Research Article

Food- and Health-Related Correlates of Self-Reported Body Mass Index Among Low-Income Mothers of Young Children

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ABSTRACT

Objective: To examine how income-related challenges regarding food and health are associated with variation in self-reported maternal body weight among low-income mothers.

Design: Cross-sectional design.

Setting: Two Northeastern cities. Seven day care centers and a Supplemental Nutrition Assistance Program outreach project.

Participants: Sample of 166 mothers; 67% were overweight or obese, 55% were Hispanic, and 42% reported household food insecurity (HFI).

Main Outcome Measures: Maternal self-reported height and weight to calculate body mass index (BMI). Independent variables were food program participation, supermarket use, 8-item food shopping practices scale, HFI, maternal depressive symptoms, and self-rated health.

Analysis: Hierarchical multiple regression analysis tested relationships between maternal BMI with the independent variables of interest, adjusting for demographic confounds.

Results: Shopping practices to stretch food dollars ($P = .04$), using community food assistance programs ($P < .05$), and HFI ($P < .04$) correlated with heavier maternal BMIs; higher self-rated health corresponded to lower BMIs ($P = .004$).

Conclusions and Implications: Some strategies low-income mothers use to manage food resources are associated with heavier BMIs. Nutrition educators, public health practitioners, and researchers need to collaboratively address the associations between these strategies, food insecurity, poor health, and unhealthy weight.

Key Words: maternal body mass index, food insecurity, low-income, food shopping practices, self-rated health (*J Nutr Educ Behav*. 2015;47:225-233.)

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INTRODUCTION

Obesity rates for US women increase as income levels decrease,[1] which puts low-income women at higher risk for many of the negative health effects of obesity, including type 2 diabetes, cardiovascular disease, and certain cancers.[2] Research has identified some correlates of unhealthy body weight among females in general; however, the path connecting economic disadvantage to female overweight remains unclear.[3] The current study addresses this gap by examining how income-related challenges regarding food and health may be associated with variation in body weight among low-income mothers.

Ensuring an adequate food supply presents a substantial challenge to low-income households, which spend close to one-third of their monthly income on food.[4] One common strategy to increase food supplies is to apply and receive federal food assistance through the Supplemental Nutrition Assistance Program (SNAP) and/or the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Research has investigated the association between SNAP participation and overweight/obesity among women; some studies have reported positive associations[5-7] and others have found no association.[8,9] In contrast, relatively few studies have investigated the association between participation in WIC and maternal weight although WIC benefits influence the amount and quality of food available to mothers.[10] Low-income families also may seek food from community food programs, such as soup kitchens and food banks, as another strategy to

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increase food supplies.[11,12] Research found that food from soup kitchens had poor nutritional content,[13] which could contribute to unhealthy weight.

Access to affordable healthy food presents a challenge for women living in poor neighborhoods because those neighborhoods tend to have fewer supermarkets than more advantaged neighborhoods.[14] Limited supermarket access, typically defined by physical proximity to the nearest supermarket or grocery store,[15] has been associated with overweight and obesity in many[16,17] but not all[15,18] studies. These discordant findings may arise because measures of neighborhood supermarket proximity may not capture actual supermarket access and use.[15]

Low-income families also report using a range of food shopping practices to stretch food resources, such as buying food in bulk and using coupons.[11,19,20] Such food shopping practices to manage food dollars have been associated with greater availability and consumption of important nutrients in households receiving SNAP benefits[20] and could be related to weight among low-income women.

Limited access to sufficient food can lead to food insecurity, especially among low-income households.[21] Food insecurity is defined as uncertain or inadequate access to sufficient and safe nutrition, or limited ability to obtain such nutrition through socially appropriate means.[22] Food insecurity has been associated with increased maternal weight among women overall.[23] Furthermore, food-insecure women with children were found to have higher weight compared with food-insecure women without children.[8] Some researchers hypothesized that the stress associated with food insecurity may function as a pathway to unhealthy eating and weight gain among low-income mothers.[24,25]

Finally, low income has negative associations with health, including higher levels of depression for adult women[26] and poorer physical health.[27] In turn, depression has been positively associated with food insecurity[23,28] and obesity among adult females,[29,30] and poor self-rated health has been identified as a consequence and predictor of excess body weight for white and black women.[31] Because most of these studies analyzed data from nationally representative samples[23,26,29,31] and/or compared mean differences between income groups,[23,27,31] it is unclear whether these health indicators are associated with variation in body mass index (BMI) among low-income women.

