RESEARCH
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Eating- and Weight-Related Parenting of Adolescents in the Context of Food Insecurity

Katherine W. Bauer, PhD; Rich MacLehose, PhD; Katie A. Loth, PhD, MPH, RD; Jennifer O. Fisher, PhD; Nicole I. Larson, PhD, MPH, RDN; Dianne Neumark-Sztainer, PhD, MPH, RD

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ABSTRACT

Background Food insecurity is hypothesized to influence mothers' use of parenting strategies to regulate children's eating. Little is known about the parenting practices directed toward adolescents in food-insecure households.

Objective Our aim was to examine the differences in use of eating- and weight-related parenting practices among mothers of adolescents by household food-security status.

Design This was a cross-sectional study.

Participants/setting A sociodemographically diverse sample of mothers and adolescents from the Minneapolis/St Paul, MN, metropolitan area who participated in the Eating and Activity Among Teens 2010 and Project Families and Eating and Activity Among Teens studies in 2009 to 2010 (dyad n=2,087). Seventy percent of mothers identified as nonwhite.

Main outcome measures We examined mother-reported use of parenting practices, including pressuring children to eat, restricting high-calorie foods, and encouraging dieting.

Statistical analyses performed Logistic regression models were used to determine the predicted probabilities of parenting practices among food-secure, low food-secure, and very-low food-secure households. Sociodemographic characteristics, mothers' body mass index, and adolescents' body mass index-for-age percentile were examined as confounders.

Results In unadjusted models, food-insecure mothers were more likely than food-secure mothers to frequently encourage their children to diet, comment on their child's weight, be concerned about their child's weight, use restrictive feeding practices, and use pressured feeding practices. After adjustment for sociodemographic characteristics and mothers' and children's body mass index, compared to food-secure mothers, mothers with low food security were more likely to frequently comment on their sons' weight (41.5% vs 32.9%, prevalence difference=8.6; 95% CI 0.9 to 16.3) and mothers with very low food security were more likely to be concerned about their sons' weight (48.8% vs 35.1%; prevalence difference=13.7; 95% CI 3.5 to 23.9). Mothers with very low food security were more likely to frequently use restrictive feeding practices with their daughters compared to food-secure mothers (33.0% vs 20.5%; prevalence difference=12.4; 95% CI 4.2 to 20.7).

Conclusions Interventions to improve food-insecure adolescents' eating behaviors may benefit from supporting mothers' use of health-promoting parenting practices.

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PARENTS PLAY AN IMPORTANT ROLE IN PROMOTING healthful dietary intake, eating behaviors, and strategies to control weight among children and adolescents. For adolescents specifically, parenting practices, such as encouraging and modeling healthful eating, have been associated with higher dietary quality and more healthful weight,[1-4] and use of practices such as excessively restricting food access, encouraging youth to diet for weight control, and engaging in weight talk and teasing have been associated with use of maladaptive weight control and disordered eating behaviors, as well as higher weight, among adolescents.[5-11] Despite the increasing appreciation of the role of families and parenting practices to youth's eating- and weight-related outcomes, little is known about how the use of these parenting practices may be influenced by families' social, cultural, or economic contexts.[12,13] Identifying the contextual factors that produce or maintain use of specific parenting practices can provide insight into the mechanisms via which socioeconomic inequalities affect children's behavior and inform family-based interventions that aim to improve youth's dietary intake and reduce risk of disordered eating and obesity.

Food insecurity, or having limited or uncertain access to safe, nutritionally adequate, and culturally acceptable food,[14]

has been associated with numerous poor mental and physical health outcomes.[15] Food-insecure youth have less healthful dietary intake and are at greater risk for nutrient deficiencies than food-secure youth.[16-25] Food insecurity has also been associated with a higher prevalence of obesity among children and adolescents in some,[25-28] but not all,[17,29-31] studies. Parenting practices are increasingly being recognized as mediators of the relationship between food insecurity and child-level nutritional and health outcomes.[32] Parents experiencing food insecurity use a number of strategies to stretch food resources and ensure that family members, especially young children, do not experience hunger.[33-37] For example, mothers who are either currently food insecure or have a history of food insecurity are less likely to adhere to recommended infant feeding practices, breastfeed for shorter duration, and are more likely to overfeed their young children or provide lax monitoring of sweets and snack intake.[33-36] While the majority of studies have focused on mothers of children preschool aged and younger, Feinberg and colleagues[37] observed that among mothers of children aged 2 to 13 years, food insecurity was associated with greater use of high-calorie supplements and appetite stimulants with children. It has been suggested that mothers use these feeding strategies out of concern for children's undernutrition and as a way to treat or appease children.[38]

