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Food Insecurity Is Associated with Body Dissatisfaction among Children in California

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Abstract

Background—Food insecurity affects 13 million children in the United States. Body dissatisfaction is also prevalent, affecting up to 46% of children. Both food insecurity and body dissatisfaction are associated with poor health outcomes, and both are associated with body weight and racial/ethnic disparities. The association between food insecurity and body dissatisfaction among children has not been examined.

Objective—The purpose of this study was twofold: to examine, in a sample of children in grades 4 through 8, the relationship of child food insecurity with body dissatisfaction and to gain an understanding of the interactive roles of body mass index (BMI), race/ethnicity, and sex in the relationship between food insecurity and body dissatisfaction.

Design—This was a cross-sectional study.

Participants/setting—This study examined data obtained from 14,768 children in grades 4 through 8 from 54 public schools in California between 2014 and 2016.

Main outcome measures—The primary outcome of interest was body dissatisfaction (five items converted to a binary indicator), and the exposure of interest was child-reported food insecurity (three items converted to a binary indicator). Subsets of validated questionnaires were used to assess body dissatisfaction and food insecurity.

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AUTHOR CONTRIBUTIONS

K. A. Madsen and L. D. Ritchie designed the research. E. A. Altman and K. A. Madsen analyzed data. E. A. Altman wrote the first draft with contributions from K. A. Madsen and L. D. Ritchie. All authors reviewed and commented on subsequent drafts of the manuscript.

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

Statistical analyses performed—Data were analyzed using multivariable logistic regression, and effect modification was examined by BMI category (underweight, normal, overweight, obese), race/ethnicity, and sex.

Results—In this large and diverse sample, after adjusting for cofounders, children experiencing food insecurity, in all BMI categories and from all racial/ethnic backgrounds, had higher odds of body dissatisfaction than their food-secure counterparts. The strength of the relationship differed by BMI and race/ethnicity, with the strongest associations observed for African-American children (odds ratio=2.32; $P<0.001$) and children with a normal children (odds ratio=1.76; $P<0.001$).

Conclusions—Experiencing food insecurity was associated with greater body dissatisfaction, with the magnitude of the association modified by BMI and race/ethnicity.

Keywords

Body mass index; Body satisfaction; Ethnicity; Food insecurity; Race

FOOD INSECURITY, DEFINED AS UNCERTAIN OR limited ability to obtain adequate food in socially acceptable ways because of lack of financial resources, affects upwards of 13 million children in the United States.¹ Child food insecurity is associated with numerous poor health outcomes, including increased risk of anemia, cognitive problems, aggression, anxiety, hospitalization, asthma, and poor oral health.² Child food insecurity is also predictive of unhealthy outcomes later in life including long-term developmental issues,³ overall poor mental health,⁴ and unhealthy diet quality.⁵ Body mass index (BMI) is not conclusively associated with child food insecurity, although a growing body of research indicates obesity rates to be higher among food-insecure children, especially older girls,⁶ pointing to a potential link between food insecurity and body weight.⁷⁻¹⁰

Food insecurity differs by race and ethnicity. In the United States, prevalence of child food insecurity is higher among minority populations, with 25% of African-American non-Latino households with children (1.3 million households) and 22% of Latino households with children (1.8 million households) experiencing food insecurity. About 13% of white non-Latino households (3 million households) are food insecure.¹ Food insecurity is associated with a lower socioeconomic position and overall lower expenditures on food, particularly among households with children.¹

As with food insecurity, body dissatisfaction is prevalent in the United States, affecting up to 46% of children.¹¹⁻¹³ Body dissatisfaction—defined as being unhappy with the shape, build, weight, or other characteristics of the body—is associated with poor health outcomes including disordered eating, smoking cigarettes, and taking diet pills.¹³ Body dissatisfaction predicts low self-esteem and depression among early-adolescent girls (13 years of age) and mid-adolescent boys (16 years of age).¹⁴

Latino, Asian-American, Native-American, and white children struggle with body- and weight-related concerns and behaviors more than African-American children.^{12,15} Studies of change in body dissatisfaction from early childhood into adolescence reveal large increases in body dissatisfaction in younger adolescents, boys, and those whose BMI increases over

time.¹⁶ As with food insecurity, body dissatisfaction disproportionately affects children of lower socioeconomic status.¹⁷

Both food insecurity and body dissatisfaction are associated with negative outcomes such as poor mental health, low self-esteem, and depression.^{2,4,14} It is not known whether food insecurity and body dissatisfaction are associated with each other. Studies that examine the association between food insecurity and body dissatisfaction are rare: only one study has been conducted with adults, and no studies have been done with children. Higher prevalence of food insecurity in 298 African-American adults was associated with higher prevalence of body dissatisfaction in unadjusted models; this association disappeared after adjusting for age, education, sex, marital status, employment status, participation in food assistance programs, family and housing arrangements, and income-to-poverty ratio.¹⁸ If food insecurity and body dissatisfaction are related in children, and in combination lead to poor mental health or other negative health outcomes, it will be important to identify subgroups experiencing food insecurity and body dissatisfaction to provide support and early intervention.