The current study sought to address these gaps by examining food- and health-related correlates of weight in an ethnically diverse sample of low-income mothers. First, the study investigated whether participation in food assistance programs (eg, SNAP, WIC, community food programs), supermarket use, food shopping practices, and food insecurity were correlated with maternal weight. Next, the study examined whether self-reported mental and physical health challenges more commonly faced by low-income women were associated with unhealthy body weight.

METHODS

Sample and Procedures

Data for these analyses were derived from a cross-sectional study designed to investigate factors contributing to food insecurity and obesity among low-income 2- to 5-year-old children.[32] The current study included a convenience sample of 166 mothers recruited from 7 preschools serving low-income urban neighborhoods, as well as a SNAP outreach project. Data from the original sample (n = 174) were collected between October, 2009 and May, 2011. For the current study, participants who were missing weight (n = 4) or height (n = 4) data were excluded, resulting in the final sample of 166. *A priori* power analyses demonstrated that a sample size of 150 was sufficient to measure moderately strong regression effects (f^2 = .15) with up to 13 covariates (α = .05, power = 0.90).

Research staff recruited families directly from the 8 sites during peak parent flow times. After obtaining informed consent, bilingual research staff administered the parent self-report measures. These assessments lasted 30–40 minutes. Participants were paid $20 for their study involvement. The Institutional Review Board at the University of Rhode Island approved all procedures.

Constructs and Measures

Participants completed a demographic and health questionnaire and measures assessing the use of food assistance programs, use of supermarkets, food shopping practices, household food security status, depression, and self-rated health. Constructs and measures are described below.

Body mass index. Maternal self-report was used to calculate BMI. Mothers were asked to report their height to the nearest inch and weight to the nearest pound. The following formula[33] was used to calculate BMIs: weight (lb)/[height (in)]^2 × 703. According to the World Health Organization, adult BMIs ≥ 25 and < 30 are considered overweight. A BMI ≥ 30 meets the definition of obese.[34]

Food program participation. Participants completed a modified version of the Current Population Survey Food Security Supplement (FSS).[35] Items from 3 of the 5 FSS modules were adapted for use. A fourth module, the Food Security Core Module (FSCM),[36] was administered in its entirety and is described below. With the exception of the FCSM, all FSS items are individually analyzed. The FSS data have been used to create national estimates of use of federal and community food assistance programs.[35] The current study adapted 2 individual items assessing participation in SNAP and WIC from the 10-item Food Program Participation Module of the FSS that assesses all federal food assistance programs. Participants were asked whether anyone in the household had received WIC (1 = yes; 0 = no) or SNAP (1 = yes; 0 = no) in the past 30 days. Two items assessing participation in community food programs were drawn from the FSS Ways of Coping Module, a 9-item questionnaire that assesses 12-month and 30-day past use of emergency food, use of programs providing food for seniors, use of soup kitchens or shelters, and availability of these resources. Participants were asked about receipt of emergency food from a church, food

pantry, food bank, or community cupboard, and about receipt of meals at a soup kitchen, church, or other community meal site. Both items referred to the previous 30 days. Any receipt of community food was coded as yes (1); no receipt was coded as 0.

