Published in final edited form as:

J Spec Pediatr Nurs. 2017 April ; 22(2): . doi:10.1111/jspn.12177.

Relationship between Food Insecurity, Child Weight Status, and Parent-Reported Child Eating and Snacking Behaviors

Tanja V.E. Kral, Ph.D., Jesse Chittams, M.S., and René H. Moore, Ph.D.

Department of Biobehavioral Health Sciences, University of Pennsylvania School of Nursing (TVEK, JC); Department of Psychiatry, University of Pennsylvania Perelman School of Medicine (TVEK); Department of Biostatistics and Bioinformatics, Rollins School of Public Health, Emory University, Atlanta, GA (RHM)

Abstract

Purpose—Prior studies showed that food insecurity may increase the odds of obesity in children and adults. We still know very little about the familial aggregation of obesity in food insecure households or the mechanisms by which food insecurity confers an increased risk of obesity to children. The purpose of this study was to compare children and mothers from food insecure and food secure households in their weight status, child eating patterns/behaviors, and maternal feeding practices.

Design and Methods—Fifty mothers of 8- to 10-year-old children were asked to complete questionnaires, including the U.S. Household Food Security survey, and had their own and their children's heights and weights measured.

Results—The odds of a child being obese were 5 times higher for children from food insecure households compared to children from food secure households [95%CI: 1.15, 20.8]. In univariate analyses, children from food insecure households showed significantly greater external eating, both past satiation and in the absence of hunger ($p < .03$), and mothers from food insecure households expressed significantly greater concern about their children's weight and used restrictive feeding practices to a greater extent ($p < .03$) when compared to families from food secure households. A greater proportion of children from food secure households consumed 3–4 snacks per day (45.9% vs. 15.4%) while a higher proportion of children from food insecure households consumed 5 snacks per day (15.4% vs. 0%; $p = .02$).

Practice Implications—These findings provide further support for an association between food insecurity and childhood obesity and suggest that differences in external eating, child snacking patterns, and select maternal feeding practices may be implicated in food-insecure children's overconsumption of calories. When caring for food-insecure children, health care providers should screen for problematic eating patterns and feeding practices.

Corresponding author: Tanja V.E. Kral, Ph.D., Department of Biobehavioral Health Sciences, School of Nursing and Perelman School of Medicine, 308 Claire M. Fagin Hall, 418 Curie Blvd, Philadelphia, PA 19104-4217. Phone: 215-573-7512; Fax: 215-573-7507; tkral@nursing.upenn.edu.

Author roles: Kral, T.V.E., Principal Investigator; Chittams, J., Senior Biostatistician, Moore, R.H., Faculty Biostatistician

Conflict of Interest Statement: The authors report no actual or potential conflicts of interest.

Keywords

Food insecurity; children; obesity; external eating

Introduction

Childhood obesity has reached an all-time high with 17.0% of 2- to 19-year-olds currently being considered obese (Ogden, Carroll, Fryar, & Flegal, 2015). Children from low-income and minority communities show an even higher prevalence of obesity (Rogers et al., 2015; Weedn, Hale, Thompson, & Darden, 2014; Wells, Evans, Beavis, & Ong, 2010) and are more prone to diet-related health disparities (Brown-Riggs, 2015; Eicher-Miller, Mason, Weaver, McCabe, & Boushey, 2011). Based on nationally representative data from the National Health and Nutrition Examination Surveys (NHANES), rates of severe obesity (BMI-for-age 99th percentile) were approximately 1.7 times higher among youth from families with greater poverty compared with youth from families of higher socio-economic status (Skelton, Cook, Auinger, Klein, & Barlow, 2009).

One of the factors that have been implicated in the association between poverty and obesity is food insecurity. Per definition of the United States Department of Agriculture, food insecurity refers to a “limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” (<https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx>). In 2014, an estimated 17.4 million (or 14%) of U.S. households were food insecure and 7.9 million children resided in food-insecure households (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015). Prevalence rates varied considerably among household types with rates being higher for all households with children (19.2%), households with children headed by a single woman (35.3%), Black, non-Hispanic households (26.1%), and low income households with incomes below the 185% of the poverty threshold (33.7%) (Coleman-Jensen, et al., 2015). Food insecurity may increase the odds of obesity through several possible pathways. One, limited resources and lack of access may prevent families from food-insecure households to purchase nutritious foods. Healthy foods are often more expensive and more perishable while less expensive foods, such as refined grains, added sugars, and fats are inexpensive and readily available in low-income communities (Aggarwal, Monsivais, & Drewnowski, 2012; Darmon & Drewnowski, 2015; DiSantis et al., 2013). Youth and adults in low-income neighborhoods have also been shown to be exposed to disproportionately more marketing and advertising of unhealthy food products such as fast food and sugary beverages (Powell, Wada, & Kumanyika, 2014; Yancey et al., 2009). Low-income neighborhoods also often lack access to full-service grocery stores and farmers’ markets where healthy foods, such as fruits and vegetables, whole grains, and low-fat dairy products are available (Beaulac, Kristjansson, & Cummins, 2009; Larson, Story, & Nelson, 2009). Additionally, food insecurity can be accompanied by cycles of “feast and famine” which can lead to eating less or skipping meals to stretch food budgets. Cycles of food deprivation and overeating can also contribute to future weight gain (Bruening, MacLehose, Loth, Story, & Neumark-Sztainer, 2012; Olson, Bove, & Miller, 2007). Further, low-income families often experience high levels of stress, anxiety, and

