularly depression, is less clear, but may be an important factor in the success of health promotion and overweight prevention programs (9).

In a society in which thinness is almost a virtue, overweight can be a social disadvantage (9-15). Although reports from clinic-based studies find that overweight adolescents have elevated rates of depressive symptoms and

low self-esteem (16,17), population-based studies find that overweight female adolescents are dissatisfied with their weight, but not necessarily depressed (17-21).

The relationship between body size and self-esteem is weak at best (22), possibly because it varies by age, race, and sex (23-25). For example, although many African-American female adolescents are heavier than white female adolescents, they are often more satisfied with their bodies, less likely to perceive themselves as overweight, and less likely to be trying to lose weight (26-30). Thus, interventions based on overweight prevention or weight loss may not be effective for African-American female adolescents.

The physiological changes that occur during adolescence increase the risk for overweight, particularly when accompanied by the unhealthy dietary patterns common during adolescence (31,32). When pregnancy occurs during adolescence, the risk of overweight is exacerbated. Adolescent mothers are approximately two times more likely to have excessive gestational weight gain (≥ 40 lb) (33) and are at increased risk for long-term postpartum weight retention (34) when compared with adult mothers.

Unhealthful dietary patterns and overweight may be particularly detrimental when they occur among adolescent mothers because the health risks may extend to their children. Mothers often give their children the same food that they eat (35-37), and early exposure to foods, such as fruits and vegetables, influences a child's preference for those foods (38,39).

In this research we investigated how dietary patterns, self-esteem, depressive symptoms, and intention to lose weight were associated with body size among adolescent African-American mothers 1 year after delivery and with changes in body size over the next year.

METHODS

Participants

The participants were African-American adolescent mothers who were part of a longitudinal randomized controlled trial of a home intervention designed to promote parenting and adolescent development among low-income families (40). Eligibility for adolescent mothers included age < 18 years, first-time delivery, African American, low income (defined as eligible for the Special Supplemental Nutrition Program for Women, Infants, and Children—family income under 185% of poverty level), no chronic or mental illnesses that would interfere with parenting or adolescent development, and intention to be the primary caregiver. In addition, because national policies require that eligibility for public services is restricted to adolescent mothers who are in the guardianship of an adult (41), many adolescent mothers live with their mothers. Therefore, we also limited our sample to adolescent mothers who were living with their mothers. Infants of eligible mothers had to be full-term (≥ 37 weeks), have a birth weight $> 2,500$ g, and have no congenital problems, chronic illnesses, or disabilities.

Procedures

Mothers were recruited from three urban hospitals in Baltimore, MD. They were approached shortly after de-

livery and given a brochure explaining the study. Those who expressed interest in enrolling in the study were scheduled to receive a baseline home evaluation 3 weeks after delivery. Over 83% (181 of 219) of the eligible mothers agreed to participate and completed the baseline evaluation. There were no differences in maternal age or education between those who completed the baseline evaluation and those who did not.

At the baseline evaluation, all mothers completed consent forms approved by the institutional review boards of the participating institutions. The baseline evaluation included standardized questionnaires on family demographics and relationships, personal health and mental health, access to services, and early adjustment to parenting. It was administered on a laptop computer; questions were presented through headphones and visually on the screen, and responses were selected with a mouse.

In-home follow-up evaluations were conducted 1 and 2 years after delivery. At both evaluations, mothers were weighed, their height was measured, and data were gathered on their dietary patterns, depressive symptoms, self-esteem, and intention to lose weight. Data from the 1-year evaluation were used to predict body size and change in body size from the first to the second year.

Measures

Mothers were weighed using a Tanita scale (Tanita Corp, Tokyo, Japan), and standard procedures from the National Health and Examination Survey (42) were used to collect weight and height data. Research assistants were trained by a registered dietitian to ensure reliability. The BMI was calculated as kg/m^2 . The BMI values were converted to z scores and percentiles based on the 2000 Centers for Disease Control and Prevention age- and sex-specific tables (5) using algorithms provided at <http://www.cdc.gov/growthcharts>.

