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Food Security Status & Overweight/Obesity among 2-to 5-year old Boys and Girls in a Community-Based Clinic

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Abstract

The purpose of this study was to examine relationships between food security, parental health behaviors, and overweight/obesity among 2- to 5-year-old children in West Tennessee ($N = 264$).

Results from logistic regression models indicate that the association between parental characteristics and child weight status vary by child sex and household food security. These findings highlight the need for more nuanced analysis that can produce results that inform and shape the development of precise health promotion and intervention strategies designed for diverse low-resource populations.

Keywords

food insecurity; childhood obesity; health disparities; race; sex

INTRODUCTION

Excess weight among preschool-age children in the United States is a significant population health concern. Overweight/obesity during childhood can have a profound effect on health over the life course,^{1–4} with studies providing evidence that obese children and adolescents are five times as likely to be obese adults than their peers who are not obese.⁵ Moreover, childhood obesity significantly increases a child's risk of developing chronic diseases, such

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as hypertension and diabetes mellitus in the short term and cardiovascular disease in the long term.^{5,6} Overweight/obesity and its sequelae are not equally distributed across populations in the United States, and the impact of excess weight on the health prospects of marginalized children is particularly acute.

Evidence has shown that weight-related health outcomes in children can be influenced by parental and/or caregiver characteristics as well as diet-related practices and preferences.^{7–10} Yet, results have been mixed with some studies reporting that a child's eating patterns are moderately influenced by parental dietary remodeling^{11–13} and others documenting a weak relationship between parental and child dietary choices.^{14,15} A key finding in this line of research is that the relationship between a parent and child's dietary patterns, as it relates to weight-related outcomes, tends to vary by race/ethnicity and socioeconomic status (SES).

Food insecurity has become a salient factor in weight-related research in recent years. It is defined as “a household-level economic and social condition of limited or uncertain access to adequate food”¹⁶ and may interact with child weight-related outcomes. Patterns of disparities in childhood food insecurity are strikingly similar to those associated with childhood obesity, wherein low-income, racial/ethnic minority families are most at risk.^{17,18} Food insecurity may be a key part of obesogenic contexts thought to increase the risk of accelerated overweight/obesity in very young children, particularly African Americans.^{19–21} Yet, evidence linking food security and overweight/obesity among preschool-age children is inconclusive as results have varied based on sex and parental factors. For example, some researchers suggest there is a negative relationship between food insecurity and overweight/obesity among girls and not boys.^{22,23} Other studies, however, have shown no association between food insecurity and overweight/obesity in children.^{24,25} This study expands current research by analyzing data from community-based primary care clinics in West Tennessee and examines the relationship among household food security, parental concerns about a child's weight, parental fruit and vegetable preferences, and overweight/obesity in 2- to 5-year-old children.

METHODS

The study population for this analysis was drawn from a large surveillance sample of low-income parents and children attending community-based, primary care clinics in Memphis, Tennessee, during 2006 – 2007. Participants were recruited and screened in clinic waiting rooms by research staff. Interested parents meeting eligibility requirements were provided additional information about the study and completed an informed consent form. This study was approved by a blinded university institutional review board.

After providing informed consent, participants' height and weight were measured. Parents completed a self-administered survey with measures on household characteristics, food insecurity, weight-related perceptions, and overweight/obesity-related behaviors, including diet and physical activity and self-efficacy associated with making healthy food choices. The food insecurity questions were drawn from the USDA Household Food Security Survey Module,²⁶ and health behavior questions were drawn from the Behavioral Risk Factor Surveillance System (BRFSS) Questionnaire.²⁷

Outcome Variable

Weight status was a two-category (normal weight and overweight/obese) variable based on body mass index (BMI) cut points specified by the Childhood Obesity Working Group of the International Obesity Taskforce.²⁸ Participants' height and weight were used to calculate BMI and were collected using a Shorr Height Measuring Board and a Seca 770 Model scale, respectively. Two measurements were taken to ensure accuracy. If there was a discrepancy, the average of the two measurements was recorded. BMI for this study was derived by transforming crude data to z-scores using the lambda-mu-sigma (LMS) method which allows for the development of smoothed growth using the curves and the efficient calculation of z-scores simultaneously.^{28,29} Z-scores were standardized to the reference population for participants' age and sex according to the 2000 Centers for Disease Control and Prevention Growth Reference in the United States. Overweight/obese classifications had too few responses for comparative analysis across three categories. As such, they were combined to enhance the robustness of regression analysis. Normal weight for children and adolescents aged 2- to 18-years-old was defined as a BMI below the 85th percentile of the CDC growth chart. Children who had BMIs at or above the 85th percentile were classified as overweight/obese.