Nationwide, adolescents are twice as likely to experience food insecurity and four times as likely to experience very low food security, a more extreme level of food insecurity, compared to young children.[39] While young children are protected from food insecurity in many families, adolescents are often not afforded the same protection, perhaps due to beliefs that adolescents have the ability to obtain food easily outside the home or can better withstand hunger.[17,40] This suggests that eating- and weight-related parenting of adolescents in food-insecure homes is different from what has been observed among parents of young children. For example, parents of adolescents may be more likely to encourage dietary restriction in an effort to conserve household food rather than encouraging overeating. However, to our knowledge, no studies have examined eating- and weight-related parenting practices directed toward adolescents among food-insecure families.

Given this knowledge gap, the current study utilizes data from EAT (Eating and Activity Among Teens) 2010 and Project F-EAT (Families and Eating and Activity Among Teens), two complementary studies of middle school– and high school–aged adolescents and their parents/caregivers. The primary aim of the current study was to examine differences in the eating- and weight-related parenting practices that mothers use with their adolescent-aged children among food-secure vs food-insecure families. We hypothesize that mothers from families experiencing food insecurity will be more likely to use parenting practices that encourage dietary restriction and dieting, including commenting on their child's weight, as compared to mothers from food-secure families.

METHODS

Cross-sectional data were drawn from the EAT 2010 and Project F-EAT studies. EAT 2010 is an observational investigation of socioecological correlates of eating, physical activity, and weight-related topics among a diverse sample of 2,793 adolescents from 20 public middle and high schools in the Minneapolis/St Paul metropolitan area of Minnesota. Students from selected health, physical education, and science classes were recruited to participate. Interested participants completed surveys and had their height and weight measured by trained research staff using standardized procedures during the school day. During participation in EAT 2010, adolescents provided contact information for up to two of their parents/guardians. These parents/guardians were then invited to participate in Project F-EAT, a survey-based study of parents that aimed to learn more about the home environments of the young people participating in EAT 2010. Data collection for Project F-EAT occurred via mail and phone between October 2009 and October 2010 and was conducted by the Wilder Research Foundation. The parent response rate in Project F-EAT was high; 77.6% of invited parents (n=3,709) completed study measures. The University of Minnesota Institutional Review Board approved the study protocol; all parents provided written informed consent and children provided written assent. Additional information about EAT 2010 and Project F-EAT have been reported elsewhere.[41-43] Given interest in parenting around eating and weight, only those data from female parents/guardians participating in Project F-EAT who reported living with their child at least 50% of the time were included in the current analytic sample. For families in which two female parents/guardians responded (eg, two mothers, mother and grandmother), an algorithm was utilized that took into account parent–child relationship with preference for biological parent over stepparent and parent over grandparent. The final analytic sample consisted of 2,087 dyads of female parents/guardians—henceforth referred to as mothers—and their adolescent-aged children.

Measures

Eating- and weight-related parenting practices and household food-security status were measured among mothers as part of Project F-EAT. Project F-EAT survey items were drawn from several sources, including items developed and previously validated for earlier Project EAT surveys[44] and measures developed and tested by other researchers. After an initial draft of the Project F-EAT survey was developed, steps were undertaken to assess face validity of included items, ensure the questions were appropriate for the intended population, and make adjustments to the overall length of the survey. The draft survey was reviewed by content experts and bicultural staff from the Wilder Research Foundation, and field tested with 28 socioeconomically and ethnically/racially diverse parents. Finally, test–retest reliability for survey items reported here was assessed using an additional sample of 102 parents who completed the survey twice during 2 weeks.