depression in part due to the financial pressures of food insecurity, low-wage work, and poor housing (Leung, Epel, Willett, Rimm, & Laraia, 2015; Liu, Njai, Greenlund, Chapman, & Croft, 2014). Stress and poor mental health are risk factors for weight gain through stress-induced hormonal changes and unhealthy eating behaviors (Adam & Epel, 2007; Tomiyama, Dallman, & Epel, 2011). Lastly, lower income neighborhoods often have fewer green spaces and recreational facilities and higher crime rates thus providing fewer opportunities for physical activity (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Singh, Siahpush, & Kogan, 2010).

While a significant relationship between food insecurity and obesity has been reported in adults, and women in particular, studies with children produced more inconsistent findings (Dinour, Bergen, & Yeh, 2007). We still know little about the familial aggregation of obesity in food insecure households or the exact mechanisms by which food insecurity may confer an increased risk of obesity to children. It is possible that children from food insecure households exhibit different eating behaviors or meal and snacking patterns than children from food secure households or that their parents may use different feeding practices to cope with the limited or uncertain availability of food in the home.

The aim of this study was to examine the familial aggregation of obesity in food insecure households and elucidate mechanisms by which food insecurity confers an increased risk of obesity to children. Obesity tends to run in families (Martin, 2008) but prevalence rates may be higher in families who do not have reliable access to nutritious foods. We therefore hypothesized that a greater proportion of children and mothers from food insecure households would be considered overweight or obese when compared to children and mothers from food secure households. Mechanisms by which food insecurity confers an increased risk of obesity to children likely include eating behaviors that maximize caloric intake and maternal feeding practices that take into account the limited food supply in the home. We therefore hypothesized that children from food insecure households would show greater snacking throughout the day and greater eating in the absence of hunger than children from food secure households and that their mothers would use more controlling feeding practices than mothers from food secure households. Examining differences in weight- and eating-related outcomes of families and children with a different food security status is expected to build the basis for future intervention studies that are aimed at promoting healthy nutrition and weight development among at-risk children and their families.

Methods

Design

This cross-sectional secondary analysis was part of a larger laboratory-based feeding study which used a randomized crossover design to examine the role of child weight status and the relative reinforcing value of food in children's response to portion size increases (Kral, Remiker, Strutz, & Moore, 2014). Mothers were asked to complete a series of questionnaires and have their own and their children's heights and weights measured during an onsite screening visit.

Sample

The study included 50 children between 8 and 10 years of age and their biological mothers living in the greater Philadelphia metropolitan area. Half of the child participants were normal-weight (BMI-for-age 5–84th percentile); the other half was obese (BMI-for-age 95th percentile). Overweight children (BMI-for-age 85–94th percentile) were excluded from the original study to maximize the weight discrepancy between the weight groups. Given that children with obesity are at greatest risk for developing chronic diseases (Han, Lawlor, & Kimm, 2010; Sutherland, 2008), we chose to focus on comparing eating behaviors of normal-weight children to obese rather than overweight children.

Families were recruited through advertisements placed in local newspapers and online (Craigslist) and flyers distributed in pediatricians' offices and local grocery stores. Families from all racial and ethnic backgrounds were eligible to participate in the study. To be included, children had to be: 8 to 10 years and normal-weight or obese. For additional details regarding inclusion criteria, see Kral and colleagues (2014). Children were excluded from the study if they had medical conditions or were taking medications known to affect food intake or body weight; were overweight; were diagnosed with a learning disability or sight/hearing impairment; had food allergies/intolerances; or were on a special diet. The study was approved by the Institutional Review Board (IRB) of the University of Pennsylvania. Subjects were asked to provide voluntary consent (mothers) and assent (children) to participate in the study by signing the consent and assent forms at the screening visit. Families were compensated \$150 for completing the entire study which included \$10 in remuneration for the child.