Dietary patterns were measured with the Youth Adolescent Food Frequency Questionnaire, an instrument that has been developed and validated for use with adolescents (43-46). Mothers were asked about breastfeeding and the foods that they had consumed over the past year. The Youth Adolescent Food Frequency Questionnaire contains 131 items and yields estimated scores on energy intake, macronutrients and micronutrients, and servings of foods consumed. We analyzed the Youth Adolescent Food Frequency Questionnaire by examining total kilocalories and number of servings consumed per day in six categories (fruits, vegetables, snacks and desserts, breads and cereals, main dishes, and dairy). Twenty-two mothers (18.6%) had initiated breastfeeding, although most had stopped in the first 3 months (40). We examined dietary intakes for women who initiated breastfeeding versus those who did not and found no statistically significant differences in intake patterns. To reduce the possibility of reporting errors, we identified seven mothers who had out-of-range values (< 500 kcal and $> 5,000$ kcal) for caloric intake. We smoothed their caloric intake by adjusting dietary consumptions < 500 kcal ($n=1$) to 500 and $> 5,000$ kcal to 5,000 ($n=6$). Analyses were run with and without the seven mothers. There were no differences in the results, so their data were retained in the data set.

Depressive symptoms were measured with the Beck

Table 1. Demographic characteristics of low-income African-American adolescent mothers by BMI^a category 1 year after delivery (n=118)

	Underweight/normal weight (n=51)	At risk for overweight (n=28)	Overweight (n=39)
Maternal characteristics at delivery			
Age in years, mean (SD) ^b	16.5 (0.9)	16.0 (0.9)	16.1 (1.2)
Maternal characteristics 1 year after delivery			
Age in years, mean (SD)	17.8 (0.9)	17.3 (1.0)	17.4 (1.25)
Education in years, mean (SD)	11.4 (1.2)	10.9 (1.1)	10.8 (1.4)
Marital status (% single)	94	90	92
Romantic relationship (% yes)	59	36	49
Coresidence with grandmother of baby (%)	90	78	94
BMI z score, mean (SD)**	0.01 (0.8)	1.2 (0.4)	2.0 (0.2)
Child characteristics			
Sex (% male)	45	39	54

^aBMI=body mass index.
^bSD=standard deviation.
**P<.01.

Depression Inventory, a 21-item scale that has been used widely to characterize depressive symptoms among adolescents and adults (47). The internal consistency of the scale for our sample was excellent, Cronbach α =.98. Scores range from 0 to 63; scores from 0 to 9 represent the normal range and higher scores represent more depressive symptoms.

Self-esteem was measured with the Rosenberg Self-Esteem scale (48). The 10-item scale uses a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Scores range from 10 to 40; high scores represent higher self-esteem. The internal consistency of the scale for our sample was adequate, Cronbach α =.82.

Intention to lose weight was assessed by a yes/no item asking mothers whether they were trying to lose weight, "I am purposely trying to lose weight by eating less."

Complete data were available from 127 mothers (70% of the sample) at 1 year. The remaining mothers were not available for the evaluation (n=51) or did not complete the food frequency questionnaire (n=3). There were no differences in maternal age and education or infant birth weight and sex between mothers who completed the evaluation and mothers who did not. Because dietary requirements differ for pregnant and lactating women, we eliminated six mothers who were pregnant or had given birth and three who were lactating at the 1-year assessment, leaving an analysis data set of 118 mothers. Using the same elimination criteria, at 2 years, complete data were available for 98 of the 118 (83%) mothers.

Analysis Plan

Using BMI measured 1 year after delivery, mothers were placed into one of four categories based on age and sex norms: underweight (BMI <5th percentile), normal (BMI \geq 5th and <85th percentiles), at risk for overweight (BMI \geq 85th and <95th percentiles), and overweight (BMI \geq 95th percentile) (5). Only two mothers were in the underweight group. We ran the analyses either eliminating the underweight mothers or combining them into the normal-weight group. Results did not differ, so we incor-

porated them into the normal-weight group, resulting in three groups.

Intervention status, maternal age at delivery, education, and breastfeeding history were included as covariates in all analyses. Rates of breastfeeding did not differ by BMI group; 10 mothers (20%) who were under/normal weight, four mothers (14%) who were at risk for overweight, and eight mothers (21%) who were overweight initiated breastfeeding (P =.79). Because total energy intake may be the mechanism linking dietary patterns, self-esteem, depressive symptoms, and intention to lose weight with BMI, we conducted the analyses with caloric intake both in and out of the models. Findings did not differ, and results are presented without adjusting for energy intake.

The cross-sectional analysis was conducted using data collected 1 year after delivery. A multivariate analysis of covariance model was used to examine differences in dietary patterns, intention to lose weight, self-esteem, and depressive symptoms by BMI group. Individual analyses of variance were planned if the overall model was significant.

For the longitudinal analysis, a multiple linear regression model was used to examine whether changes in BMI z score from 1 to 2 years after delivery were related to dietary patterns, self-esteem, depressive symptoms, or intention to lose weight reported at 1 year.