Supermarket use. To assess shopping at supermarkets and grocery stores, the researchers adapted 2 items from the 11-item Food Expenditures Module of the FSS, a validated measure of household spending on food.[37] This module includes 3 items that ask whether respondents shopped at certain types of stores (eg, supermarkets or grocery stores, stores other than supermarkets, restaurants), in the past 7 days, followed by *Did you/anyone in your household buy food from any other kind of place last week?* The remaining items ask how many times respondents shopped at those types of stores and how much was spent on food and non-food items. The current researchers adapted the item that allowed respondents to name the store (*Can you tell me all of the places where you or someone in your household bought food during the last week?*) with the follow-up question about times shopped in the past week at each named store. A research assistant coded the supermarket or grocery store status of each response (1 = supermarket; 0 = not a supermarket). The number of times shopped in the past week at each store designated as a supermarket or grocery store was combined to create the variable of number of times shopped at a supermarket. If no supermarket or grocery store was named, number of times shopped at supermarket = 0.

Food shopping practices. As part of a broader study of family food behaviors, a pilot survey of shopping practices to stretch food dollars was administered to 38 mothers of children aged 2–11 years recruited from 2 day care centers and 2 food outreach programs serving low-income neighborhoods in a Northeastern city. A detailed description of the study procedures is reported elsewhere.[32] Based on focus group research with low-income mothers,[11,19] the initial food shopping practices survey asked respondents how frequently they used 3 practices to stretch food dollars: used food coupons, bought food in bulk, and shopped for food at a certain store because of a sale. These items were followed by an open-ended question: *Are there any other strategies you use to help feed your family and save money?* Cognitive interviews with an initial sub-sample of 5 of these mothers indicated that respondents had no difficulty understanding the questions and the 4-point Likert scale response set. Results from the open-ended question identified 4 additional food shopping practices used by these mothers: bought lower-cost food to save money, bought less food of low nutritional value, went to ≥ 2 stores to find cheaper foods, and used a shopping list. Research suggesting that low-income families will buy cheaper energy-dense food over more expensive fruits and vegetables[38] led to the addition of the final item: bought fewer fruits and vegetables to save money.

The final 8-item Food Shopping practices scale asked participants to rate their use of these strategies on a 4-point Likert scale (1= never; 4 = often) in the previous 30 days. These items were summed into a scale that achieved acceptable internal reliability (α = .71). Four respondents were each missing 1 item from this scale, or 12.5% of scale items. Because missing data accounted for < 20% of the scale items, person-means were substituted for the missing items in the scale in the following manner: all available responses were summed and then divided by the number of items answered. The final scale ranged from 1 to 4, with higher scores indicating more frequent use of these shopping strategies. The use of person-mean imputation on scale items has been found to produce acceptable kappas when missing values are low, as was the case here.[39]

Food security status. Parents completed the FSCM,[36] considered the reference standard for measuring household food security in the US.[40] The FSCM consists of 18 items that examine the household's perception of access to sufficient amounts and types of food during the previous 12 months (eg, *We could not afford to eat balanced meals*). The current study also used the standardized Spanish-language version for Spanish-speaking participants, developed and validated with focus groups.[41] Reliability and validity for the 18-item FSCM are high (α = .86–.93).[42] In accordance with standard protocols developed by US Department of Agriculture, households responding with ≤ 2 affirmative responses were classified as food secure; those with 3 or more affirmative responses were classified as food insecure.[36]

Health indicators. Maternal mental health was assessed with the Center for Epidemiologic Studies Depression Scale[43] (CES-D), a 20-item self-report instrument that screens for the presence of depressive symptoms in the previous week. Participants rate each item on a 4-point rating scale, with a maximum score of 60. Higher scores indicate greater levels of depressive symptoms. This brief, widely used screening measure has achieved high internal consistency for both the English (α > .84) and Spanish (α = .90) versions.[44,45] Analysis of CES-D scores indicated acceptable internal reliability (α = .88) in the current sample.