Procedure

At the screening visit for the main study, mothers were asked to complete a series of questionnaires and have their own and their children's height and weight measured.

Instruments

Demographic Questionnaire—Mothers completed a basic demographic questionnaire which included, but was not limited to, questions about their age, race/ethnicity, marital status, college degree, household income, child meal and snack patterns (number of meals/snacks consumed per day), and the frequency with which mothers instructed their children to clean their plate (never, sometimes, often, always).

Assessment of Household Food Security—The 6-item short form of the U.S. Household Food Security survey module was used to assess participating families' food security status (Blumberg, Bialostosky, Hamilton, & Briefel, 1999). The sum of affirmative responses to the six survey questions make up the household's raw score. This raw score describes four levels of food security: high food security (i.e., no indications of food access problems or limitations); marginal food security (i.e., 1–2 indications of food access problems such as anxiety over food sufficiency or shortage of food in the house); low food security (i.e., reports of reduced quality, variety, or desirability of diet); and very low food security (i.e., reports of multiple indications of disrupted eating patterns and reduced food intake) (<http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/>

[definitions-of-food-security.aspx](#)). We categorized households with high and marginal food security as ‘food secure’ and households with low or very low food security as ‘food insecure.’ This short form of the U.S. Household Food Security survey module has shown to have acceptable conceptual validity, specificity (99.5%) and sensitivity (85.9%) for determination of overall food insecurity for households with children (Blumberg, et al., 1999) as well as good internal consistency (Cronbach’s $\alpha = 0.86$) (Hamilton et al., 1997).

Parent Feeding Style Questionnaire (PFSQ)—The Parental Feeding Style Questionnaire (PFSQ) is a 27-item caregiver-report questionnaire, which assesses 1) maternal emotional feeding, 2) instrumental feeding (using food as reward), 3) prompting/encouragement to eat, and 4) control over child eating (Wardle, Sanderson, Guthrie, Rapoport, & Plomin, 2002). Items were scored on a 1–5 scale (1 = “I never do”, 2 = “I rarely do”, 3 = “I sometimes do”, 4 = “I often do”, 5 = “I always do”); average scores were used for analyses. The psychometric properties of the PFSQ were assessed in a sample of 221 parents of boys and girls (mean age: 5.6 ± 1.5 years) (Wardle, et al., 2002). The questionnaire has been shown to have good internal reliability (Cronbach’s $\alpha = .65$ to $.85$) and 2-week test–retest reliability ($r = 0.76$ to 0.83) for all four subscales (Wardle, et al., 2002).

Child Feeding Questionnaire (CFQ)—The Child Feeding Questionnaire (CFQ) is a 31-item instrument, which assesses 1) parents’ perceptions of their responsibility for child feeding (Perceived Responsibility), 2) parents’ perceptions of their own weight status history (Parent Perceived Weight), 3) parents’ perceptions of their child’s weight status history (Perceived Child Weight), 4) parents’ concerns about the child’s risk of being overweight (Parents’ Concerns About Child Weight), 5) extent to which parents oversee their child’s eating (Monitoring), 6) extent to which parents restrict their child’s access to food (Restriction), and 7) parents’ tendency to pressure their children to eat more food (Pressure to Eat) (Birch et al., 2001). For each item, mothers were asked to indicate their response on a 5-point Likert Scale, with each point on the scale represented by a specific word anchor (Note: anchors differed across questions; 1 = unconcerned/disagree/never, 2 = a little concerned/slightly disagree/rarely, 3 = concerned/neutral/sometimes, 4 = fairly concerned/slightly agree/mostly, 5 = very concerned/agree/always); average scores were used for the analyses. The questionnaire showed adequate internal consistency with Cronbach’s alpha coefficients for the various subscales ranging from 0.70 to 0.92 (Birch, et al., 2001). Initial support for the validity of the instrument was provided by the observed significant relationships ($r = 0.30 - 0.50$) between four of the seven CFQ factors (i.e., perceived parent weight, perceived child weight, concerns about child weight, pressure to eat) and independent measures of children’s weight status.