RESULTS

Cross-Sectional Analysis at 1 Year

Over half of the mothers (56.7%) were overweight (33.0%) or at risk for overweight (23.7%) 1 year after giving birth. The remaining mothers (43.2%) had a BMI in the normal/underweight range (41.5% normal, 1.7% underweight). There were no differences in demographics by maternal BMI (Table 1). The mothers' ages at delivery ranged from 13.5 to 17.9 years, with a mean of 16.3 years (standard deviation=1.0). At the time of the interview, the majority of adolescent mothers were in high school (66%), unemployed (68%), single (92%), and residing with their moth-

Table 2. Means, standard deviations, and percentiles of dietary variables, self-esteem, depressive symptoms, and intention to lose weight by BMI^a category for low-income African-American adolescent mothers 1 year after delivery, adjusted for intervention status, maternal age, education, and breastfeeding history (n=118)

	Underweight/normal weight (n=51)	At risk for overweight (n=28)	Overweight (n=39)
	← mean (SD) ^b →		
Fruits ^c	2.7 (2.2)	2.7 (2.4)	2.2 (2.5)
Vegetables ^c	1.6 (1.2)	1.3 (1.3)	1.2 (1.4)
Snacks and desserts ^c	4.4 (3.7)	4.0 (4.8)	3.8 (2.6)
Breads and cereals ^c	2.7 (2.9)	2.6 (2.0)	2.0 (1.9)
Main dishes ^c	3.4 (2.3)	2.8 (1.7)	2.4 (1.4)
Dairy ^c	1.9 (1.5)	2.0 (1.7)	2.0 (1.7)
Calories per day	2,587 (1,184)	2,405 (1,253)	2,549 (1,083)
Self-esteem ^d	32.7 (5.1)	33.9 (4.6)	32.7 (4.3)
Depressive symptoms ^e	7.8 (11.1)	7.4 (8.3)	6.1 (8.8)
Intend to lose weight (% yes)**	10.9	22.2	43.8

^aBMI=body mass index.

^bSD=standard deviation.

^cAverage number of servings per day.

^dRosenberg Self-Esteem scale, high scores indicate higher self-esteem (47).

^eBeck Depression Inventory, low scores indicate fewer depressive symptoms (46).

***P*<.01.

ers (87%). Approximately half of the adolescent mothers were romantically involved with a male partner (51%). One fifth (20%) of the young mothers reported depressive symptoms (Beck Depression Inventory >9).

The overall model examining differences in maternal dietary patterns, self-esteem, depressive symptoms, and intention to lose weight by body size was marginally significant, $F(20, 204)=1.53, P=.07$ (Table 2). Univariate analyses showed that there was a statistically significant association between BMI group and the mother's intention to lose weight, $F(2, 111)=7.63, P<.01$. Overall, one fourth of the mothers (25%) said they were trying to lose weight; 11% of the normal-weight group said they were trying to lose weight, as compared with 22% of the group at risk for overweight and 44% of the overweight group. There were no differences in dietary patterns, self-esteem, or depressive symptoms by BMI group. Although there were no differences by BMI group in the average number of calories or servings of fruits, vegetables, snacks, breads, dairy products, or main meals consumed per day, the young mothers reported dietary patterns that deviated from the recommended number of calories and servings from each food group (49). Women in the 14- to 19-year-old age group who are not lactating or pregnant and are participating in regular physical activity require an average of 2,350 kcal per day (50), fewer than the mean of 2,527 kcal reported consumed by the young mothers in this sample. The mothers reported eating an average of 2.5 servings of fruits and 1.4 servings of vegetables per day. Orange juice and french fried potatoes were the most commonly consumed fruit and vegetable, respectively. Although 41% of the mothers in the underweight/normal group consumed the recommended five fruits and vegetables per day, compared with 36% in the group at risk for overweight and 26% in the overweight group, the differences were not significant, $\chi^2=2.37, P=.31$. Across all BMI groups, the adolescent mothers ate

an average of 4.1 daily servings of high-fat, high-sugar snacks and desserts, far more than the minimal servings recommended. The most frequently consumed snacks were cookies, potato chips, corn chips, and chocolate.

We repeated the multivariate analysis to determine whether intention to lose weight was associated with dietary patterns, self-esteem, or depressive symptoms after adjusting for age, grade, intervention status, breastfeeding history, and BMI. The overall model was not significant, $F(10, 104)=1.53, P=.13$, indicating that there were no differences in any of the variables by the mothers' intentions to lose weight.

