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Food Insecurity and Compensatory Feeding Practices Among Urban Black Families

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What's Known on This Subject

Food insecurity is associated with a range of poor childhood health and developmental outcomes. The relationship between food insecurity and childhood overweight is unclear.

What This Study Adds

This study explores the relationship between food insecurity and maternal feeding practices that may alter the feeding environment and increase risk for childhood overweight. We focus on a high-risk population: ethnically diverse, urban black families.

ABSTRACT

OBJECTIVE. In this we study explored the relationship between food insecurity and compensatory maternal feeding practices that may be perceived as buffers against periodic food shortages among urban black families.

METHODS. We interviewed a convenience sample of black mothers of children aged 2 to 13 years. Food-security status (predictor) was determined at the household level. Five maternal feeding practices (outcomes) were assessed. Two were based on Birch's Child Feeding Questionnaire (restricting access to certain foods and pressuring a child to eat), and 3 were derived from investigators' clinical experience (use of high-energy supplements, added sugar in beverages, and perceived appetite stimulants). Anthropometric data were collected from mothers and children.

RESULTS. A total of 278 mother-child dyads were analyzed, and 28% of these mothers reported being food insecure. Use of Child Feeding Questionnaire feeding practices was defined as the top quartile of responses. Use of nutritional supplements, defined as "at least 1 to 2 times monthly," ranged from 13% to 25%. In logistic regression models adjusted for child age, weight status, and ethnicity and maternal weight status, mothers from food-insecure households were significantly more likely to use high-energy supplements and appetite stimulants. The odds of using the remaining compensatory feeding practices (adding sugars to beverages, pressuring a child to eat, and restricting access to certain foods) were elevated among food-insecure households but did not reach statistical significance.

CONCLUSIONS. Household food insecurity was independently associated with 2 of the 5 maternal compensatory feeding practices studied, and such practices may alter the feeding environment. Longitudinal research is necessary to determine how the relationship between food security and compensatory maternal feeding practices may affect child weight trajectories. *Pediatrics* 2008;122:e854–e860

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Key Words

food insecurity, feeding behavior, overweight children, African American, Haitian

Abbreviations

CFQ—Child Feeding Questionnaire

OR—odds ratio

CI—confidence interval

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MORE THAN ONE third of black children and adolescents in the United States are overweight or at risk for overweight.¹ The increased prevalence of overweight in this population has led researchers to investigate risk factors that may contribute to obesity. One such factor is food insecurity,^{2–4} which, in 2006, affected 11% of all US households and 15.6% of households with children.^{5,6} Food insecurity is higher in black households, where 26.4% of such households with children are food insecure.⁶

The relationship between food insecurity and overweight is well established among adult women. Population-based studies have shown an association between obesity and moderate levels of food insecurity among women.^{2–4} Several hypotheses have been offered, including overcompensation for periods when food is scarce, leading to overall increased intake; cycling food and energy intakes during periods of food scarcity and relative abundance, making the body more efficient in using dietary energy and leading to weight gain over time⁷; and increased consumption of energy-dense foods, which are less expensive and may be more plentiful in food-insecure households, leading to an overall increase in energy intake.⁸

In contrast to adult women, the relationship between food insecurity and overweight among children is uncertain. Some studies reported an association between household food insecurity and lower BMI among children,^{9–11} others found that food insecurity was associated with higher BMI,^{12–14} and 1 study found no association.¹⁵ These seemingly

contradictory findings have motivated researchers to explore further the complex dynamics of food insecurity and identify potential pathways whereby food insecurity affects childhood weight status.

The aim of this study was to explore the relationship between food insecurity and maternal feeding practices in an ethnically diverse, urban black population. We focused on this population because they have higher rates of both food insecurity⁵ and obesity¹⁶ than other populations in the United States. From the literature^{17–19} and our own experience, we identified 5 feeding practices that mothers may have adopted to compensate for the household's experience of periodic food shortages. These feeding practices have the potential to alter the child's feeding environment and may contribute to childhood overweight.^{20–22} We hypothesized that among black households, food insecurity may result in increased use of such compensatory feeding practices.