Assessment of Child Eating in the Absence of Hunger—The Parent Report Child Eating in the Absence of Hunger Questionnaire (EAH-PC) (Tanofsky-Kraff et al., 2008) was used to assess children’s susceptibility to eating when satiated in response to the presence of palatable foods. On this 14-item questionnaire, mothers read a prompt stating, “Imagine that your child is eating a meal or snack at home, school, or at a restaurant. Imagine that your

child eats enough of his/her meal so that he/she is no longer hungry.” Mothers were instructed to respond to questions about how often their child would *keep eating* for various reasons, such as “because the food looks, tastes, or smells so good” or “is feeling tired.” Mothers were also asked how often their child *starts eating* (after they have “finished eating a meal or snack some time ago and [are] not yet hungry”) in situations such as when the child “is with other people who are eating,” or because s/he “is feeling sad or depressed.” Mothers completed this questionnaire by rating the items on a 5-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). The subscales included Eating Past Satiation and EAH in response to External Eating cues, Negative Affect, and Fatigue/Boredom. Average scores were used for analyses. In a study with 140 children, ages 8 to 17 years, and their parents all subscales demonstrated good internal reliability (Cronbach’s $\alpha = 0.85 - 0.94$), temporal stability over an average of 10 weeks ($r = 0.63 - 0.70$) and convergent validity as indicated by significant associations between the subscales and children’s interview assessed overeating (Shomaker, Tanofsky-Kraff, Elliott, et al., 2010; Shomaker, Tanofsky-Kraff, Zocca, et al., 2010; Tanofsky-Kraff, et al., 2008).

Assessment of Child and Maternal Height and Weight—A trained staff member measured children’s and mother’s weight on a digital scale (Tanita BWB-800, Arlington Heights, IL; accurate to 0.1kg) and their standing height on a stadiometer (Veder-Root, Elizabethtown, NC; accurate to 0.1cm) with children and mothers wearing light clothing and having their shoes removed. Child age- and sex-specific BMI percentiles and z-scores were calculated using the CDC Growth Charts (https://www.cdc.gov/nchs/data/series/sr_11/sr11_246.pdf).

Children were classified as normal-weight (BMI-for-age 5 – 84th percentile) or obese (BMI-for-age 95th percentile). Maternal BMI was calculated as weight (kg) divided by height (m) squared. Mothers were classified as underweight (BMI < 18.5 kg/m²), normal-weight (BMI 18.5 – 24.9 kg/m²), overweight (25.0 – 29.9 kg/m²), or obese (≥ 30 kg/m²) (http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html).

Analysis Plan—Data were analyzed using the SAS System for Windows (Version 9.4; SAS Institute, Cary, NC) and SPSS (Version 23; SPSS Inc., Chicago, IL). The Shapiro-Wilk test was used in conjunction with distribution plots and summary statistics (e.g., skewness, kurtosis) to examine the normality of the distribution of continuous variables. Independent two sample t-tests were used for normally distributed continuous variables, nonparametric Wilcoxon Rank-Sum tests for non-normally distributed variables, and Chi-Square or nonparametric Fisher’s Exact tests for categorical variables to compare mothers and children from food secure and food insecure households in demographic and anthropometric variables, parent feeding practices, child eating behaviors and meal and snack patterns. We also computed the odds ratio for obesity in children from food insecure households as compared to children from food secure households. We controlled for potentially confounding demographic characteristics (i.e., household income, maternal race) in families from food secure and food insecure households by adding these covariates to the logistic regression models for maternal and child weight outcomes, parent feeding practices, and child eating in the absence of hunger. Descriptive statistics are reported as means ($\pm$ SDs) for

continuous variables or as frequencies (percentages) for categorical variables unless otherwise indicated. Reported P values are 2-sided and $P < 0.050$ was considered significant for all tests.

Results

Maternal and child demographics

Of the 50 participating families in the study, 13 families (26%) were classified as food insecure while the remaining 37 families (74%) were classified as food secure. Mothers from food insecure households did not differ significantly from mothers from food secure households in age, ethnicity, marital status, or education ($p > .27$). There was a trend ($p < .08$) for a between group difference in maternal and child race, with a higher proportion of both mothers and children from food insecure households being African American (84.6%) when compared to mothers and children from food secure households (62.2%). There also was a significant difference in household income between the two groups ($p < .02$) with a greater proportion of mothers from food insecure homes (91.6%) showing household incomes of less than \$50,000 compared to mothers from food secure homes (54%). Children from food insecure households did not differ significantly from children from food secure households in age, sex, or ethnicity ($p > .19$; Table 1).

Maternal and child anthropometric characteristics

Table 1 also depicts the anthropometric characteristics for mothers and children by food security status. Mothers from food insecure households did not differ significantly in any of the anthropometric characteristics, including height, weight, BMI, or proportion of overweight/obesity, when compared to mothers from food secure households ($p > .13$), even when controlling for maternal race and income ($p > .28$). The majority of mothers from both food insecure and food secure households were considered overweight or obese (92.3% vs. 83.7%; $p = .87$; Figure 1).