Food Security

Food security was reported by mothers using the six-item US Household Food Security Survey Module adapted for self-administration, which assesses household food security during the past 12 months. This scale has been shown to correctly classify 97.7% of families when compared with the full 18-item scale included in the Current Population Survey.[45,46] Parents who responded in the affirmative to

fewer than two items were categorized as experiencing "food security," those that responded in the affirmative to two to four items were categorized as experiencing "low food security," and those that responded in the affirmative to five or more items were categorized as experiencing "very low food security." Two-week percent agreement for household food security (food secure vs insecure)=0.91 and κ=0.64 for three levels of food security (food secure, low food secure, very low food secure).

Eating- and Weight-Related Parenting Practices

Frequent Encouragement to Diet. Encouragement to diet was assessed with the following question: "To what extent do you encourage your child to diet to control his/her weight?" Four response options ranged from "not at all" to "very much"[47] (2-week test–retest, r=0.68). Mothers were identified as frequently encouraging their child to diet if they responded "somewhat" or "very much" to this item.

Frequent Encouragement for Healthy Eating. Encouragement for healthy eating was assessed with the following question: "How often in the past year have you had a conversation with your child about healthy eating habits?" Response options included, "Never/rarely," "A few times a year," "A few times a month," "A few times a week," and "Almost every day" (2-week test–retest, r=0.48). This item was adapted from similar items used in the Parental Energy Index.[48] Frequent encouragement of healthy eating was defined as encouraging healthful eating a few times a month or more often.

Frequent Comments about Child's Weight. Comments about child's weight were assessed with the following two questions: "How often in the past year have you had a conversation with your child about his/her weight or size?" (2-week test–retest, r=0.59) and "Have you mentioned to your child that he/she weighs too much?" (2-week test–retest, r=0.73). Response options for both included, "Never/rarely," "A few times a year," "A few times a month," "A few times a week," and "Almost every day." These item was adapted from similar items used in the Parental Energy Index.[48] Parents were identified as frequently commenting on their child's weight if they responded "a few times a month" or more often to either of these two questions.

Concern about Child's Weight. Concern about child's weight was measured with one question: "How concerned are you about your child's weight?" Response options included, "Not at all concerned," "A little concerned," "Quite concerned," and "Very concerned." This item was originally developed for the Nepean Kids Growing Up Parent Questionnaire[49] and 2-week test–retest was 0.68. Parents were identified as being concerned about their child's weight if they responded that they were "Quite concerned" or "Very concerned."

Restrictive Feeding Practices. Restrictive feeding practices were measured using six items from the eight-item Restriction Subscale of the Child Feeding Questionnaire.[50] Two items were dropped from the original subscale based on recommendations from a validation study conducted within a diverse population of parents of adolescents.[51] Test–retest among Project F-EAT participants was r=0.72 and Cronbach's α=.86. Agreement with individual items was assessed using a 4-point Likert scale, with anchors to indicate strength of agreement or disagreement. Scores across the six items were averaged and mothers who scored in the highest quartile of responses on the Restriction subscale were defined as using a high level of restrictive feeding practices.

Pressured Feeding Practices. Pressured feeding practices were measured using the full four-item Pressure-to-Eat Subscale of the Child Feeding Questionnaire.[50] Test–retest among Project F-EAT participants was r=0.73 and Cronbach's α=.70. The scale is scored from 1 (low pressure) to 4 (high pressure). Individual items were measured using a 4-point Likert scale, with anchors to indicate strength of agreement or disagreement. Scores across the four items were averaged and mothers who scored in the highest quartile of responses on the Pressure to Eat subscale were defined as using a high level of pressured feeding practices.