Longitudinal Analysis from 1 to 2 Years

One year after delivery, mothers weighed an average of 73.8 kg. By year 2, mothers weighed an average of 77.7 kg, which resulted in a statistically significant increase of 3.9 kg (95% confidence interval: 2.4, 5.4; $P<.01$). The average height 1 year after delivery was 163.4 cm, and there was no significant increase in height over the 1-year period ($P>.8$).

We calculated the 1-year change in BMI *z* score by subtracting the BMI *z* score at the 1-year visit from the BMI *z* score at the 2-year visit. The average change in BMI *z* score was .13 (standard deviation=0.53, range -0.90 to 2.68, 95% confidence interval: 0.02 to 0.24, $P<.01$). The most noticeable change occurred among mothers who were at risk for overweight 1 year after delivery; by 2 years, 42% (9 of 22) had moved into the overweight category. Although most mothers (75 of 98 [76%]) remained in the same BMI category, of those who changed categories, 67% (16 of 24) moved up into the next category and 33% (8 of 24) moved down to a lower BMI category (Table 3).

After adjusting for maternal age, education, intervention status, and breastfeeding history, there was no as-

Table 3. Stability/change in the number of participants^a by BMI^b category from 1 to 2 years after delivery, n (%)

	2 Years after Delivery			Total
	Underweight/normal ($<85^{\text{th}}$ percentile)	At risk for overweight ($\geq 85^{\text{th}}$ percentile to $<95^{\text{th}}$ percentile)	Overweight ($\geq 95^{\text{th}}$ percentile)	
1 year after delivery				
Underweight/normal ($<85^{\text{th}}$ percentile)	34 (35)	7 ^c (7)	0 (0)	41
At risk for overweight ($\geq 85^{\text{th}}$ percentile to $<95^{\text{th}}$ percentile)	5 ^d (5)	8 (8)	9 ^c (9)	22
Overweight ($\geq 95^{\text{th}}$ percentile)	0 (0)	3 ^d (3)	32 (33)	35
Total	39	18	41	98

^aSample (n=98) limited to participants with complete data at both 1 and 2 years after delivery.
^bBMI=body mass index.
^cMothers who increased in BMI category from 1 to 2 years after delivery.
^dMothers who decreased in BMI category from 1 to 2 years after delivery.

sociation between dietary patterns, depressive symptoms, self-esteem, or intention to lose weight at the 1-year evaluation and change in BMI *z* score between the 1- and 2-year visits, $F(13, 84)=1.23$, $P=.27$.

DISCUSSION

Body Weight Among Adolescent Mothers

These findings reflect the national concern regarding increasing rates of overweight among African-American female adolescents. Over half of the young mothers (57%) were either overweight or at risk for overweight 1 year after delivering their first child. During the second year of parenting, maternal BMI *z* scores increased, especially among the heaviest mothers. The mean number of calories exceeded the recommendations for female adolescents and probably reflected the mothers' frequent consumption of high-fat, high-sugar snacks and desserts (4.1 servings per day). This pattern is concerning not only because it contributes to the mothers' own overweight status and negative health consequences, but also because it is not a healthful diet to model for their young children. The lack of adherence to nutritional recommendations reported among the African-American adolescent mothers in our sample is consistent with findings reported by others (31,51), and highlights the urgent need for health promotion programs that focus on adolescent nutrition (52).

The lack of association between body size 1 year after delivery or change in body size between the first and second year and measures of dietary patterns, self-esteem, and depressive symptoms suggests that among many African-American adolescent mothers, body size per se was not related to perceptions about their self-esteem and mental health. These findings are consistent with those from other investigators who have documented no relationship between BMI and depressive symptoms among African-American adolescents (17-21,23-30).

Although the diets of female adolescents are often high in fat and sugar and low in many required macronutrients and micronutrients (31), overweight African-American female adolescents may see little reason to modify

their diets or to conform to an ideal body weight that may be discrepant from their perceived norm.

Intention to Lose Weight

One year after delivery, 44% of overweight mothers indicated their intention to lose weight by eating less. These figures are consistent with data from Desmond and colleagues, who reported that 40% of overweight African-American female adolescents were trying to lose weight, compared with 100% of overweight white female adolescents (27). Recent evidence suggests that although many female African Americans tolerate a relatively large body size, their preference is for a body size in the average range (53-55). Many overweight African-American adolescents make an accurate appraisal of their body size and recognize that they are heavy (15), but are not necessarily ready to take steps to change (56).

