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Maternal Strategies to Access Food Differ by Food Security Status

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ABSTRACT

Background Household food insecurity is associated with health and behavior risk. Much less is known about how food insecurity is related to strategies that adults use in accessing food: how and where they shop, use of alternative food sources, and their ability to manage resources.

Objective To examine how maternal behaviors, including shopping, accessing alternative sources of food, and managing resources, are related to household food security status (HHFSS).

Design Cross-sectional study collecting survey data on HHFSS, shopping behaviors, use of alternative food sources, and managing resources obtained from low-income mothers of preschool-aged children.

Participants One hundred sixty-four low-income mothers of young children (55% Hispanic) from two communities in Rhode Island.

Measures HHFSS was measured using 10 items from the 18-item Core Food Security Module to assess adult food security. Mothers were surveyed about where, when, and how often they shopped; the strategies they use when shopping; their use of alternative sources of food, including federal, state, and local assistance; and their ability to manage their resources.

Statistical analysis Analysis of variance and χ^2 analyses assessed the associations between demographic variables, shopping, accessing alternative food sources, and managing resources, and HHFSS. Multivariate logistic regression assessed the associations between HHFSS and maternal demographic variables, food shopping, strategies, alternative sources of food, and ability to manage resources.

Results Maternal age and language spoken at home were significantly associated with HHFSS; food insecurity was 10% more likely among older mothers (adjusted odds ratio [aOR] 1.10, 95% CI 1.03 to 1.17) and 2.5 times more likely among Spanish-speaking households (compared with non–Spanish speaking [aOR 3.57, 95% CI 1.25 to 10.18]). Food insecurity was more likely among mothers reporting more informal strategies (aOR 1.98, 95% CI 1.28 to 3.01; $P<0.05$) and perceiving greater inability to manage resources (aOR 1.60, 95% CI 1.30 to 1.98; $P<0.05$).

Conclusions The results suggest that low-income mothers use a variety of strategies to feed their families and that the strategies they use vary by HHFSS. Community nutrition programs and providers will need to consider these strategies when counseling families at risk for food insecurity and provide guidance to minimize the influence on healthy food choices.
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FOOD INSECURITY IS DEFINED AS HAVING LIMITED and/or uncertain availability to enough food for an active and healthy life.[1] Approximately 14% of households in 2014 reported food insecurity, with one-third of those households reporting a more extreme form of food insecurity known as very-low food security.[1] The prevalence of household food insecurity rose steadily from 1998 until 2008, and reached its highest level (14.9%) in 2011.[1] Levels of household food insecurity have remained fairly stable or declined slightly.[1]

Income is highly predictive of food security status. Household food insecurity was reported by 40% of respondents living in households with incomes below the federal poverty level ($19,790 for a household of three in 2014), and by fewer than 7% of those in households with incomes above 185% of the federal poverty level.[1] Food insecurity rates vary significantly by household demographic characteristics (eg, education, income, race, and ethnicity). Compared with the national average of 14%, rates of food insecurity were higher for households headed by single mothers (35%), households with young (<6 years) children (20%), black non-Hispanic households (26%), and Hispanic households (22%).[1]

A wide variety of additional factors (eg, access to grocery stores, transportation, and education) contribute to a

household's ability to purchase adequate and nutritious food. For example, many lower-income households have limited access to healthy food options[2] despite the fact that only a small percentage of households are considered by the US Department of Agriculture (USDA) to live in food deserts (2.3 million, or 2% live more than a mile from a supermarket and do not have access to a vehicle).[3] Cost is another factor influencing a household's ability to purchase adequate and nutritious food. Research has documented wide disparities in the costs of healthy foods by geographic region.[4] Low-income neighborhoods and communities of color not only have fewer grocery stores overall, but stores in these communities also offer fewer healthy food options (eg, fruits and vegetables) and charge higher prices than in middle-income, predominantly white neighborhoods.[2]