Sociodemographic Characteristics. Annual household income was assessed with one item asked of the mothers: "What was the total income of your household before taxes in the past year?" Six response option categories were offered: "less than $20,000," "$20,000 to $34,999," "$35,000 to $49,000," "50,000 to $74,999," "$75,000 to $99,999," and "$100,000 or more" (2-week test–retest agreement=74%). Due to the small number of mothers who reported a household income >$75,000, the highest two response options were collapsed. Mothers were also asked how many children under the age of 18 years lived in their household (2-week test–retest, r=0.99). Maternal educational attainment was assessed with the question: "What is the highest grade or year of school that you have completed?" Response options included "Did not finish high school," "Finished high school or got GED [General Educational Development]," "Some college or training after high school," "Finished college," and "Advanced degree" (2-week test–retest agreement=84%). Maternal employment status was assessed with one item: "Which of the following best describes your current work situation?" Five response options were available: working full time, working part time, stay-at-home caregiver, currently unemployed but actively seeking work, and not working for pay (2-week test–retest agreement=82%). Mothers' race/ethnicity was assessed by the following item: "Do you think of yourself as: white; black or African American; Hispanic or Latino; Asian American; Hawaiian or Pacific Islander; American Indian or Native American; and Other." If a mother selected "Other," there was a space to fill in the racial/ethnic category with which they identified. Mothers were given the option to choose more than one category, and those with multiple responses were coded as "mixed/other" for analyses (2-week test–retest agreement=99%). Adolescents' sex and birthrate were self-reported on the EAT 2010 survey, and age was determined using the birthdate and date of survey administration.

Maternal Body Mass Index. Mothers' height and weight were assessed by self-report. Adult participants were asked to report their height to the nearest feet and inches and their weight to the nearest pound on the Project F-EAT survey. Self-reported height and weight has been shown to be highly

correlated with objectively measured values in adults.[52] Body Mass Index (BMI) was calculated using the formula weight in kilograms divided by height in meters squared (2-week test–retest=0.97 for height, 0.95 for weight).

Adolescent BMI Percentile. Adolescents' height and weight were measured as part of the EAT 2010 study. Height to the nearest 0.1 cm and weight to the nearest 0.1 kg were assessed in a private area at schools by trained research staff using standardized equipment and procedures. Age- and sex-specific percentiles were based on the 2000 Centers for Disease Control and Prevention Growth Charts.[53]

Statistical Analysis

Crude demographic- and weight-related variables were compared across level of food security (food security, low food security, and very low food security) using χ^2 and F tests. To assess whether the prevalence of eating- and weight-related parenting practices differed by level of food security, logistic regression models were used. The three-level food security variable was modeled using indicator variables and included as the main predictor. Separate models were fit for each of the six dependent variables. For each outcome, we fit an unadjusted, crude regression; a model adjusting for sociodemographic characteristics; and a model additionally adjusted for mothers' BMI and children's BMI percentile. Individuals missing data for the outcome or any covariates were dropped from the analysis. Analyses were stratified by adolescent sex to allow estimation of separate associations of food security with eating and weight-related parenting practices for boys and girls. Following each of the logistic models, the adjusted prevalence of the dependent variable (parenting practice) was computed for each level of food security. The associations between food security and parenting practices were calculated as the difference between these prevalences (using food secure as the reference group) with corresponding 95% CIs. All analyses were performed in Stata software (version 13, 2013, StataCorp LP).

RESULTS

Among mothers participating in Project F-EAT, 60.2% reported that they were food secure, 26.0% reported low food security, and 13.9% reported very low food security within the past year (Table 1). Differences in level of food security were observed by mothers' race/ethnicity, employment status, household income, educational attainment, and mean number of children in the home (all, $P<0.01$). Mothers' mean BMI was positively associated with food insecurity ($P<0.01$), and a statistically significant association was observed between level of food insecurity and BMI percentile among boys ($P=0.02$), but not girls ($P=0.15$).

In unadjusted analyses, several differences in the frequent use of eating- and weight-related parenting practices among mothers with boys in the EAT 2010 study were observed by food-security status (Table 2). For example, 30.5% of mothers with low food security and 31.3% of mothers with very low food security reported frequently using restrictive feeding practices with their sons, compared to 21.9% of food-secure mothers (prevalence difference [PD] for food secure vs low food secure=8.6; 95% CI 1.9 to 15.3; PD for food secure vs very low food secure=9.4; 95% CI 7.0 to 18.0). After adjustment for sociodemographic characteristics (Table 3, Model 2), some of these differences became nonsignificant. Additional adjustment for mothers' BMI and sons' BMI percentile did not greatly alter the relationships between food security and parenting practices. Compared to food-secure mothers, mothers experiencing low food security were more likely to frequently comment on their sons' weight (41.5% vs 32.9%; PD=8.6; 95% CI 0.9 to 16.3) and mothers with very low food security were more likely to be concerned about their sons' weight (48.5% vs 35.1%; PD = 13.7; 95% CI 3.5 to 23.9).