Independent Variables

Household food security status, the main independent variable, was derived from six items on the U. S. Household Food Security Survey Module.^{30,31} Food insecure households were defined as those headed by parents who had affirmative responses to at least two of the items. Food insecure household were coded "1" and secure households were coded "0."

Other parental variables were included in the analysis. Parental concerns about a child being overweight were derived from the parent's response to a single item: "How concerned are you about your child becoming overweight?" Responses to this question were "not at all," "somewhat concerned," and "very concerned." The responses to the "somewhat concerned" and "very concerned" categories were small and combined into a single category. The result was a dichotomous variable with "concerned" responses being coded "1" and "not at all" responses being coded "0." The physical activity variable for this analysis was a dichotomous variable indicating whether participants met the national recommendations for exercise. This variable was derived from responses to three questions asking the number of days over the past week that respondents participated in the following: vigorous physical activity for at least 20 minutes, moderate physical activity for 30 minutes, and/or strength training. The *Physical Activity Guidelines for Americans*³² was used as a guideline, and respondents who engaged in 20 minutes of vigorous activity for at least 4 days per week or 30 minutes of moderate intensity exercise for at least 5 days per week and had two or more days of strength training on a weekly basis were coded "1"; all others were coded "0." A fruit and vegetable preference score was derived from 45 items, and parents were asked whether they consumed fruits and vegetables. The response categories were "yes" coded "1" or "no" coded "0." The fruit and vegetable preference score was the sum of "yes" responses. Higher values were indicative of a greater preference for fruits and vegetables.

Child sex and race were demographic measures included in the analysis. The sex variable was a dichotomous measure in which male children were coded “0” and female children were coded “1.” The child’s race was derived from an item asking parents to identify their child as white/Caucasian, black/African American, Hispanic, Asian/Pacific Islander, or other. The racial variable for this analysis was a dichotomous variable in which African Americans were coded “1” and all other groups were coded “0.”

Analytic Strategy

Study population characteristics were described overall by child sex and household food security status using the mean and standard deviation for continuous variables and proportions for categorical variables. Students’ t-tests and Chi-square tests were used to examine differences among continuous variables and categorical variables, respectively, by child sex and household food security status. Logistic regression models were specified to examine the association between household food security status and overweight/obesity among preschool-age children. Because there are known overweight/obesity differences between males and females⁵ and a known paradox between food insecurity and overweight/obesity,¹⁹ these analyses were stratified by child sex and household food security status. P-values less than 0.05 were considered statistically significant. All statistical analyses were conducted with Stata SE, version 15.

RESULTS

Sample characteristics for the 264 parents and children based on child sex and household food security status are presented in Table 1. The majority of children in the sample were African American (83.3%), and the sample was almost equally distributed between males (48.1%) and females (51.9%). Nearly one-quarter of the children in the sample (23.3%) were classified as overweight/obese, and 28.4% of parents in the sample were concerned about their child being overweight. Most parents (59.1%) reported that they met physical activity guidelines, and the average fruit and vegetable preference score was 16.1. Over 4 out of every 10 households (42.1%) experienced food insecurity.

When examining differences in the child and parent’s characteristics by child sex, no differences were observed. With respect to the differences between the child and parent’s characteristics by household food security status, there was a larger proportion of parents in food insecure households who were concerned about their child being overweight or obese (35% v. 23.5%; $p = 0.04$) relative to parents in food secure households. Parents in food secure households also had, on average, higher fruit and vegetable preference scores (17.0 vs. 15.0; $p = 0.01$) than those experiencing food insecurity.