Children from food insecure households were significantly taller and showed greater body weights compared to children from food secure households ($p < .04$). The difference in height, but not weight, became non-significant when controlling for maternal race and income ($p = .059$). In terms of their weight status, 77% of children from food insecure households were obese compared with 41% of children from food secure households ($p = .02$; Figure 1). Expressed differently, the odds of being obese were 4.9 times [95% CI: 1.15, 20.8] higher for children from food insecure households when compared to children from food-secure households. The differences in children's weight status remained significant when adjusting for household income and maternal race ($p = .04$).

Child Meal and Snack Patterns

Univariate analyses showed that the majority of children from both food secure and food insecure households (~85%) consumed three meals per day (Table 2). Children from food secure and food insecure households significantly differed in the number of snacks they consumed per day ($p = .02$). A greater proportion of children from food secure households consumed 3–4 snacks per day (45.9% vs. 15.4%) while a slightly higher proportion of

children from food insecure households consumed 5 snacks per day (15.4% vs. 0%). There was no statistically significant difference in the proportion of children from food insecure and food secure households who were instructed by their mothers either sometimes or often/always to “clean their plate” during a meal (46% vs. 59%; $p = .72$).

Parent Feeding Practices

Mothers from food insecure households expressed significantly greater concern about their child’s weight and restricted their child’s access to food to a greater extent than did mothers from food secure households ($p < .03$; Table 2). The differences in maternal concern about child weight and restriction became non-significant when adjusting for income and maternal race ($p > .09$). Mothers from food insecure and food secure households did not differ significantly in any other parent feeding practices ($p > .11$), even when adjusting for covariates ($p > .08$).

Child Eating in the Absence of Hunger

Children from food insecure households showed significantly greater external eating, both past satiation and in the absence of hunger, when compared with children from food secure households ($p < .03$; Table 2). The differences in external eating, both past satiation and in the absence of hunger, became non-significant when adjusting for household income and maternal race ($p > .09$). Children from food insecure and food secure households did not significantly differ in eating due to negative affect or fatigue/boredom ($p > .14$), even when adjusting for covariates ($p > .20$).

Discussion

This study showed that the odds of being obese were 5 times higher for children from food insecure households when compared to children from food-secure households. Children from food insecure households also exhibited significantly greater external eating, both past satiation and in the absence of hunger, and showed different snacking patterns when compared to children from food secure households. Mothers from food insecure households, when compared to mothers from food secure households, showed significantly greater levels of concern about their children’s weight and used restrictive feeding practices to a greater extent, but they did not differ significantly in their weight status. Together, these findings suggest that children from food insecure households may be at an increased risk of eating beyond hunger and obesity and should be targeted for early intervention.

This study aimed to compare children and mothers from food insecure and food secure households in their weight status. As we hypothesized, a significantly higher proportion of children from food insecure households were obese compared to children from food secure households and this relationship remained significant after controlling for covariates. Two recently published reviews of the literature (Eisenmann, Gundersen, Lohman, Garasky, & Stewart, 2011; Larson & Story, 2011) and subsequent investigations (Kaur, Lamb, & Ogden, 2015; Kohn, Bell, Grow, & Chan, 2014; Metallinos-Katsaras, Must, & Gorman, 2012; Papas, Trabulsi, Dahl, & Dominick, 2015; Speirs & Fiese, 2016; Vedovato et al., 2015) revealed mixed support for an association between food insecurity and child weight status. It

is possible that factors such differences in child ages, the presence or absence of child hunger with food insecurity, or differences in food assistance participation may account for the mixed findings in prior studies and present important areas of future research. As children grow older they become more independent from the food supply at home and have more opportunities to consume food outside the home (e.g., at school, stores, friends' homes) (Borradaile et al., 2009; Drewnowski & Rehm, 2013). Also, food-insecure families who participate in the Supplemental Nutrition Assistance Program (SNAP) may experience repeated cycles of food abundance at the beginning of the month followed by food scarcity at the end of the month due to the fixed monthly benefit issuance schedules (Wilde & Ranney, 2000), which may lead to adaptive eating behaviors among family members (e.g., overeating at the beginning of the month followed by caloric restriction later in the month).