Similar to mothers of boys, food-insecure mothers with adolescent girls in EAT 2010 were more likely to report using several eating- and weight-related parenting practices that have been correlated with poor outcomes, as compared to food-secure mothers in unadjusted models (Table 2). After adjustment for sociodemographic characteristics (Table 4, Model 2) some of these associations remained. However, after additional adjustment for maternal BMI and daughters' BMI percentile (Table 4, Model 3), only the association between food-security status and restrictive feeding practices remained. Among mothers of daughters, those who were very low food secure were more likely to frequently use restrictive feeding practices compared to food-secure mothers (33.0% vs 20.5%; PD=12.4; 95% CI 4.2 to 20.7). Among both mothers of sons and daughters, no associations were observed between food-security status and encouragement of healthful eating in the crude or adjusted models.

DISCUSSION

It has been suggested that food insecurity influences parents' use of specific parenting practices to ensure that food resources are appropriately distributed among families and, specifically, often to ensure that young children have sufficient amounts to eat and do not experience hunger.[32] In the current study, which drew from a sociodemographically diverse, urban population, a large proportion of families reported being food insecure. Several significant differences were observed in mothers' use of eating- and weight-related parenting practices by families' food-security status. Mothers from households experiencing low or very low food security were more likely to report that they engage in parenting practices that have been linked to higher child BMI and disordered eating, such as encouraging children to diet, frequently commenting on children's weight, and using restrictive feeding practices.[8,9,47] Several of these associations became nonsignificant after adjustment for sociodemographic characteristics and mothers' and adolescents' BMI. However, food-insecure mothers remained more likely to be concerned about and comment on their sons' weight and use restrictive feeding practices with their daughters.

Findings from both the crude and adjusted models demonstrate that mothers in food-insecure households use different eating- and weight-related parenting practices than mothers from food-secure families. However, some of these differences may be explained by other economic, social, or cultural factors that food-insecure families are more likely to experience than food-secure families. Among mothers in Project F-EAT, the parenting practices used by those experiencing food insecurity reflect a concern of excessive intake and overweight among their children. This runs counter to research conducted among parents of younger children,

Table 1. Food-security status by sociodemographic characteristics and body mass index of mothers and adolescents participating in Project F-EAT[a] and EAT[b] 2010 studies

	Food secure	Low food secure	Very low food secure	*P* value
	←——— *n (%)* ———→			
Total	1,256 (60.2)	542 (26.0)	289 (13.9)	
Annual household income ($)	←——— % ———→			
<20,000	26.7	49.7	59.1	<0.01
20,000 to 34,999	21.0	25.5	25.2	
35,000 to 49,999	16.8	15.4	10.8	
50,000 to 74,999	16.0	6.6	4.2	
>75,000	19.5	2.7	0.7	
	←——— *mean±SD*[c] ———→			
No. of children in home	2.6±1.7	3.2±1.9	2.9±1.5	<0.01
	←——— % ———→			
Mothers' education				
Did not complete high school	25.7	39.7	31.5	<0.01
Completed high school	20.8	21.1	19.9	
Some college	25.0	26.5	35.0	
Completed college	19.7	10.5	12.6	
Postgraduate education	8.9	2.3	1.1	
Mothers' employment status				
Working full-time	51.7	39.4	32.8	<0.01
Working part-time	18.6	14.8	16.6	
Stay-at-home caregiver	11.5	19.9	16.2	
Unemployed but seeking work	7.8	14.2	15.9	
Not working for pay	10.4	11.7	18.7	
Mothers' race/ethnicity				
White	35.8	20.1	26.3	<0.01
African American/black	27.8	28.0	29.8	
Hispanic	17.5	17.9	11.6	
Asian	14.8	27.8	21.8	
Mixed/other	4.1	6.2	10.5	
	←——— *mean±SD* ———→			
Mothers' BMI[d]	28.0±6.1	28.7±6.1	30.4±7.5	<0.01
Adolescent age	14.5±2.0	14.3±1.9	14.4±1.9	0.20
Adolescent BMI percentile				
Boys	65.8±0.3	72.0±0.3	70.2±0.3	0.02
Girls	68.6±0.3	69.6±0.3	73.1±0.3	0.15