Mothers completed a single-item, self-rated health measure, with 5 response categories ranging from excellent health (5) to poor health (1).[46] This single item measure is the most frequently used health assessment in the US[47] and possesses strong predictive validity for mortality and morbidity.[48]

Covariates. To adjust for other potential biological and sociocultural confounds of maternal weight and income status, the following variables from the demographic and health questionnaire were considered: breastfeeding status (1 = ever breastfed; 0 = never breastfed); number of adults in household; partner/marital status (1 = married or lives with partner; 0 = no partner/spouse); maternal age in years; maternal ethnicity (1 = Hispanic; 0 = non-Hispanic); primary home language (1 = Spanish; 0 = English); maternal education in years; and maternal employment (1 = yes; 0 = no). Monthly household income was collected in 7 increments of $500, ranging from $0–$500 to ≥ $4,000. Because of small cell sizes in 4 categories (n < 20), the original 7 categories were collapsed into 3 categories with roughly equivalent numbers of participants (n > 40)

in each category (< $1,000, $1,001–$1,500, and > $1,500).

Statistical analyses. The researchers analyzed data with SPSS (version 21, IBM, Armonk, NY, 2013). Preliminary analyses tested variables for normality and multi-colinearity. The analyses revealed acceptable correlations among independent variables ($r < .50$)[49] and normal distributions (skew < 1.4).[50] An improbable value was found for the number of times shopped at a supermarket in the past week (9) for a participant who also noted shopping only a few times a month for food. This value was recoded as missing. Bivariate analyses using correlations and *t* tests identified significant ($P < .05$) relationships between the covariates and BMI to include in the multiple regression model.

Next, the authors used hierarchical multiple regression analysis to test the hypothesis that maternal BMI is a function of food program participation, supermarket use, food shopping practices, food security status, and self-reported health indicators. To adjust for other confounds of weight, model 1 entered all sociodemographic covariates identified as significant in the bivariate comparisons. Next, food- and health-related variables were entered using forward stepwise regression to identify significant relationships. The combined contribution of significant food- and health-related variables was assessed by examining the amount of additional model variance explained by model 2 (adjusted multivariate coefficient [R^2] change) and the individual significance level of each variable in the overall model. Acceptable results of the variance inflation factor and colinearity tolerance suggested that the estimated betas were well-established in the regression model. Significance was set at $P < .05$. Missing data were minimal with 1 data point missing for 2 respondents. The regression results were unchanged when the missing data were excluded (n = 164) or the mean was substituted for missing data (n = 166). The latter model is presented. *Post hoc* chi-square analyses with Bonferroni correction examined whether receipt of community food varied by any sociodemographic variable.

RESULTS

Descriptive Analyses

As shown in Table 1, the majority of mothers were single (63%), were of Hispanic ancestry (55%), and earned < $1,500/mo (60%). Overall, 66% of mothers met the World Health Organization definition of overweight or obese.[34] Food insecurity was prevalent (42%) whereas close to one quarter of mothers scored at or above the CES-D depression screening cutoff of 16.[44] Participation in government food assistance programs was high, with 80% reporting receipt of SNAP and/or WIC benefits. In contrast, only 17% received assistance from community food programs. Preliminary analyses identified 2 demographic variables that were significantly associated with maternal BMI. Mothers who primarily spoke Spanish in the home had lower BMIs (mean, 26.9; SD, 5.8) than those who did not (mean, 29.7; SD, 7.8; $t = 4.8$, $P = .03$). Maternal BMI was positively correlated with the number of other adults in the home ($r = .189$; $P < .02$).

Some significant bivariate associations were found among the food- and health-related variables. Mothers in food-insecure households reported more frequent use of food shopping practices to stretch food dollars ($t = –2.48$; $P = .01$) and higher CES-D scores ($t = 2.26$; $P < .02$) than mothers in food-secure households. The CES-D scores were negatively associated with mother's self-rated health ($r = –.299$; $P = .003$) and were higher among mothers receiving SNAP benefits compared with those who did not ($t = 2.41$; $P < .02$).

Multivariate Analyses

Table 2 shows the results of the hierarchical multivariate regression analyses with all significant predictors. Model 1 indicated that demographic variables accounted for 7% of the variance (adjusted $R^2 = .06$), which was significantly different from 0 ($P = .003$). Maternal BMI was positively associated with the number of other adults living in the home ($P = .009$) and negatively associated with Spanish as the primary language in the home ($P < .02$).