With respect to children's primary caregivers, mothers in both groups showed high levels of overweight and obesity (~80–90%) and their food security status did not account for differences in their weight status even after controlling for covariates. Contrary to our findings, a prior review of the literature did suggest that women who experience food insecurity showed higher rates of overweight and obesity than women from food secure households (Larson & Story, 2011). The current study did not assess mothers' history of food insecurity to further evaluate the temporal relationship between food insecurity and weight status in adults, which should be a focus of future investigations. The high proportion of overweight and obesity among mothers in both groups confers a risk for obesity to children which may be independent of families' food security status. Data from prior research suggest that children whose mothers were obese showed more than a 3-fold increased risk of childhood obesity (Strauss & Knight, 1999). Therefore, studies are needed which parse out the relative contributions of maternal obesity and food insecurity on children's weight development over time.

With respect to children's meal and snack patterns, our results showed significant between-group difference in the number of snacks children consumed per day, but no difference in the number of daily meals consumed. Increased snacking has been associated with an increased risk of developing obesity in children (Barlow, 2007; Kuhl, Clifford, & Stark, 2012; Murakami & Livingstone, 2016) and therefore warrants a more refined assessment in future studies. For example, it will be important to determine the type (i.e., nutritional composition) of snacks that are being consumed, where snacks are being consumed (inside or outside the home), and considerations surrounding the role of lower-cost snacks in child feeding in food insecure households.

This study also showed that, when based on univariate analysis, children from food insecure households exhibited significantly greater external eating, both past satiation and in the absence of hunger, when compared with children from food secure households. This finding may serve as an early indicator that eating in children from food-insecure households may be governed more by external cues rather than internal cues of hunger and fullness. If true, increased reliance on external cues may make children from food insecure households more susceptible to excess energy intake and weight gain over time as adhering less to internal cues of hunger and fullness and eating when full has been identified as a possible behavioral phenotype for obesity in children (Kral et al., 2012). It is important to note, however, that

this finding was based on maternal report and unclear to what extent these parent-reported behaviors correspond with actual child behaviors. Prior studies that tested the association between the EAH-PC questionnaire and child intake in a laboratory setting showed mixed findings. While Shomaker and colleagues (Shomaker et al., 2013) did show that parent-reported EAH to external cues was positively associated with adolescent EAH during a laboratory meal, a study by Madowitz and colleagues (Madowitz et al., 2014) with treatment-seeking overweight and obese children failed to show an association between the EAH-PC external eating subscale and laboratory-assessed EAH. Thus, it will be important for future research to objectively examine eating behaviors of children from food insecure households and, if confirmed, also systematically examine the mechanisms by which food insecurity may contribute to eating beyond hunger in children. It is also important to note that the between-group differences in external eating, both past satiation and in the absence of hunger, became non-significant when for household income and maternal race. This finding suggests that household income, in particular, may be an important demographic characteristic to consider in the relationship between food insecurity and external eating in children.

With respect to maternal feeding practices, the results from the univariate analysis showed that mothers from food insecure households exhibited significantly greater concern about their child's weight and restricted their child's access to food to a greater extent than did mothers from food secure households. This finding is in agreement with a recent cross-sectional study in adolescents and their mothers which also showed that mothers with very low food security were more likely to be concerned about their sons' weight and were more likely to frequently use restrictive feeding practices with their daughters compared to food-secure mothers (Bauer et al., 2015). Restrictive feeding practices have been shown to be associated with overeating in children, such as EAH (Fisher & Birch, 2002; Liang et al., 2016; Reina et al., 2013), impaired caloric compensation (Tripicchio et al., 2014), increased energy intake (Rollins, Savage, Fisher, & Birch, 2016), and increased child weight status (Dev, McBride, Fiese, Jones, & Cho, 2013; Dinkevich et al., 2015). It remains unclear if mothers use restriction as an effort to control child's weight or if unreliable access to food may prompt mother to ration or limit access to food to make it last longer. Interestingly, the observed between group differences in maternal concern about child weight and restriction became non-significant when controlling for household income and maternal race. Spruijt-Metz and colleagues (Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002) have previously shown that African-American mothers scored higher on several child feeding variables, including restriction of child eating, when compared to white mothers. More research is needed on the role of household income on parent feeding practices, and feeding restriction, in particular.