[a]F-EAT=Families and Eating and Activity Among Teens.
[b]EAT=Eating and Activity Among Teens.
[c]SD=standard deviation.
[d]BMI=body mass index (calculated as kg/m^2).

which has found that food-insecure parents are more likely to encourage overeating or use pressured eating practices with their children.[34,36,37]

Understanding the broader family food context, in addition to specific parenting practices used, is important to identifying the mechanisms through which food insecurity

Table 2. Unadjusted associations between use of eating- and weight-related parenting practices and food security among mothers participating in Project F-EAT[a] by adolescent sex (Model 1)

	Boys (n=968)					Girls (n=1,190)				
	Prevalence			Prevalence Differences (95% CI)		Prevalence			Prevalence Differences (95% CI)	
Parenting practices	FS[b]	LFS[c]	VLFS[d]	FS vs LFS	FS vs VLFS	FS	LFS	VLFS	FS vs LFS	FS vs VLFS
Frequent encouragement to diet	20.9	30.5	32.8	9.6 (3.0 to 16.3)	11.9 (3.2 to 20.6)	23.6	31.5	35.1	7.9 (1.6 to 14.1)	11.4 (3.3 to 19.6)
Frequent encouragement for healthy eating	65.3	69.5	71.8	4.2 (−2.8 to 11.1)	6.5 (−2.2 to 15.1)	61.1	66.7	68.4	5.6 (−0.9 to 12.1)	7.3 (−0.8 to 15.5)
Frequent comments about child's weight	32.0	47.1	41.5	15.1 (7.8 to 22.5)	9.5 (0.2 to 18.9)	33.2	42.1	49.0	8.8 (2.1 to 15.5)	15.8 (7.1 to 24.5)
Concerned about child's weight	35.1	39.1	50.4	4.0 (−3.3 to 11.2)	15.2 (5.8 to 24.7)	36.0	42.2	48.1	6.2 (−0.5 to 13.0)	12.1 (3.4 to 20.7)
Frequent use of restrictive feeding practices	21.9	30.5	31.3	8.6 (1.9 to 15.3)	9.4 (0.7 to 18.0)	20.1	29.1	37.4	8.9 (2.9 to 14.9)	17.3 (9.1 to 25.5)
Frequent use of pressured feeding practices	18.5	28.1	29.8	9.6 (3.1 to 16.0)	11.2 (2.8 to 19.7)	17.7	29.0	25.2	11.3 (5.3 to 17.2)	7.5 (0.1 to 14.9)

[a]F-EAT=Families and Eating and Activity Among Teens.
[b]FS=food secure.
[c]LFS=low food secure.
[d]VLFS=very low food secure.

Table 3. Predicted probabilities of use of eating and weight-related parenting practices by food-security status among mothers of adolescent boys participating in Project F-EAT[a] (n=986)

	Model 2[b]					Model 3[c]				
	Estimated Prevalence			Prevalence Differences (95% CI)		Estimated Prevalence			Prevalence Differences (95% CI)	
Parenting practices	FS[d]	LFS[e]	VLFS[f]	FS vs LFS	FS vs VLFS	FS	LFS	VLFS	FS vs LFS	FS vs VLFS
Frequent encouragement to diet	24.0	24.1	28.6	0.1 (−6.4 to 6.6)	4.6 (−4.1 to 13.4)	22.6	23.1	28.5	0.5 (−5.9 to 6.8)	5.8 (−2.8 to 14.4)
Frequent encouragement for healthy eating	64.2	69.4	72.2	5.3 (−2.3 to 12.8)	8.0 (−1.3 to 17.3)	63.3	68.5	72.2	5.2 (−2.7 to 13.1)	8.9 (−0.5 to 18.3)
Frequent comments about child's weight	33.6	42.7	41.4	9.1 (1.5 to 16.7)	7.8 (−2.0 to 17.6)	32.9	41.5	40.7	8.6 (0.9 to 16.3)	7.8 (−2.0 to 17.6)
Concerned about child's weight	35.6	35.7	49.2	0.2 (−7.6 to 7.9)	13.7 (3.3 to 24.0)	35.1	35.8	48.8	0.8 (−7.0 to 8.5)	13.7 (3.5 to 23.9)
Frequent use of restrictive feeding practices	24.9	25.0	26.3	0.1 (−6.5 to 6.8)	1.4 (−7.3 to 10.1)	25.3	24.8	25.2	−0.6 (−7.4 to 6.3)	−0.2 (−8.7 to 8.4)
Frequent use of pressured feeding practices	20.5	23.5	25.8	3.0 (−3.3 to 9.2)	5.2 (−3.2 to 13.6)	20.0	23.6	26.2	3.5 (−2.9 to 9.9)	6.2 (−2.3 to 14.7)