METHODS

Study Design and Sample

The study was part of larger project to examine differences in maternal feeding practices among black subpopulations. From November 2003 to September 2005, we conducted a cross-sectional survey of a convenience sample of mothers with children aged 2 to 13 years (survey available on request). Our sample included Haitian and African American households. We defined the household as Haitian when the child, the child's mother, or the child's maternal grandmother was born in Haiti. We restricted the definition of African American to US-born black children whose mothers and maternal and paternal grandmothers were also born in the United States to create a more culturally homogeneous group. Participants were recruited primarily from a pediatric primary care clinic of an urban teaching hospital. To increase the sample size of Haitian families, we extended recruitment to local churches with Haitian congregations. Children with major gastrointestinal anomalies or other medical conditions that interfered with appetite or ability to eat were excluded from this study. Families who met eligibility criteria were administered a standardized survey instrument, based on Birch's Child Feeding Questionnaire (CFQ).^{18,22,23} We added questions regarding food-security status, the use of nutritional supplements, and maternal demographics. The questions were asked orally in English or Haitian Creole on the basis of the mother's language preference. Anthropometric data for the mother and the child were collected at the time of the interview. The study was approved by the Boston University Medical Center institutional review board.

Measures

Food Insecurity

Food insecurity, the primary predictor in our analyses, is conceptualized into 4 domains: (1) uncertainty or worry about food; (2) inadequate quality of food; (3) inadequate quantity of food; and (4) food acquired through

socially unacceptable means.²⁴ We used the 6-item Short Form of the 12 Month Food Security Questionnaire* to classify households by using recommended cutoff scores: food secure (≤ 1 positive response), low food security (2–4 positive responses), and very low food security (5–6 positive responses).^{6,25–28} On the basis of standard guidance,²⁹ we combined the last 2 groups to form the food-insecure category. Households that affirmed ≤ 1 responses were classified as food secure, and households that affirmed ≥ 2 responses were classified as food insecure.

Compensatory Maternal Feeding Practices

In this study, the outcome variables were 5 compensatory maternal feeding practices, 2 defined by the CFQ and 3 derived from clinical experience. The CFQ was designed to explore the relationship between parental control of feeding and the development of children's eating habits, on the basis of responsiveness to hunger satiety cues.¹⁹ Birch included questions about parental restriction of foods and pressuring children to eat, hypothesizing that high levels of parental control around food selection and intake may inhibit children's feeding self-regulation and place children at risk for becoming overweight.^{18,22}

Pressuring a Child to Eat

This practice was assessed using 4 items from the CFQ, including, "My child should always eat all of the food on her plate," and, "I have to be especially careful that my child eats enough." Each item was scored on a 5-point Likert scale. We determined an overall score for this practice (sum of item scores/number of items) and examined its distribution in the sample. We constructed a dichotomous variable, with the highest quartile of scores designated as affirmative for the feeding practice.

Restricting Access to Certain Foods

Evidence of food restriction was examined using 8 items from the CFQ, including, "I have to be sure that my child does not eat too many sweets," and, "I have to be sure that my child does not eat too many high-fat foods." The items were scored and a dichotomous variable was constructed in the manner described in the previous section.

Use of Nutritional Supplements

The following 3 feeding practices were identified through the clinical experience of the investigators. For each practice, we constructed a dichotomous variable, with the affirmative defined as engaging in the use of any of the products "at least 1 to 2 times monthly":

- Use of high-energy supplements: High-energy supplements were defined as nutritional supplements that increase energy intake. Specific preparations included Pediasure, Boost, Carnation Instant Breakfast, and

*The categorization of food security was changed in 2006 on the basis of a report Food Insecurity and Hunger in the United States: An Assessment of the Measure, conducted by the National Research Council of the National Academies. The categories of food secure, food insecure without hunger, and food insecure with hunger were replaced by those described in this paragraph.

Malta, a beverage commonly given to children in the Caribbean and Latin America.

- Use of added sugar: Added sugar referred to the practice of adding sugar to a child's juice or milk.
- Use of appetite stimulants: Appetite stimulants were substances that the mother believed would stimulate the child's appetite, including cyproheptadine (Periactin and its Canadian counterpart, Vimicon), vitamins, and bush teas.