The strengths of this study include the unique cohort of weight-discrepant children (50% normal-weight, 50% obese) and the inclusion of a large number of minority children. To our knowledge, this analysis is also among the first that concurrently assessed maternal and child weight status, child meal and snack patterns, maternal feeding practices, and parent-reported child eating behaviors by food security status. The study also had several limitations. This study used the 6-item short form of the U.S. Household Food Security survey module to assess food insecurity in our sample. This short form of the survey fails to

measure more severe levels of food insecurity at which child hunger is observed. Child hunger may be an important modifier in the relationship between food insecurity and child eating and weight outcomes and therefore should be included in future analyses. Second, our findings from the covariate analysis revealed that household income changed the relationship between food insecurity and several weight and feeding outcomes. The current study, however, did not assess household size and therefore could not determine the proportion of families who lived below federal poverty levels. Future studies should further study the relationship between food insecurity and poverty, including participation in food assistance programs, to delineate the relative contribution of these factors on food consumption and weight status. Future investigations should also examine whether the findings from this study hold in the presence of confounding covariates. These studies are expected to lay the groundwork for future intervention studies. Behavioral interventions that focus on educating families about healthy food choices and parent feeding strategies that promote adhering to hunger and fullness cues at meals while at the same time taking the families' socioeconomic situation into consideration are especially needed. Lastly, an a priori power analysis was only conducted for the main study but not for this secondary analysis. It is therefore possible that the current sample size may have limited the statistical power for this analysis.

How might this information affect nursing practice?

The findings from this analysis provide further support for an association between food insecurity and childhood obesity and suggest that differences in external eating, child snacking patterns, and select maternal feeding practices may be implicated in food-insecure children's overconsumption of calories. Therefore, when caring for children from food-insecure households nursing staff and other health care providers should devote time to inquiring about child eating and parent feeding practices and inform families about the increased risk for childhood obesity. If time permits, it may also be helpful for nurses to either administer the 6-item U.S. Household Food Security survey to families or ask more broadly about families' access to nutritious foods. For families who communicate difficulties with reliable access to foods it may further be helpful for nurses to provide families with some local resources about food pantries or community social workers and outreach services in their neighborhoods that help to fight hunger.

Acknowledgments

Financial Support: This research was funded by NIH grant # R03DK091492.

Acknowledgement: We acknowledge the contributions of the staff and students at the Center for Weight and Eating Disorders at the University of Pennsylvania who assisted with this study. The authors' responsibilities were: TVEK: study design, data collection, statistical analysis, interpretation of results, manuscript writing; and JC/RHM: statistical analysis, interpretation of results, critical revision of manuscript. The authors have no competing interests.

Abbreviations

BMI	body mass index
PFSQ	Parent Feeding Style Questionnaire
CFQ	Child Feeding Questionnaire

EAH eating in the absence of hunger**References**

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Figure 1.

Maternal (N = 50) and child (N = 50) weight status by food security status.

Table 1

Demographic and anthropometric characteristics of mothers and children by food security status

Variables	Food Insecure N = 13	Food Secure N = 37	p-Value ^I
Mothers			
Age (years), $M \pm SD$	40.9 $\pm$ 4.7	39.5 $\pm$ 7.1	.53
Race, n (%)			
Asian	0	1 (2.7)	
African American	11 (84.6)	23 (62.2)	
Caucasian	1 (7.7)	12 (32.4)	
Multiracial	1 (7.7)	0	
Unknown	0	1 (2.7)	.08
Ethnicity, n (%)			
Hispanic	1 (7.7)	1 (2.7)	
Non-Hispanic	10 (76.9)	33 (89.2)	
Unknown	2 (15.4)	3 (8.1)	.27
Marital Status, n (%)			
Single	8 (61.5)	19 (51.4)	
Married	3 (23.1)	11 (29.7)	
Divorced, separated, or widowed	2 (15.4)	7 (18.9)	.95
College degree or above (n (%) yes) ^I	8 (61.5)	18 (48.6)	.60
Household income ² , n (%)			
< \$25,000	4 (33.3)	15 (40.5)	
\$25,000 – \$50,000	7 (58.3)	5 (13.5)	
> \$50,000	1 (8.3)	17 (45.9)	.02*
Height (cm), $M \pm SD$	1.64 $\pm$.1	1.66 $\pm$.1	.29
Weight (kg), $M \pm SD$	89.5 $\pm$ 20.8	83.2 $\pm$ 16.5	.27
BMI (kg/m ²), $M \pm SD$	33.4 $\pm$ 7.4	30.2 $\pm$ 6.1	.13
Weight Status, n (%)			
Underweight/Normal-weight	1 (7.7)	6 (16.2)	
Overweight	4 (30.8)	13 (35.1)	
Obese	8 (61.5)	18 (48.6)	.65
Children			
Age (years), $M \pm SD$	9.8 $\pm$.8	9.5 $\pm$.8	.38
Sex (male/female), n (%)	5 (38.5)/8 (61.5)	19 (51.4)/18 (48.6)	.42