The purpose of this study was twofold: to examine, in a sample of children in grades 4 through 8, the relationship of child food insecurity with body dissatisfaction and to gain an understanding of the interactive roles of BMI, race/ethnicity, and sex in the relationship between food insecurity and body dissatisfaction.

METHODS

Study Population and Design

For this investigation, baseline data were collected during the 2014–2015 and 2015–2016 school years (two separate cohorts) from a randomized trial of BMI screening and reporting in 79 California public schools.¹⁹ Only students in the intervention arm of the study in which BMI was assessed were included in the analysis (n=19,046). Of those, 4,278 students with missing data were excluded from analysis. The present study includes baseline data from 14,768 children in grades 4 through 8 from the 54 schools where BMI was assessed at baseline. Schools were recruited from one school district in northern California, one school district in central California, and three school districts in southern California. To be eligible for participation in the study, schools were required to have a specific percentage (15% and 85%) of Latino students enrolled and to have at least 30 students in each grade. All children in grades 4 through 8 were eligible for participation in the study. Parents of eligible students were informed of the study by means of a letter sent home with the students and were given the opportunity to opt out of the study. A total of 94% of students enrolled in the schools participated. Of those enrolled students, 95% completed a survey. This study was approved by the University of California Berkeley's Committee for the Protection of Human Subjects.

Child Food Insecurity

Child food insecurity was measured using three of the five items on awareness in the Child Food Security Assessment, a validated self-report scale developed to assess children's

experiences and perceptions of cognitive, emotional, and physical food insecurity.²⁰ Fram and colleagues²¹ found that children aged 6 years and older are cognitively, emotionally, and physically aware of food insecurity and may take responsibility for managing some of their families' resources. Thus, a novel approach to assessing child food insecurity, by asking children directly about their experiences, was developed and validated.²⁰

In the modified form of the Child Food Security Assessment used in this study, children reported how often they experienced awareness of food insecurity over the past 12 months with response options including “never,” “1 or 2 times,” and “many times.” Items were as follows: “I worry about how hard it is for the adults in my home to get enough food for us” (emotional awareness), “We can't get the food we want because there is not enough money” (cognitive awareness), and “I feel hungry because there is not enough food to eat” (physical awareness). Child food, insecurity was analyzed categorically. Children who reported “never” in response to all three questions were considered to be *food secure*, children who reported “1 or 2 times” for at least one of the items were considered to be *marginally food insecure*, and children who reported “many times” for at least one of the items were considered to be *food insecure*. Using previously collected data on 4,024 fourth- and fifth-grade students in California,⁵ the accuracy of the three-item subset to predict the full five-item scale was examined in a new linear regression analysis for the present study. The three- and five-item scales were highly correlated ($r=0.94$), and the standard deviation of the residuals from the linear regression was 0.82 on the 15-point scale, evidence of the accuracy of the three-item subset.

Body Dissatisfaction

Body dissatisfaction was measured using a modified form of the Body Shape Satisfaction Scale, a validated scale commonly used in studies of children.^{11,13,16} Five items assessed satisfaction with height, weight, body shape, body build, and health using a Likert scale, with scores ranging from “very unhappy” (1) to “very happy” (5). Children who averaged a score of 4 or higher on all five items (ie, on average, they reported being “happy” or “very happy” with the dimensions of the Body Shape Satisfaction Scale) were considered to have body satisfaction, and all others were considered to have body dissatisfaction. The cutoff score of 4 was based on results of a previous study in which the modified Body Shape Satisfaction Scale was used with adolescents in the United States.¹¹

Covariates

School staff assessed BMI among participating students in the intervention arm of the study between February and April in 2015 and 2016. As part of the study, all school staff charged with conducting height and weight assessments were asked to register for and attest to having watched a training video. Schools received research-grade stadiometers (ShorrBoard Infant/Child/Adult Measuring Board, Weigh and Measure, LLC) and scales (Tanita BWB 800S Digital Scale, Weigh and Measure, LLC). The measured heights and weights were converted to BMI-for-age-and-sex percentiles using the Centers for Disease Control and Prevention growth charts,²² with children classified as having a BMI <5th percentile (ie, underweight); normal BMI; BMI 85th percentile and <95th percentile (ie, overweight); and BMI 95th percentile (ie, obese).