[a]F-EAT=Families and Eating and Activity Among Teens.
[b]Model 2: Adjusted for sociodemographic characteristics (child's age, mothers' race/ethnicity and educational attainment, number of children in home, and household income).
[c]Model 3: Model 2 with additional adjustment for maternal body mass index (BMI; calculated as kg/m^2) and adolescent BMI percentile.
[d]FS=food secure.
[e]LFS=low food secure.
[f]VLFS=very low food secure.

Table 4. Predicted probabilities of use of eating and weight-related parenting practices by food-security status among mothers of adolescent girls participating in Project F-EAT[a] (n=1,190)

	Model 2[b]					Model 3[c]				
	Estimated Prevalence			Prevalence Differences (95% CI)		Estimated Prevalence			Prevalence Differences (95% CI)	
Parenting practices	FS[d]	LFS[e]	VLFS[f]	FS vs LFS	FS vs VLFS	FS	LFS	VLFS	FS vs LFS	FS vs VLFS
Frequent encouragement to diet	24.2	28.8	33.1	4.6 (−1.8 to 11.1)	8.9 (0.5 to 17.4)	25.7	27.3	31.8	1.7 (−4.5 to 7.8)	6.1 (−1.8 to 14.0)
Frequent encouragement for healthy eating	61.4	65.7	66.2	4.4 (−2.8 to 11.5)	4.8 (−4.2 to 13.8)	61.3	65.5	64.1	4.2 (−3.2 to 11.6)	2.8 (−6.6 to 12.2)
Frequent comments about child's weight	35.1	36.8	43.9	1.7 (−5.1 to 8.4)	8.8 (0.0 to 17.6)	36.1	35.3	42.2	−0.7 (−7.5 to 6.0)	6.1 (−2.7 to 14.8)
Concerned about child's weight	35.7	40.4	47.4	4.7 (−2.5 to 12.0)	11.6 (2.3 to 21.0)	36.4	38.5	45.2	2.1 (−4.9 to 9.0)	8.8 (−0.1 to 17.6)
Frequent use of restrictive feeding practices	20.1	26.9	34.4	6.8 (0.6 to 13.0)	14.3 (5.8 to 22.8)	20.5	26.3	33.0	5.7 (−0.4 to 11.8)	12.4 (4.2 to 20.7)
Frequent use of pressured feeding practices	19.1	22.4	22.6	3.4 (−2.2 to 8.9)	3.5 (−3.6 to 10.6)	18.9	21.6	21.1	2.7 (−2.8 to 8.2)	2.3 (−4.7 to 9.2)

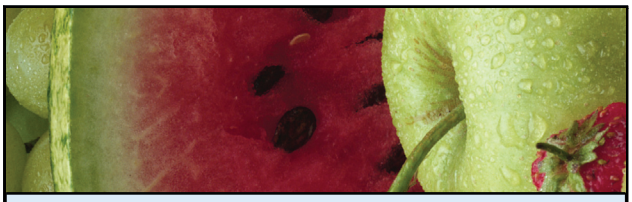
[a]F-EAT=Families and Eating and Activity Among Teens.
[b]Model 2: Adjusted for sociodemographic characteristics (child's age, mothers' race/ethnicity and educational attainment, number of children in home, and household income).
[c]Model 3: Model 2 with additional adjustment for maternal body mass index (BMI; calculated as kg/m^2) and adolescent BMI percentile.
[d]FS=food secure.
[e]LFS=low food secure.
[f]VLFS=very low food secure.