Variables	Food Insecure N = 13	Food Secure N = 37	<i>p</i> -Value ^I
Race, <i>n</i> (%)			
African American	11 (84.6)	23 (62.2)	.05
Caucasian	0	11 (29.7)	
Multiracial	2 (15.4)	3 (8.1)	
Ethnicity, <i>n</i> (%)			
Hispanic	2 (15.4)	2 (5.4)	.19
Non-Hispanic	9 (69.2)	32 (86.5)	
Unknown	2 (15.4)	3 (8.1)	
Height (cm), <i>M</i> ± <i>SD</i>	145.3 ± 9.7	139.3 ± 8.1	.04 [*]
Weight (kg), <i>M</i> ± <i>SD</i>	49.1 ± 12.8	39.2 ± 11.6	.01 [*]
BMI-for-age percentile ³ , <i>M</i> ± <i>SD</i>	84.7 ± 27.6	67.2 ± 31.9	.18
BMI z-score, <i>M</i> ± <i>SD</i>	1.47 ± 1.08	0.76 ± 1.24	.07

Note: M, mean; SD, standard deviation

¹Univariate independent two sample t-tests for normally distributed continuous variables, nonparametric Wilcoxon Rank-Sum tests for non-normally distributed variables, and Chi-Square or nonparametric Fisher's Exact tests for categorical variables.

²Missing degree information for 3 mothers; missing income information for one mother

³Nonparametric Wilcoxon Rank-Sum test

^{*}Significant at *p* < .050

Table 2

Maternal feeding practices and child eating and meal patterns by food security status

Variables	Food Insecure N = 13	Food Secure N = 37	p-Value ¹
Child Meal and Snack Patterns			
# meals consumed (per day), <i>n</i> (%)			
2 meals	0	2 (5.4)	
3 meals	11 (84.6)	32 (86.5)	
4 meals	2 (15.4)	3 (8.1)	.78
# snacks consumed (per day), <i>n</i> (%)			
1–2 snacks	9 (69.2)	20 (54.1)	
3–4 snacks	2 (15.4)	17 (45.9)	
5 snacks	2 (15.4)	0	.02 *
Instructed to clean plate, <i>n</i> (%)			
Never	7 (53.8)	15 (40.5)	
Sometimes	3 (23.1)	13 (35.1)	
Often/Always	3 (23.1)	9 (24.3)	.72
Maternal Feeding Practices: Parent Feeding Style Questionnaire (PFSQ)			
Instrumental feeding ² , <i>M ± SD</i>	1.5 ± .7	1.4 ± .6	.92
Control, <i>M ± SD</i>	3.9 ± .6	3.8 ± .5	.68
Emotional feeding ² , <i>M ± SD</i>	1.4 ± .5	1.4 ± .4	.96
Encouragement, <i>M ± SD</i>	3.7 ± .7	3.4 ± .6	.18
Maternal Feeding Practices: Child Feeding Questionnaire (CFQ)			
Concern about child weight ² , <i>M ± SD</i>	3.5 ± 1.5	2.5 ± 1.6	.03 *
Restriction, <i>M ± SD</i>	3.7 ± .6	3.1 ± 1.0	.01 *
Pressure, <i>M ± SD</i>	2.4 ± 1.1	2.7 ± 1.2	.54
Monitoring, <i>M ± SD</i>	4.2 ± .6	3.8 ± .9	.23
Parent Report of Child Eating in the Absence of Hunger Questionnaire (EAH-PC)			
<u>Eating Past Satiation:</u>			
Negative Affect ² , <i>M ± SD</i>	1.3 ± .6	1.2 ± .5	.96
Fatigue/Boredom ² , <i>M ± SD</i>	1.9 ± 1.0	1.5 ± .7	.14
External Eating, <i>M ± SD</i>	3.0 ± .9	2.3 ± .9	.03 *

Variables	Food Insecure N = 13	Food Secure N = 37	<i>p</i> -Value ¹
<u>Eating in Absence of Hunger:</u>			
Negative Affect ² , <i>M</i> ± <i>SD</i>	1.3 ± .6	1.1 ± .4	.73
Fatigue/Boredom ² , <i>M</i> ± <i>SD</i>	1.7 ± .8	1.5 ± .8	.20
External Eating, <i>M</i> ± <i>SD</i>	3.5 ± 1.0	2.6 ± 1.1	.01 *

Note: M, mean; SD, standard deviation

¹Univariate independent two sample t-tests for normally distributed continuous variables, nonparametric Wilcoxon Rank-Sum tests for non-normally distributed variables, and Chi-Square or nonparametric Fisher's Exact tests for categorical variables

²Nonparametric Wilcoxon Rank-Sum test

* Significant at $p < .050$