Race/ethnicity data were provided by schools, and categories included Asian, African American, Latino, Other, and White. Students of any race who identified as Hispanic were classified as Latino; all others were considered non-Latino. The “Other” group included students who identified as Native Hawaiian/Pacific Islander, more than one race, not one of the major races otherwise included, or those who declined to state their race/ethnicity.

Data on free/reduced priced school meal (FRPM) eligibility were used as a proxy for socioeconomic status. Imputed FRPM eligibility was used for 5,076 children from schools that did not provide FRPM data, with probability of FRPM eligibility ranging from 0 to 1. Sequential imputation with chained equations was used to impute the missing values in a regression model adjusting for height, weight, age, sex, and race and accounting for clustering by school district.

Statistical Analysis

Multivariable logistic regression, accounting for clustering of students within schools, was used to assess the relationship between food insecurity and body dissatisfaction. The exposure of interest was food insecurity, and the outcome of interest was body satisfaction. Models were adjusted for age and FRPM eligibility and included interaction terms for race/ethnicity, BMI, and sex.

Statistical analyses were performed with Stata 14.2 software using the *logistic* command with the *cluster* option.²³ Odds ratios were generated using the *lincom* command, and effect modification was assessed using the *test* command. Two- and three-way interactions were screened using a *P* value of <0.2.²⁴

RESULTS

On review of preliminary results from the food insecurity/body satisfaction and the food insecurity/BMI models, no significant differences between the marginally food-insecure and food-insecure groups were found. Therefore for all analyses, the marginally food-insecure and food-insecure groups were combined, creating a binary food insecurity variable with students considered either *food secure* or *food insecure*.

Just over half of study participants (56%) reported experiencing food insecurity during the prior year (Table 1). The distribution of food secure to food insecure was generally similar among strata by weight status, race/ethnicity, and sex, although less than half of the white children (45%) reported being food insecure, whereas other racial/ethnic groups had higher percentages of food-insecure children. A total of 6,972 children (47%) were classified as having body dissatisfaction. Children who were classified as Asian, Latino, other, and White had an overall greater prevalence of body dissatisfaction than African-American children.

BMI significantly modified the association ($P<0.01$) between food insecurity and body satisfaction (sex was not a significant effect modifier; $P>0.2$). Although food-insecure children who had a normal BMI and those who were overweight or obese all had significantly higher odds of body dissatisfaction than food-secure children (Table 2), the odds of body dissatisfaction were particularly high among children with normal BMI (odds

ratio=1.76, $P<0.001$). When significant differences were tested among the BMI subgroups, children with a normal BMI had significantly higher odds of body dissatisfaction than children from other BMI categories.

Race/ethnicity was also a significant effect modifier ($P<0.01$) (Table 2). Although food insecurity was significantly associated with body dissatisfaction among children of all racial/ethnic backgrounds, further testing revealed that African-American children had significantly higher odds of body dissatisfaction than all other racial/ethnic groups (odds ratio=2.32, $P<0.001$).

A three-way test of interaction between food insecurity, BMI, and race/ethnicity was not significant because none of the individual terms had a P value less than 0.187 and there was no improvement in the pseudo-likelihood or area under the receiver operating characteristic curve.

DISCUSSION

In this large, racially and ethnically diverse study of children, experiencing food insecurity was associated with body dissatisfaction. The odds of reporting body dissatisfaction when experiencing food insecurity were especially high among children with a normal BMI and African-American children. Given that both food insecurity and body dissatisfaction are separately associated with poor health outcomes,^{2-5,11-14,25} the potential combined impact of both factors among some groups of children is concerning.