Paradoxically, more than half of low-income families do not report food insecurity. Research suggests that further exploration of what happens at a household level in terms of shopping, food access, and management of food resources may shed light on factors that distinguish between food-secure (FS) and food-insecure (FI) households.[5] Key informant interviews and focus groups with low-income heads of households have been the primary research methodology for identifying strategies that poor families use to stretch their food resources.[5,6] Identified strategies include shopping to maximize one's food dollars (eg, frequenting sales or buying in bulk), social network strategies that involve seeking assistance with food from relatives and neighbors, and the use of food assistance programs.[7] For example, Jarrett and colleagues[7] interviewed 12 low-income female caregivers and reported that families with inadequate food supplies were more likely to use social networking strategies and food consumption strategies (eg, eating less and utilizing leftovers) than those with adequate food supplies. Mothers in both groups reported using a variety of shopping strategies to stretch dollars. In contrast, a qualitative study involving interviews with 90 heads of households receiving benefits from the Supplemental Nutrition Assistance Program (SNAP) reported different results.[8] They found that FS households were more likely to use family networks and shop for sales, whereas households with the lowest food security had no network to turn to and were the least likely to shop for sales.[8] Lack of consistency across these qualitative studies, and a lack of any quantitative measurement of frequencies of coping mechanisms, suggest that further examination of these associations is warranted.

The purpose of this study was to examine factors that may help account for differences between FS and FI households within a low-income population. An important question explored in this article is whether or not household-level behaviors that adults use vary as a function of food security status. Specifically, we examine variability in household food security status (HHFSS) in relation to how, when, and where household members shop for food; other sources of assistance or strategies low-income mothers use when trying to feed their family; and mothers' ability to manage household resources.

MATERIALS AND METHODS

Sample and Procedures

This study's data are derived from a broader cross-sectional study examining the associations between family feeding behaviors, maternal depression, and child obesity among low-income households.[9] A sample of more than 200 mothers and their preschool-aged children were recruited between October 2009 and May 2011 from seven day-care centers and at social service agencies that serve low-income populations where SNAP Outreach activities were conducted. All day-care centers targeted low-income families in two urban communities in Rhode Island. The sample used to address the questions herein includes 164 mothers of preschool-aged children.

At each day-care center, flyers in English and Spanish were placed in each child's backpack or mailbox describing the study and informing parents that a research assistant would be inviting parents and their children to participate. Research staff visited during peak hours and approached women when dropping off or picking up their children. In these cases, mothers were asked to participate in a study on the challenges of feeding their children healthy food. After obtaining informed consent in writing, trained bilingual research staff interviewed the mothers, using English or Spanish versions of the survey instrument as appropriate. All procedures were approved by the Institutional Review Board at the University of Rhode Island. The interview took 30 to 40 minutes to complete. Participating mothers were provided with $20 for their study involvement. For purposes of this study, only data from household and maternal sociodemographic variables are included.

Dependent (Outcome) Variable

Household Food Security. The original study assessed each family's food security status using the USDA 18-item Food Security Core Module.[10] The module includes questions about the amount, quality, and ability of the household to access food during the previous 12 months. For purposes of this study, results of the 10 items assessing adult HHFSS were used. HHFSS is classified into three groups based on the USDA standard criteria: FS, which was defined as fewer than three affirmative responses; low food security (LFS), which was defined as three to seven affirmative responses; and very-low food security (VLFS), which was defined as eight or more affirmative responses.[10] Households classified as LFS and VLFS are collectively referred to as FI. Although all FI households are considered to experience inadequate diets due to limited resources, LFS is thought to reflect poor food quality with a diet of inexpensive but energy-rich, nutrient-poor foods, whereas VLFS reflects an inadequate quantity of food or hunger.[11]

Independent (Predictor) Variables

Information on shopping behavior, alternative sources of food access, and management of resources were collected as part of the broader study cited above.[9] A detailed list of all independent variables and their coding are presented in the Figure. A brief description of each is provided below.

Grocery Shopping. Information about the frequency (eg, daily, weekly, or monthly), store location, and the amount of money spent on food at each store was collected. Parents were asked to rate the frequency of their use of shopping strategies during the past 30 days on a 5-point scale (0=never to 4=often). Types of stores and shopping

Grocery shopping

- Major food shopping frequency (daily, weekly, monthly)
- Shopping frequency at different stores during past week
- Store types (n=1-5): Supermarket, convenience store, corner store/neighborhood market, specialty store, superstore or discount store
- Strategies used during past 30 d (n=0-8): Includes using coupons, buying in bulk, taking advantage of sales, purchasing lower cost foods, buying fewer vegetables or fruits, purchasing less junk food, shopping at multiple stores, using a shopping list