Child and Maternal Weight Status

BMI (kg/m^2) was calculated for mothers and children on the basis of heights and weights obtained at the time of the interview. Measurements were obtained by trained medical assistants (hospital-based individuals) or research assistants (church-based individuals). For children, we calculated BMI percentiles by age and gender according to the Centers for Disease Control and Prevention guidelines³⁰ and categorized them as overweight (BMI \geq 85th percentile), normal weight (BMI $<$ 85th percentile and $>$ 5th percentile), or underweight (BMI \leq 5th percentile). Mothers with a BMI of \geq 25 were classified as overweight and with a BMI of $<$ 25 as normal weight.

Statistical Methods

Logistic regression models were used to explore associations between compensatory maternal feeding practices (outcomes) and food insecurity (predictor). Covariates were identified from significant associations with study outcomes in bivariate analyses and included child age and ethnicity and maternal age. Maternal age was highly correlated with child age and, therefore, dropped from multivariate analyses. Child and maternal weight status did not have significant associations with either compensatory feeding practices or food security; however, we elected to include these covariates in our logistic regression models because of numerous studies suggesting that such associations exist.^{2-4,13,14,20-22}

Because a large number of interviews ($n = 216$) did not include complete information required to calculate BMI, we developed a strategy to deal with missing data.[†] Among women who were missing height only ($n = 159$), we classified them as overweight ($n = 103$) when they weighed \geq 164 lb, which corresponds to a BMI of 25 for the 95th percentile for height (ie, 68 in).³¹ For women who weighed $<$ 164 lb ($n = 56$) or were missing both height and weight ($n = 57$), we imputed their weight status using a dichotomous definition, normal versus overweight, on the basis of BMI cutoffs described previously. We used the Multiple Imputation procedure in SAS 9.1 for Windows³² to generate 5 data sets to tabulate the pattern of missing weight status and approximate the missing values.³³ The imputation was based on 4 of the 5 compensatory feeding practices (the restriction outcome was not included because of missing

[†]Missing maternal anthropometric data is attributed to study procedures, not maternal reasons, and is considered missing at random. Maternal weight was not collected during the study pilot phase ($n = 29$ interviews). Maternal height was not collected until midway through the study.

data), food-security status, and covariates that were significant in bivariate analyses: ethnicity and child age. We used the MIANALYZE Procedure to adjust standard errors.[‡] The imputed maternal weight status was then used in the logistic regression models.

Our model-building strategy involved entering covariates in a stepwise progression to determine their impact on the relationship between food security and compensatory feeding practices. After determining the unadjusted odds ratio (OR) for food insecurity, we examined the child covariates age and weight status, then ethnicity, and, finally, imputed maternal weight status. For logistic regression models, ORs and 95% confidence intervals (CIs) are reported.

RESULTS

We interviewed 306 mothers. We excluded 10 interviews because the child's BMI percentile was missing or $<$ 5th percentile. Use of nutritional supplements may have been medically indicated for underweight children. Nine interviews were excluded because of missing child age, precluding our ability to calculate a BMI percentile. An additional 7 interviews were excluded because of missing food-security data. Finally, we excluded 2 interviews that were missing data on $>$ 1 outcome. A comparison of demographic characteristics (ethnicity, BMI percentile, age, and gender) showed that excluded individuals did not differ significantly from the study sample. Our final analytic sample included 278 mother-child pairs.

Food-Security Status

A description of the sample characteristics by food-security status is depicted in Table 1. Seventy-nine (28%) households in the study were food insecure. The food-secure and food-insecure groups differed significantly by ethnicity, child's age, and use of compensatory feeding practices. Compared with African American families, Haitian families were significantly more likely to be food insecure. Families with older children were also disproportionately more likely to be food insecure. Nearly 60% of children met study criteria for overweight; however, this characteristic was not associated with food security.

Compensatory Feeding Practices

All compensatory feeding practices were significantly elevated among food-insecure families. The use of nutritional supplements was common in this population of low-income, urban African American and Haitian families. Routine use of high-energy boosters, added sugars, and appetite stimulants was reported by 25%, 13%, and 13% of all households, respectively (Table 1).

Logistic Regression Analyses

Results of our model-building strategy are shown in Table 2. In the unadjusted model, food security was significantly associated with all compensatory feeding practices. Overall, there was little change in ORs with the inclusion of the child and maternal covariates, with

[‡]Additional details of the imputation procedure are available from the authors on request.