Social Comparison Theory, which theorizes that people select a comparison anchor or a type of ideal person against which they compare themselves, may help in determining why different groups of children have different odds of body dissatisfaction.²⁶ Specifically, it is possible that the ideal comparison anchor for food-insecure children may be different than the ideal comparison for food-secure children. The comparison anchor may also vary across BMI category and racial/ethnic groups, particularly given that racial/ethnic differences exist with regard to both food insecurity and body dissatisfaction.^{1,12}

Food-insecure African-American children had significantly higher odds of body dissatisfaction than other race/ethnicity groups. In the United States, African-American children generally have higher prevalence of food insecurity,¹ but lower body dissatisfaction,^{15,27} than children of other racial/ethnic backgrounds.¹² This juxtaposition of food insecurity and body dissatisfaction is not fully reflected in these findings. Food-insecure African-American children may compare themselves differently than their food-secure African-American peers. African-American children were previously found to choose a larger ideal body image against which to compare themselves, as opposed to children from other racial/ethnic groups.¹⁵

Food insecurity was also significantly associated with body dissatisfaction for white, Asian, and Latino children. In the United States, white, Asian, and Latino children tend to have a higher prevalence of body dissatisfaction compared with African-American children,¹² whereas white and Asian children tend to have a lower prevalence of food insecurity than African-American and Latino children.¹

There is consistent evidence that children with a normal BMI and African-American children have greater body satisfaction than their peers.^{12,15} Contrary to expectations, this study revealed that food insecurity among children with a normal BMI and African-American children was associated with the greatest odds of body dissatisfaction. Conversely, in groups that traditionally have higher body dissatisfaction (including white, Latino, and Asian children),¹² the association between food insecurity and body dissatisfaction, although significant, was of smaller magnitude.

This study demonstrated no difference in the association between food insecurity and body dissatisfaction when marginally food-insecure children were compared with those with greater food insecurity. Previous research measuring household food insecurity has also shown that any experience of food insecurity is detrimental for children.³ Experiencing any food insecurity may make children more aware of body image and cause them to become more conscious of their bodies, perhaps leading to body dissatisfaction, regardless of severity of food insecurity.

The large sample size of almost 15,000 children provided substantial power for stratified analyses. Asking children directly about their experiences is a novel approach to assessing food insecurity. In most studies,¹⁻⁴ child food insecurity is reported by parents. The data used in this study were cross-sectional, however, and thus temporality could not be assessed. Food insecurity was measured using three items from a validated 5-item scale,²⁰ and although the three items accurately differentiated the extent of food insecurity compared with the 5-item scale, using three items may have underestimated the prevalence of children's experience of food insecurity. Because body satisfaction was measured using only five questions from a larger validated questionnaire¹¹ and the validity of the five-item subset has not been assessed, the subset of questions may not accurately reflect body satisfaction in the present study. Lastly, data on several factors that might be related to both food insecurity and body dissatisfaction were not collected and therefore could not be adjusted or tested as mediators (eg, mental health, self-esteem, parental well-being, parental education, and income).

CONCLUSIONS

Experiencing food insecurity was associated with body dissatisfaction, with the magnitude of the association modified by BMI and race/ethnicity. Further studies examining the relationship between child food insecurity and body dissatisfaction that include variables not available in this analysis, such as mental health and self-esteem, are needed to better understand this complex relationship.

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RESEARCH SNAPSHOT

Research Question: Is there an association between child food insecurity and body dissatisfaction, and does this relationship differ by body mass index and racial/ethnic categories?

Key Findings: In this cross-sectional study of 14,768 children in grades 4 through 8 in California, food insecurity was significantly associated with body dissatisfaction for all body mass index categories and racial/ethnic backgrounds.

Characteristics of 14,768 public school children (grades 4 through 8) in California participating in a survey on food insecurity

Table 1.