Alternative food sources

- Federal Nutrition Assistance Program Participation during the past 30 d (yes=1, no=0)
  - Supplemental Nutrition Assistance Program
  - Special Supplemental Nutrition Program for Women, Infants, and Children
  - National School Lunch Program and School Breakfast Program
- Community Food Program Participation over the past 30 d (yes=1, no=0)
  - Pantry program
  - Soup kitchen
  - Senior meal site
- Informal sources of food, frequency over past 30 d (never=1, often=4)
  - Pooling resources to create a shared meal
  - Borrowing food
  - Exchanging or trading foods
  - Store credit to purchase food
- Total number of informal strategies used (range=0-4)
- Restaurant (Fast food and/or Full Service) visits during past week

Perceived ability to manage resources

- Strongly agree=1 and Strongly disagree=5; higher scores indicate lower ability (range=4-20)
  - Sticking to a budget
  - Cooking balanced meals
  - Managing household bills
  - Making money last throughout the month

Figure. Independent variable descriptions of maternal strategies used to access food used to predict food security status in low-income families from two urban Rhode Island communities.

strategies are listed in the Figure. A composite variable representing the total number of strategies used was calculated as the sum of the number of strategies that subjects reported they ever used (ie, rarely, sometimes, or often), with higher scores indicating a greater number of shopping strategies used. The internal consistency of this scale as calculated using Cronbach's α on this analytic sample was acceptable (α=.71).

Alternative Sources of Food. A detailed list of alternative sources of food is presented in the Figure. Participants reported on their use of alternative sources of food during the past 30 days, including participation in federal nutrition assistance programs and community food programs. Two questions assessed frequency of eating at a fast-food restaurant and/or a full-service restaurant during the past week. Questions to assess these different food sources came from a variety of measures, including modules from the Current Population Survey Food Security Supplement[12] and project-developed items based on the work of Kempson and colleagues.[13-15]

Informal sources of food acquisition (eg, borrowing or trading) were assessed by asking participants to rate the frequency of their use on a 4-point Likert scale (1=never to 4=often). Higher scores on each item indicated more frequent use. A composite variable representing the total number of informal sources used, was calculated as the sum of the number of sources that subjects reported they ever used, with higher scores indicating a greater number of different sources used. Internal consistency of the composite as measured by Cronbach's α for the composite was moderate (α=.53). Individual items and the sum score were examined in the analyses.

Maternal Ability to Manage Household Resources. A 4-item project-constructed scale assessed mothers' perceptions of their ability to keep within a family budget. Items were developed based on research with low-income families experiencing difficulties managing their resources.[16] Parents rated their ability on a 5-point Likert scale (1=strongly agree to 5=strongly disagree). The items (see the Figure) were

summed to create a measure of perceived ability to manage family resources, which achieved an acceptable internal consistency (Cronbach's α=.69). Higher scores indicated higher levels of perceived inability.

Covariates

Participants provided data on household demographic characteristics, including household size, partner/marital status (married or lives with partner/no partner or spouse), maternal age, maternal race or ethnicity (black, non-Hispanic white), language spoken in the home (Spanish only, English, or both Spanish and English), years mother attended school, and maternal employment (yes/no). Data on monthly income, collected in $500 increments, was included for those above and below $1,500 because this amount was the closest to the median split and most closely approximated the federal poverty level for a household of three at the time of data collection ($1,627 per month).[17] Participants were asked about their receipt (yes/no) of any type of assistance program, including Social Security income, subsidized child care, heating assistance, cash assistance (eg, Temporary Assistance to Needy Families), and health care (eg, Medicaid and the State Children's Health Insurance Program).

Statistical Analysis

Preliminary analyses assessed variables for normality, completeness of data, and collinearity. Means, standard deviations, and frequencies were examined, composite scores were calculated, and reliabilities were established. Bivariate associations between food security status and the following continuous variables were examined using analysis of variance (ANOVA) followed by post hoc test with Duncan's test of mean values: demographic variables (eg, maternal age and education, household size, and number of children) and independent variables (eg, shopping, use of other food sources, and ability to manage resources). Bivariate associations between HHFSS and the categorical demographic (eg, marital status, race or ethnicity, language spoken, and household monthly income) and independent variables (eg, shopping frequency) used χ^2 analysis. Bivariate analyses were examined using both two levels of food security (FS and FI) and three levels (FS, LFS, and VLFS) and are reported for the three levels, except where results differ between the two specifications.