The finding that a disproportionate number of overweight mothers intend to lose weight may suggest that some mothers would prefer to be thinner. However, caution is noted in interpreting intention to lose weight as a sign of dissatisfaction because in our data, intention to lose weight was not related to self-esteem, depressive symptoms, or the change in body size from 1 to 2 years after delivery. The mothers who indicated that they intended to lose weight had dietary patterns that were high in calories and fat, and did not differ from those with no intention to lose weight. One possible interpretation of this finding is that mothers who reported that they intended to lose weight may be expressing a desire to be consistent with social norms on dieting and thinness, but may lack the knowledge, skills, or motivation to alter their diets. Thus, they may be at an early stage in their decisions regarding dietary changes and may be open to nutritional interventions.

Methodological Limitations

There are several methodological limitations that should be considered when interpreting these findings. First, because of the dependence on self-reports, our data may reflect inaccuracies based on the participants' ability and

willingness to report information about themselves. We attempted to minimize this potential problem by administering questionnaires on computers to reduce respondent bias and by including objective information on weight and height.

Second, dietary intake was estimated by a food frequency questionnaire, a method that provides a better estimate of group than individual dietary intake. We used a questionnaire specifically developed and validated among adolescents (43-46), and we determined that intake did not differ based on initiation of breastfeeding. In addition, we reduced variability by applying physiological minimum and maximum values to reports of caloric intake.

Finally, we did not collect data on prepregnancy weight or physical activity. The sample was recruited after delivery, and prepregnancy weight was not available. Although physical activity patterns are low among African-American female adolescents (57), variations in physical activity may have influenced the relationships with body size 1 and 2 years after delivery.

CONCLUSIONS

These findings provide useful insights that can guide intervention and prevention efforts among African-American adolescent mothers. There is widespread support for interventions to prevent and treat overweight among adolescents (15,58,59). However, it is difficult to obtain sustainable changes in body composition (60,61), and few programs have been implemented with minority adolescents. Programs that emphasize weight loss or thinness may have limited value among African-American adolescents, who may not conceptualize overweight in negative terms. Therefore, attention should be focused on multi-level public health interventions that promote community and societal opportunities for healthful lifestyle and dietary choices (62-64), and identify palatable, affordable, and easily accessible nutritional alternatives to high-fat snacks.

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APPLICATIONS

Obesity among Postpartum African-American Adolescents

Currently obesity is a health concern among children and adolescents (1). However, African-American and Hispanic females tend to have higher rates of obesity relative to other racial/ethnic groups (2,3). Research on pregnant African-American adolescents indicates that there is an issue with high incidences of obesity prior to pregnancy as well as postpartum (4). The causes for the increase in weight are diets high in energy, fat, and sugar and low levels of physical activity (5-7). Even though adolescents want to lose weight, Black and colleagues' study concluded that self-esteem and depression are not predictors of weight-management success or failure (8). This could be due to African-American adolescent females having a higher acceptance of the diversity of body types within their culture comparative to their white counterparts.

Research has indicated that African-American women tend to accept larger body frames and adolescent females may mirror that same attitude (9). African-American adolescents believed that more varying body types were depicted on television for their racial/ethnic group than for white adolescent females (10). There is limited pressure to be thin and positive reinforcement from the community to accept physical diversity (10). Interventions focusing on weight management may not be the most effective method

for weight loss among African-American women and adolescents, but programs that assist the adolescent in improving overall health may be a better alternative.

Simply stating that more educational programs for adolescents are needed to improve eating behavior, while true, is inadequate. Teens who are at risk of becoming pregnant or who are pregnant or postpartum have urgent needs for assistance. Most of all there is a need to identify underlying risk factors that trigger the health behaviors that lead to increased obesity rates among African-American adolescent females, regardless of income level. Nutrition education needs to be adapted to fit the environmental parameters of the community in which food habits are formed. Billingsley, a sociologist and Bronfenbrenner, a developmental psychologist, both have come to the same conclusion: each person is influenced by those entities that make up their environment. The lack of adoption of behaviors that would improve health is dependent on those supportive systems (11,12).

In African-American culture, the family, which includes the extended family (blood and adopted relations), provides a strong support system (11). Many times making healthier food choices may not be limited to the adolescent but may be dictated by the majority in the home or by head of household (13). Black and colleagues indicated that many of these adolescents lived with their caregiver (8). Providing individual nutrition counseling may be a start in order to build self-efficacy with the adolescent, but methods to incorporate family into nutrition education may be warranted. This would provide the

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