The significant food- and health-related variables were added to the regression equation in model 2. Taken together, these variables significantly increased the amount of explained variance in maternal BMI over model 1 ($R^2\Delta = .13$; $F\Delta_{(4, 159)} = 6.48$; $P < .001$). After adjusting for the type of language spoken in the home and the number of adults in the household, 3 variables related to food resources were significantly associated with maternal BMIs. Any use of community food programs ($P < .05$), more frequent use of food shopping practices to stretch food dollars ($P = .04$), and household food insecurity ($P < .04$) had positive associations with BMI for these low-income women. In contrast, participation in WIC or SNAP and the number of weekly shopping trips to supermarkets did not emerge as significant correlates of maternal BMI.

In terms of health indicators, maternal self-rated health ($P = .004$) was significantly associated with BMI such that mothers who reported better health had lower BMIs. Of all of the independent variables, self-rated health had the largest standardized regression coefficient ($\beta = –.211$). Depressive symptoms, as measured by CES-D scores, were not significantly associated with maternal BMI. The final equation accounted for 17% of the variance in BMI.

To assess whether unmeasured constructs related to low-income might explain some of these relationships, the multiple regression analyses were rerun with 2 dummy variables representing the 3 levels of household income (monthly household income < $1,000 vs > $1,500; and monthly household $1,000–$1,500 vs > $1,500). The income variables did not significantly predict BMI scores and none of the other associations changed (not shown). Because only 17% of the sample used a community food program, *post hoc* chi-square analyses with Bonferroni correction examined whether any sociodemographic variables were associated with use of this food source. These analyses revealed that households with monthly incomes < $1,500 were significantly more likely to use community food programs compared with households with incomes > $1,500 (86% vs 14%; $\chi^2 = 8.9$; $P = .003$).

Table 1. Demographics, Food-Related Indicators, Health Indicators, and Self-Reported Weight Characteristics of Low-Income Mothers (n = 166)

Characteristics	Prevalence of Characteristic (% or Mean [SD])	Range
Sociodemographic covariates		
Education < 12th grade	56.1%	
Employed	74.5%	
Monthly household income		
< $1,000	34.9%	
$1,000–$1,500	23.2%	
> $1,500	39.2%	
Missing	0.6%	
Ethnicity		
Hispanic	55.4%	
Black	12.7%	
White	22.3%	
Other	9.0%	
Missing	0.6%	
Marital status		
Single	62.7%	
Married	31.3%	
Divorced	3.6%	
Widowed	1.2%	
Missing	1.2%	
Lives with partner/spouse	42.8%	
Spanish primary language at home	25.3%	
Ever breastfed focal child	62.8%	
Maternal age, y (mean [SD])	30.1 (7.2)	18–55
Maternal education, y (mean [SD])	12.6 (3.1)	3–22
Number of other adults in home, n (mean [SD])	0.9 (0.8)	0–5
Food-related indicators		
Food assistance programs		
Enrolled in Special Supplemental Nutrition Program for Women, Infants, and Children	59.0%	
Enrolled in Supplemental Nutrition Assistance Program	61.4%	
Uses community food programs[a]	16.9%	
Times per week shopped supermarket (mean [SD])	2.1 (1.6)	0–7
Food shopping practices scale (mean [SD])	2.69 (0.6)	1–4
Household food insecurity (≥ 3 yes)	41.6%	
Health indicators		
Center for Epidemiological Studies–Depression Scale scores (mean [SD])	10.9 (8.9)	0–60
Self-rated health (mean [SD])	3.2 (1.0)	1–5
Maternal weight		
BMI (mean [SD])	29.0 (7.4)	17–59
Overweight (30 < BMI ≥ 25)	32.5%	
Obese (BMI ≥ 30)	33.1%	

BMI indicates body mass index.
[a]Community food programs include food banks or pantries and/or soup kitchens.