The independent association between child overweight/obesity and child and parental characteristics for the total sample by child sex and household food security status is presented in Table 2. Results in the full model indicated that parents who had concerns about their children being overweight or obese were twice as likely to have an overweight/obese child than those did not have these concerns. This model also indicated parental fruit and vegetable preferences have a modest inverse relationship to child overweight and obesity (OR = 0.93, 95% CI = 0.89–0.98).

The models in Table 2 also highlight sex-specific patterning of relationships. Parents who were concerned about their children being overweight or obese were over three times (OR = 3.41, 95% CI = 1.42–8.41) as likely to have a daughter who was overweight or obese relative to parents who were not concerned about their children being overweight or obese. Also, every unit increase in parental fruit and vegetable preference was associated with a slight decrease in the odds of a child being overweight or obese (OR = 0.91, CI = 0.85–0.98). Among males, African Americans had a lower incidence of overweight or obesity (OR = 0.34, CI = 0.12–0.93) relative to male peers of other races in the sample.

Table 2 also presents evidence that factors associated with a child being overweight or obesity can vary by household food security status. Parents' concerns about their child being overweight/obese was the only variable with statistically significant results in the food secure model. Parents in food secure households who had concerns about their child's weight status were more than twice as likely to have an overweight or obese preschool-age child than parents without such concerns. The food insecure model also produced one significant finding: fruit and vegetable preference among parents in food insecure households was inversely related to weight status among preschoolers. Each point increase in a parental fruit and vegetable preference score was associated with a decrease in the likelihood the child would be overweight or obese (OR = 0.87, CI = 0.79–0.95).

DISCUSSION

In this study, the researchers examined the association among household food security, parental concerns about their child's weight, parental fruit and vegetable preferences, and overweight/obesity in 2- to 5- year old children. Significant relationships were found between household and parent characteristics and child overweight/obesity. The patterns of these associations varied by child sex and household food security status. These findings suggest that those who design weight reduction and weight gain prevention programs for preschool-age children should consider how social and household factors interact to influence pediatric obesity risks. Food insecure parents in this study had significantly lower fruit and vegetable preference scores compared to parents in food secure households. These findings are consistent with an earlier study by Cunningham and colleagues' that found food insecurity is associated with lower fruit and vegetable consumption.³³ Parental modeling of healthy dietary practices is a critical determinant of a child's eating behaviors.³⁴ However, the findings of this current study suggest parents in food insecure households may have a limited ability to model positive eating behaviors relative to more affluent parents who have more access to healthy foods and a greater capacity to purchase, prepare, and integrate them into daily eating behaviors.^{35,36}

Additionally, food insecure parents with concerns about their child being overweight/ obese were more likely to have an overweight/obese child. This finding contrasts with previous research indicating an incongruence between actual health behaviors performed and low resource parents' concern about their preschool-age child's weight.^{37,38} Interventions recommending the maintenance of a healthy diet seems practical; however, food insecure families in this study may have a heightened concern about their child's weight because of a

limited ability to purchase healthier food options and pronounced availability of inexpensive, calorie-dense foods.

This study also produced findings depicting notable race and sex differences. African American parents reported greater food insecurity and parental concerns about weight despite having higher fruit and vegetable preference scores that may be indicative of resilience or protective factors. Research focusing on individual- or family-based assets could be a fruitful line of inquiry as results could be used to tailor interventions that incorporate strengths of a given population. Parents of female children reported greater parental concerns about weight and significantly lower fruit and vegetable preference scores. Parental concern for their female child's weight was also correlated with an increased likelihood of their child being overweight/ obese. The sex-specific pattern of results is consistent with other studies^{25, 39, 40} and may be indicative of the influence of gender on parent-child perceptions and interaction. Studies examining the impact of gender on parental perceptions could be useful in the effort to address early accelerated weight gain among young African American girls, a population with disproportionate risks for overweight, obesity, and related sequelae.