TABLE 1 Population Characteristics According to Food-Security Status

Characteristic	Study Population (n = 278), n (%)	Food Secure (n = 199), n (%)	Food Insecure (n = 79), n (%)
Ethnicity ^a			
African American	138 (50)	110 (56)	28 (36)
Haitian	140 (50)	89 (44)	51 (64)
Child characteristics			
Age, y ^a			
2–5	116 (42)	87 (44)	29 (36)
6–10	121 (44)	91 (46)	30 (38)
11–14	41 (14)	21 (10)	20 (26)
Male gender	119 (44)	79 (40)	40 (52)
Child weight status			
Normal weight (BMI 5th–85th percentile)	115 (42)	83 (42)	32 (40)
Overweight (BMI > 85th percentile)	163 (58)	116 (58)	47 (60)
Maternal characteristics			
Age, y			
<30	65 (24)	51 (26)	14 (18)
30–40	120 (44)	86 (44)	34 (44)
>40	87 (32)	57 (30)	30 (38)
Weight quartiles, lb			
<153	55 (25)	38 (25)	17 (24)
154–175	57 (26)	39 (26)	18 (26)
176–204	52 (24)	38 (25)	14 (20)
≥205	57 (26)	36 (24)	21 (30)
Compensatory feeding practices ^a			
Pressure to eat	75 (27)	47 (24)	28 (35)
Restricting access to food	76 (30)	47 (26)	29 (39)
Energy boosters	70 (25)	40 (20)	30 (38)
Added sugar to beverages	37 (13)	21 (11)	16 (20)
Appetite stimulants	36 (13)	18 (9)	18 (23)

^a Significant differences between food-secure and food-insecure groups ($P < .05$).

the exception of restricting access to desired foods, for which the effect size of food security decreased by 35% compared with a 1% to 17% change seen in other models. In the fully adjusted model, compared with food-secure households, mothers in food-insecure households were significantly more likely to engage in 2 of the 5 hypothesized compensatory feeding practices: use of high-energy boosters (OR: 2.1 [95% CI: 1.1–4.0]) and use of a perceived appetite stimulant (OR: 3.2 [95% CI: 1.5–7.1]). Two additional practices approached statistical significance: adding sugar to beverages (OR: 2.1 [95% CI: 0.99–4.4]) and pressuring a child to eat (OR: 1.8 [95% CI: 0.98–3.2]). Because ethnicity was highly associated with compensatory feeding practices, we con-

ducted a subsequent analysis that included the interaction between ethnicity and food security and found that there was no differential effect of food security on any of the outcomes by ethnicity.

DISCUSSION

This study is 1 of the first to examine quantitatively the relationship between food insecurity and specific maternal feeding practices. In this sample of ethnically diverse, urban black families, household food insecurity was significantly associated with 2 of the 5 compensatory feeding practices that may increase the risk for overweight in a population in which prevalence of childhood overweight is high, and the odds were elevated for the other

TABLE 2 ORs for Compensatory Feeding Practices According to Food-Insecurity Status

Outcome	Unadjusted Model, OR (95% CI)	Adjusted for Child Factors, OR (95% CI) ^a	Adjusted for Child Factors + Ethnicity, OR (95% CI)	Fully Adjusted Model Child Factors + Ethnicity + Maternal Weight Status, OR (95% CI) ^b
Pressuring to eat	1.78 (1.01–3.13)	1.86 (1.04–3.31)	1.79 (0.99–3.23)	1.77 (0.98–3.19)
Restricting access to certain foods	1.84 (1.04–3.26)	1.75 (0.98–3.14)	1.47 (0.81–2.69)	1.49 (0.81–2.73)
Use of high-energy boosters	2.43 (1.37–4.31)	2.70 (1.50–4.86)	2.05 (1.08–3.90)	2.09 (1.10–3.99)
Use of appetite stimulants	2.97 (1.45–6.06)	3.28 (1.57–6.85)	2.98 (1.41–6.32)	3.24 (1.48–7.08)
Adding sugar to beverages	2.15 (1.06–4.38)	2.51 (1.21–5.22)	2.11 (0.99–4.46)	2.09 (0.99–4.44)

^a Child age and child weight status are categorized as presented in Table 1.