DISCUSSION

This study identified 3 food-related correlates of maternal BMI. Shopping practices to stretch food resources, such as using coupons, buying in bulk, and shopping for sales, correlated with heavier maternal BMIs, which addressed gaps in previous studies that linked shopping strategies to nutrient availability but not to maternal body weight.[20] At least 1 plausible pathway may explain this relationship. Because poor mothers seek low-cost items that will not spoil,[51] these mothers may be more likely to make bulk or sale purchases of energy-dense, nonperishable foods

Table 2. Hierarchical Multiple Regression Coefficients Predicting Maternal Body Mass Index Among Low-Income Mothers (n = 166)

	Model 1		Model 2	
Predictor	**b[a] (Standard Error)**	**β[b]**	**b[a] (Standard Error)**	**β[b]**
Covariates				
Number of other adults in house	1.77 (0.7)	.201**	1.72 (0.6)	.209**
Speaks Spanish at home	–3.11 (1.3)	–.182*	–2.82 (1.3)	–.172*
Food-related indicators				
Uses community food programs[c]			2.90 (1.4)	.146*
Food shopping practices scale			1.79 (0.9)	.154*
Household food insecurity			2.30 (1.1)	.153*
Health indicators				
Self-rated health			–1.62 (0.6)	–.211**
F change	6.021**		6.483***	
Degrees of freedom	2, 163		6, 159	
Full model adjusted multivariate coefficient	.057**		.169***	

*$P < .05$, **$P < .01$, ***$P \leq .001$.
[a]b = unstandardized regression coefficient; [b]β = beta coefficient (standardized regression coefficient); [c]Community food programs include food banks or pantries and/or soup kitchens. Reference categories are English at home, no participation in community food programs, and household food-secure.

such as soft drinks, cereals, cookies, pasta packages, and potato chips rather than lower-calorie items that are perishable, such as fruits and vegetables. Larger inventories of unhealthy food in the home have been associated with greater consumption of fat,[52] which may lead to unhealthy BMIs.

This study simultaneously examined the associations between maternal body weight and participation in SNAP, WIC, and community food assistance programs. Consistent with research noting poor diets among food pantry participants[53] and the low nutritional value of food provided through community food assistance programs,[13] use of community food resources was positively associated with maternal BMIs in this sample of low-income mothers. Clearly, community food programs provide essential resources to families; however, it is unknown whether reliance on these emergency food sources to meet nutritional needs may be contributing to unhealthy weight among low-income mothers. As noted earlier, only 17% of the sample reported using a community food program. Furthermore, income and use of community food programs were significantly correlated. Thus, unobserved differences related to very low income may account for the association between maternal body weight and use of community food programs.

In contrast, receipt of SNAP or WIC was not associated with maternal body weight. The results regarding SNAP contradict many studies in this area[5,6] but are consistent with the findings of Ver Ploeg and colleagues[9] that BMI differences between SNAP recipients and non-recipients have diminished. The null findings regarding WIC echo those of the national study of Martin and Lippert[8] and add to the limited empirical knowledge regarding the association between participation in WIC and maternal BMI. Because these data are cross-sectional, the effects of earlier or persistent participation in government food assistance programs are not known. Furthermore, the study did not collect data on the amount of SNAP/WIC benefits, an important consideration because some research has associated lower SNAP benefits with heavier BMIs among women.[54]

Rates of weekly shopping at supermarkets were not significantly associated with maternal BMI. Research on the relationship between neighborhood supermarket access and healthier body weight is mixed.[14,15] The current study adds to the literature because it assessed actual weekly use of supermarkets by these mothers, as opposed to supermarket proximity. Importantly, the vast majority of these urban mothers (88%) shopped at a supermarket at least once in the previous week. Although weekly supermarket shopping rates varied among these mothers (mean, 2.1; SD, 1.6), the high use of this food source may explain the null findings.

Consistent with prior research,[8] mothers who reported food insecurity had significantly higher BMIs than those who were food secure. Frongillo and Bernal[24] hypothesized that maternal weight gain may result from stress associated with food insecurity. Stress, such as that stemming from inadequate access to food, leads to increased cortisol secretion, which is associated with greater caloric intake and weight gain.[55] Furthermore, acute stress is believed to alter one's metabolic and stress response system in ways that increase the likelihood of eating unhealthy foods and binge eating when food is available.[26] It also is possible that food-insecure mothers reserve higher-quality household food for their children, resulting in a poorer diet for themselves.