Characteristics	Total sample (n = 14,768)	Food secure ^d (n = 6,508, 44%)	Food insecure (n = 8,260, 56%)	P value ^b	Body satisfaction (n = 7,796, 53%)	Body dissatisfaction ^c (n = 6,972, 47%)	P value ^b
<i>n (%)</i>							
Body mass index^d							
Underweight	451 (3)	234 (4)	217 (3)	<0.001	249 (3)	202 (3)	<0.001
Normal weight	8,272 (56)	3,771 (57)	4,561 (55)		5,091 (65)	3,181 (46)	
Overweight	2,720 (18)	1,176 (18)	1,554 (19)		1,316 (17)	1,404 (20)	
Obese	3,325 (23)	1,387 (21)	1,938 (23)		1,140 (15)	2,185 (31)	
Race/ethnicity^e							
Asian	2,150 (14)	994 (15)	1,156 (14)	<0.001	967 (12)	1,183 (17)	<0.001
African American	978 (7)	489 (7)	489 (6)		609 (8)	369 (5)	
Latino	8,902 (60)	3,578 (55)	5,324 (64)		4,685 (60)	4,217 (61)	
Other	390 (3)	164 (3)	226 (3)		194 (3)	196 (3)	
White	2,348 (16)	1,283 (20)	1,065 (13)		1,341 (17)	1,007 (14)	
Sex							
Female	7,229 (49)	3,323 (51)	3,906 (47)	<0.001	3,689 (47)	3,540 (51)	<0.001
Male	7,539 (51)	3,185 (49)	4,354 (53)		4,107 (53)	3,432 (49)	
Free/reduced priced meal eligibility^f							
Eligible	10,339 (70)	4,061 (62)	6,278 (76)	<0.001	5,319 (68)	5,020 (72)	<0.001
Not eligible	4,429 (30)	2,447 (38)	1,982 (24)		2,477 (32)	1,952 (28)	
<i>median±SD^g</i>							
Age, y	10.2±1.3	10.5±1.3	10.1±1.2	<0.001	10.1±1.2	10.4±1.3	<0.001
<i>n (%)</i>							
Body satisfaction^c							
Satisfaction	7,796 (53)	3,749 (58)	4,047 (49)				
Dissatisfaction	6,972 (47)	2,759 (42)	4,213 (51)	<0.001			

^aChild food insecurity was measured using three of the five items on child awareness from the Child Food Security Assessment. Children who reported experiencing different aspects of food insecurity over the past year "1 or 2 times" or "many times" were considered food insecure; children who reported "never" experiencing aspects of food insecurity were considered food secure.

^b P values were calculated using the χ^2 tests for categorical variables and t test for the continuous variable for each category.

^c Body satisfaction/dissatisfaction was measured using a modified form of the Body Shape Satisfaction Scale. Five items assessed satisfaction with height, weight, body shape, body build, and health using a Likert scale ranging from “very unhappy” (1) to “very happy” (5). Children who averaged a score of 4 or higher on all five items were considered to have body satisfaction, and all others were considered to have body dissatisfaction.

^d Measured height and weight were converted to body mass index (BMI)—for-age-and-sex percentiles, using the Centers for Disease Control and Prevention growth charts. Underweight=BMI <5th percentile; normal=BMI 5th percentile and <85th percentile; overweight=BMI 85th percentile and <95th percentile; and obese=BMI 95th percentile.

^e Race/ethnicity data were provided by schools, and categories included Asian, African American, Latino, other, and white. The “other” group included students who identified as Native Hawaiian/Pacific Islander, more than one race, not one of the major races otherwise included, or those who declined to state race/ethnicity.

^f Imputed free/reduced priced meal (FRPM) eligibility was used for 5,076 children from schools that did not provide FRPM data.

^g SD=standard deviation.

Table 2.

Odds of body dissatisfaction by food insecurity among 14,768 public school children in California (grades 4 through 8), separately stratified by race/ethnicity and body mass index

	Food secure (n=6,508)	Food insecure ^a (n=8,260)	P value
Stratified by body mass index^b			
Underweight (n=451)	Ref ^c	1.49 (0.97, 2.29)	0.067
Normal weight (n=8,272)	Ref	1.76 (1.59, 1.95)	<0.001
Overweight (n=2,720)	Ref	1.39 (1.19, 1.61)	<0.001
Obese (n=3,325)	Ref	1.30 (1.10, 1.54)	0.002
Stratified by race/ethnicity^d			
Asian (n=2,150)	Ref	1.46 (1.23, 1.74)	<0.001
African American (n=978)	Ref	2.32 (1.80, 3.00)	<0.001
Latino (n=8,902)	Ref	1.47 (1.36, 1.60)	<0.001
Other ^e (n=396)	Ref	1.78 (1.17, 2.71)	0.007
White (n=2,348)	Ref	1.76 (1.52, 2.06)	<0.001

^aValues are expressed as odds ratios with 95% CI in parentheses.

^bFirst model was stratified by body mass index; clustered at the school level; and adjusted for age, race/ethnicity, sex, and free/reduced priced meal eligibility. Interaction *P* value=0.0048.

^cRef=reference.

^dSecond model was stratified by race/ethnicity; clustered at the school level; and adjusted for age, body mass index, sex, and free/reduced priced meal eligibility. Interaction *P* value=0.0021.

^eOther includes Native Hawaiian/Pacific Islander, more than one race, not one of the major races otherwise included, and those who declined to state race/ethnicity.