influences children's dietary and health outcomes. In an earlier analysis of data from Project F-EAT by Bruening and colleagues,[43] food-insecure parents reported several characteristics of the family environment that promote less-healthful eating and may increase children's obesity risk. For example, families with low or very low food security reported more frequent fast food for family meals; less frequent inclusion of salad, vegetables, and fruit for family meals; and an increased frequency of serving sugar-sweetened beverages with meals. In addition, food-insecure parents reported poorer dietary quality themselves and a greater likelihood of binge eating. These family environment characteristics, in combination with use of parenting practices that encourage dieting and dietary restriction, may increase food-insecure adolescents' risk of dietary inadequacy, disordered eating, and obesity.

The current study has a number of strengths, including a large sample size with a sufficient number of participants reporting low and very low food security, which provided the ability to examine differences between these two food-insecure groups and food-secure families. Data were collected from diverse, urban families in the Midwest; therefore, findings are generalizable to similar populations. In addition, several sociodemographic characteristics were measured in Project F-EAT, allowing for covariate adjustment of these variables. A limitation of the study is that both food security and parenting practices were self-reported by mothers; therefore, social desirability bias may be introduced by this assessment method. Further, while the six-item measure of household food security has demonstrated very high validity compared to the gold-standard 18-item US Household Food Security Survey Module,[45] minor misclassification of food-insecure households as food secure may have occurred. In addition, several comparisons were tested in this study, increasing the likelihood that the statistically significant associations were observed by chance. Finally, this study was descriptive in nature and cross-sectional in design; therefore, causality cannot be inferred. Future longitudinal research that follows children through childhood and includes children's perspectives on their families' food security would provide greater insight into how food scarcity alters both parental and child behavior.

CONCLUSIONS

Several eating- and weight-related parenting practices differ between food-secure and food-insecure mothers; specifically, food-insecure mothers were more likely to comment on and be concerned about their sons' weight and use restrictive feeding practices with their daughters, even after accounting for socioeconomic factors and differences in BMI among food-secure and food-insecure mothers and adolescents. In concert with prior findings from Project F-EAT regarding the home food environment of food-insecure families, the current study suggests that the family social environment during the adolescent period may play a role in the development of poor eating behaviors and obesity among food-insecure adolescents. Given evidence that mothers from food-insecure families are more likely to use maladaptive eating- and weight-related parenting practices with their adolescent-aged children, addressing maternal behavior in the context



PRACTICE IMPLICATIONS

What is the current knowledge on this topic?

Parenting practices are important to children's dietary quality, eating behaviors, and obesity risk. Little is known about how food insecurity may influence parents' use of eating and weight-related parenting practices.

How does this research add to knowledge on this topic?

Food-insecure mothers of adolescent-aged children reported more frequent use of several eating and weight-related parenting practices, including encouraging dieting and restricting food, as compared to food-secure mothers.

How might this knowledge impact current dietetics practice?

Interventions to improve dietary quality and reduce obesity risk among food-insecure families may benefit from addressing parenting practices.

of interventions that address healthful eating and weight control among food-insecure families may increase the likelihood that such programs lead to sustainable dietary intake, eating behavior, and/or weight changes.

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AUTHOR INFORMATION

K. W. Bauer is an assistant professor of public health and J. O. Fisher is a professor of public health, Center for Obesity Research and Education, Temple University, Philadelphia, PA. R. MacLehose is an associate professor, N. I. Larson is a senior research associate, D. Neumark-Sztainer is a professor, Division of Epidemiology and Community Health, School of Public Health, and K. A. Loth is a postdoctoral fellow, Department of Psychiatry, all at the University of Minnesota, Minneapolis.

Address correspondence to: Katherine W. Bauer, PhD, Center for Obesity Research and Education, Temple University, 3223 N. Broad St, Suite 175, Philadelphia, PA 19140. E-mail: Katherine.Bauer@Temple.edu

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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