In terms of health indicators, mothers who rated their own health more highly had significantly lower BMIs than mothers who gave lower self-ratings of health. Indeed, this factor emerged as the most significant

individual correlate of maternal BMI for these low-income mothers. Self-rated health has been found to better predict actual health and potential undiagnosed health problems compared with diagnostic tools.[31] Thus, self-rated health is believed to capture bodily perceptions that indicate problematic functioning that cannot be discerned through more standard clinical assessments.[47] However, it remains unclear whether self-rated health predicts or is a consequence of maternal BMI.

Maternal depressive symptoms did not correlate with maternal BMI. These findings are inconsistent with previous studies that documented an association between depression and subsequent increases in BMI.[56,57] However, a recent national study found no association between depression and weight status among Mexican American and black non-Hispanic women, although this relationship was observed among white non-Hispanic women.[58] Because depressed Hispanic women are more likely to report decreased appetite compared with depressed non-Hispanic women,[59] it is possible that the CES-D depression measure, which contained only 1 item assessing appetite, was not sensitive enough to detect this common depressive symptom among Hispanic subjects. In addition, Hispanic subgroups have been found to present depression in the form of physical symptoms or somatic symptoms,[60] which may complicate the detection and diagnosis of depression in this population.

Study strengths include the examination of a variety of strategies and resources to access and manage food supplies, and the use of a low-income sample that included a high portion of Hispanic women (55%), which is an understudied group. However, there were some limitations. First, the sample consisted of urban Northeastern mothers with high rates of employment; thus, the findings may not apply to other low-income populations. Although 80% of families participated in WIC and/or SNAP, selection bias cannot be ruled out because unobserved variables that relate to participation in food assistance programs and maternal weight may exist, such as acculturation status. Maternal BMIs were calculated with self-report data. This methodology is frequently used in studies assessing income and weight,[61,62] but it has been found to produce underestimates of BMI.[63] Self-report was used to assess all constructs of interest and it may inflate the likelihood of identifying significant relationships in the regression analysis. Because the data are cross-sectional with some measures covering different time frames (ie, past week vs past 30 days), the specific direction of effects cannot be determined. *A priori* power analyses indicated that the sample size was adequate to detect moderately strong regression effects; however, the size may have been insufficient to discern less powerful but important relationships. Finally, the predictor variables explained 17% of the variance in maternal BMIs, a significant but relatively low percentage.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The results suggest that the strategies mothers employ to increase and manage food resources, including strategically stretching food dollars and using community food programs, are associated with heavier BMIs. Future research needs to better elucidate the relationships between these strategies and maternal weight. The food shopping practices scale demonstrated acceptable internal reliability and was associated with maternal BMI. Although they are preliminary, these results support validating this scale with other low-income populations. Future studies should collect qualitative data on specific food shopping practices that are associated with weight, to help nutrition educators guide low-income families toward healthy and cost-saving choices. The study results also suggest that greater attention to the use of community food programs is needed. Longitudinal research should examine the frequency, amount, and timing of receipt of food resources to clarify how participation in federal and community food programs might be associated with weight.

Beyond these strategies to increase and manage food resources, household food insecurity was associated with heavier maternal BMIs. Providing nutrition education to SNAP participants has been identified as an effective way to increase food security, especially for households with an employed adult.[64] Research should investigate whether such education also results in healthier weights for low-income mothers experiencing food insecurity. The single-item self-rating of health question had particular salience as a correlate of BMI in this low-income group. Furthermore, low self-rated health has been found to predict decreased physical activity among low-income adults.[65] These findings draw attention to the importance of longitudinal research to identify the direction of the associations among self-rated health, food insecurity, and maternal BMI. From a practice perspective, the study results highlight the need to increase collaboration among nutrition educators, public health practitioners, and researchers to better address the pathways to unhealthy weight among low-income mothers.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.