Limitations

The current study has notable limitations. First, causality cannot be examined due to a cross-sectional study design. Second, data were obtained using convenience sample of parents and children attending community-based primary care clinics. As such, results are not generalizable to participants who receive care from other types of providers and live in other regions of the country.¹⁷ Lastly, data were self-reported; thus, social desirability, may have affected the extent to which parents reported food-related behaviors in the home.⁴¹ Despite these limitations, this study also has significant strengths. Forty-two percent of the participants were food insecure, which highlights the continued need to examine and address food insecurity. This study also demonstrates, in food insecure households, parental fruit and vegetable preferences can negatively influence a child's likelihood of being overweight/ obese; however, more research is warranted. Notwithstanding the limitations of this study, the findings lend insight into the complex relationship between household food insecurity and preschool obesity and pave the way for future studies utilizing additional variables and larger sample sizes.

CONCLUSION

Health and well-being are critical across the life course. Adequate nutrition in early childhood is essential to growth and development as well as to establishing healthy eating habits. These findings provide insight regarding the relationship between household food insecurity and overweight/obesity in 2- to 5-year old children. Socioeconomic stressors within the household can adversely affect dietary and physical behaviors of preschoolers, primarily through influence on parental practices. Therefore, educational and nutritional interventions designed for 2- to 5-year-old children and their parents should target innovative ways to promote fruit and vegetable consumption, such as teaching palatable, yet healthy, fruit and vegetable preparation methods. Furthermore, research extending from this work

may lead to the development of health promotion and intervention strategies that target parents and their preschool-age children and address social determinants of health.

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Distribution of Sample Characteristics of 264 Preschool Children and Low-income Parents for the Total Sample, by Child's Sex and Household Food Security

Table 1.

	Total Sample	Child Sex		Household Food Security		<i>p</i>
		Female (N=137)	Male (N=127)	Secure (N=153)	Insecure (N=111)	
Child Characteristics						
Male (%)	48.1			45.8	51.4	.37
African American (%)	83.3	84.7	81.9	83.0	83.8	.87
Overweight/Obesity (%)	23.3	24.4	22.0	22.2	24.8	.62
Parent Characteristics						
Household food insecurity (%)	42.1	39.4	44.9			.37
Concerned about child being overweight (%)	28.4	29.9	26.8	.57	23.5	.04
Meets physical activity guidelines (%)	59.1	58.4	59.8	.81	60.1	.69
Fruit and vegetable preference score (mean ± sd)	16.1±6.4	16.1±6.4	16.2±6.4	.88	17.0±6.1	.01

Note: **Bold values are statistically significant**

Relationship between overweight/obesity among Preschoolers and Weight Concerns among Their Parents in a Community Clinic Sample, by Total Sample, Child Sex, and Household Food Security

Table 2.

Variable	Pooled Model OR (95% CI)	Female OR (95%CI)	Male OR (95%CI)	Food Secure OR (95% CI)	Food Insecure OR (95% CI)
Male	0.89 (0.49 – 1.62)	--	--	0.94 (0.41 – 2.12)	0.87 (0.34 – 2.26)
African American	0.76 (0.35 – 1.65)	2.20 (0.56 – 8.76)	0.34 (0.12 – 0.93)	0.83 (0.29 – 2.41)	0.66 (0.20 – 2.17)
Household food insecurity	0.92 (0.49 – 1.70)	0.84 (0.35 – 2.01)	0.99 (0.40 – 2.48)	--	--
Parent concerned about child overweight/obesity	2.19 (1.16 – 4.15)	3.41 (1.42 – 8.14)	1.12 (0.40 – 3.16)	2.44 (1.00 – 5.92)	1.63 (0.61 – 4.34)
Parent meets physical activity guidelines	0.76 (0.41 – 1.39)	0.86 (0.37 – 2.00)	0.65 (0.26 – 1.63)	0.53 (0.23 – 1.22)	1.30 (0.50 – 3.38)
Parent fruit and vegetable preference score	0.93 (0.89 – 0.98)	0.91 (0.85 – 0.98)	0.95 (0.88 – 1.02)	0.99 (0.92 – 1.05)	0.87 (0.79 – 0.95)

Note: CI, confidence interval; OR, odds ratio; **Bold values statistically significant**