^b Maternal weight status (normal weight [BMI < 25] versus overweight [BMI ≥ 25]) is based on imputed data.

feeding practices studied. These findings contribute to the growing body of research documenting wide-reaching negative impacts of food insecurity on the health and development of America's children.^{13,14,34–39}

This study is one of the first to use CFQ subscales, pressuring a child to eat and restricting access to desired foods, to examine maternal control of feeding when resources are limited and undernutrition is a perceived risk. Our study findings suggest a possible association between these feeding practices and food insecurity in an urban, low-income black population; however, previous work by Matheson et al⁴⁰ found that food-related parenting attitudes among Mexican American mothers, using the same 2 CFQ subscales, did not differ significantly between food-secure and food-insecure households. The CFQ, which was initially validated in predominantly middle- to high-income populations,^{18,22,23} needs to be examined further to assess its properties among ethnically diverse, lower income, more food-insecure groups.

The increased use of high-energy supplements and appetite stimulants among food-insecure families was somewhat surprising, given their cost. Local offices of the Special Supplemental Nutrition Program for Women, Infants, and Children confirmed that they provide such supplements only to children who are clinically defined as underweight, children who were excluded from these analyses. Mothers may perceive these strategies as protective against undernutrition in their children and may believe that ensuring a child's "good appetite" may buffer them during periods of limited food access.

The mechanisms that link food insecurity and maternal feeding practices are uncertain; however, researchers^{41–43} have identified a common pattern of managing food resources in response to increasing family economic stress. Mothers, in particular, are likely to sacrifice food quality and variety to preserve children's usual levels of food intake, which tend to be disrupted only in dire situations. Hamelin et al⁴⁴ described the phenomenon of worrying about having enough food in the future as a key feature of food insecurity. Worry about food sufficiency may manifest at the household level through modifications of eating pattern and ritual, during periods of both food adequacy and shortage. This model suggests that the experience of food insecurity may lead to feeding practices that mothers view as protective. It also helps explain the seemingly counterintuitive relationship between food restriction and food insecurity. Food-insecure families may restrict access to certain "unhealthy" desired foods to ensure that the child is sufficiently hungry to eat food of higher nutritional quality.

The lack of association between compensatory feeding practices and maternal weight status was unexpected, given previous research suggesting an association between maternal weight status and food insecurity and between maternal weight status and child feeding practices.^{22,23,45–47} To explore this relationship further, we conducted additional analyses to investigate whether there was a different relationship between food insecurity

and compensatory feeding practices depending on maternal weight status. In models that included an interaction term for maternal weight and food insecurity, using both imputed maternal weight status and raw maternal weight data (weight in pounds), we found no differential effect on compensatory feeding practices on the basis of mother's weight. Our findings may be attributable to the higher than expected proportion of overweight women in our sample and require additional investigation in future studies.

This study has several limitations. First, we cannot directly link the compensatory feeding practices identified in this study to childhood overweight. Although the prevalence of these feeding practices and childhood overweight was high in our sample, the study was not designed to evaluate causality. Second, we used a convenience sample that introduces the possibility of selection bias. Although these results may not be generalizable to other populations, the sampling approach should not influence internal associations. Third, there were a large number of missing maternal weight and height data. We addressed this issue by using multiple imputation methods to compare findings with and without complete data. Overall, results were stable between the 2 analyses, but this study needs to be replicated using complete maternal anthropometric data.

CONCLUSIONS

In this study, we offer a model of household food insecurity that provides a rationale for compensatory maternal feeding practices that may promote childhood overweight. Our study findings suggest that food insecurity may alter the feeding environment and highlight the importance of including questions about food security, nutritional supplements, and perceived appetite stimulants as a routine part of dietary history. A positive response to questions about use of nutritional supplements can serve as a prompt to pediatric providers to probe further household food adequacy and consistent access to quality food and link families to community-based food programs as needed. Additional research is needed to replicate study findings in a larger, more ethnically diverse sample. In addition, the relationship between food insecurity and childhood overweight is not well established and remains a topic of investigation. Following children longitudinally could provide insight on how food-security status might alter maternal feeding practices and child weight trajectories.

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