Multivariate logistic regression was used to predict food security status using the independent variables adjusting for demographic variables (as covariates). Only those that were significantly associated with HHFSS in the bivariate analyses were included in the multivariate analysis. Only participants with complete data on all variables were included (n=152) in the multivariate analysis. Given limited sample size, multivariate analyses were conducted using the two levels of food security status only.

RESULTS

Sample Description

On average, mothers in the sample (n=164) were 30 years old, and had completed 12 years of education (Table 1). Households were generally small, averaging four people, including two children. More than half of participants were Hispanic and the majority of participants reported speaking English or both English and Spanish. Twenty-one percent reported speaking only Spanish. More than half (56.7%) of households were classified as FS, and the remaining (43.3%) were classified as FI. Twenty-nine percent had LFS, and 14.1% had VLFS. Two-thirds of mothers were employed, with more than 60% of households reporting <$1,500 per month in income (data not shown). Almost all participants (96%) reported receiving at least some form of assistance, including nutrition or heating assistance, subsidized early childhood education and care, health care, Supplemental Security Income, and/or cash assistance.

Table 1. Participant characteristics of low-income mothers from two urban Rhode Island communities (N=164) in a study to examine how maternal strategies to access food are related to household food security status

Demographic characteristic	Result		
	n (%)	*mean±standard deviation*	*Range*
Maternal age (y)		30.1±7.2	18-55
Household size		4.0±1.4	2-9
Children		2.2±1.6	1-6
Maternal education (y)		12.6±3.3	0-22[a]
Language spoken			
English	120 (73)		
English and Spanish	6 (4)		
Spanish only	35 (21)		
Other	3 (2)[b]		
Marital status			
Single	95 (58)		
Married/partnered	69 (42)		
Maternal race or ethnicity			
Hispanic	90 (55)		
White, Non-Hispanic	21 (13)		
Black, Non-Hispanic	38 (23)		
Other	14 (9)[c]		
Household food security status			
Food secure	93 (57)		
Low food security	49 (29)		
Very low food security	22 (13)		
Household monthly income			
≤$1,500	99 (61)		
>$1,500	65 (39)		

[a]One mother reported no schooling.
[b]Cambodian, Yorube, and not specified.
[c]Included multiracial, Asian Pacific Islander, Native Americans, and not specified.

In terms of shopping patterns, almost all participants (88%) shopped at least once at a supermarket during the prior week, and 30% shopped at discount stores (Table 2). Far fewer shopped for groceries at corner stores (15%), specialty stores (12%), or convenience stores (10%). Individuals varied widely in how often they reported doing their major food shopping, ranging from daily (2%) to monthly (34%), and the amount of money spent on food varied widely (range=$0 to $550 during past week). When asked about strategies they used (eg, coupons, buying in bulk, shopping at multiple stores, and using a shopping list), the top five most common were purchasing lower-cost foods (83%), taking advantage of sales/discount offers (74%), purchasing less junk food (73%), shopping at multiple stores (65%), and buying in bulk (63%). The least common strategy was reducing their purchases of fruits and vegetables (31%). Mothers reported using an average of six (5.83±1.94) of the eight strategies at least some of the time when they shopped (data not shown).

Table 2. Shopping locations and strategies used among low-income families from two urban Rhode Island communities (N=164) in a study to examine how maternal strategies to access food are related to household food security status

	n (%)	*mean±standard deviation*
Past week typical shopping locations	**Shoppers at each location[a]**	**Times per week**
Supermarket	144 (88)	2.14±1.67
Warehouse/discount	50 (31)	0.44±0.81
Corner store/market	24 (15)	0.38±1.37
Specialty shop	19 (12)	0.22±0.76
Convenience store	16 (10)	0.22±0.84
Total shopping frequency in any store during past week		3.40±2.39
Amount spent on food in past week ($)		121.12±102
Past month shopping strategies	**Sometimes/often**	
Lower cost food	136 (83)	
Sales	121 (74)	
Less junk food	119 (73)	
Multiple stores	106 (65)	
Bulk	104 (63)	
Shopping list	98 (60)	
Coupons	67 (41)	
Fewer fruits/vegetables	51 (31)	

[a]Percentages exceed 100 because respondents reported shopping at more than one location.

Low-income women in our sample reported using other sources of assistance to increase their ability to provide food for their families. Most women reported participating in a variety of federal nutrition assistance programs (eg, SNAP; Special Supplemental Nutrition Program for Women, Infants, and Children [WIC]; and both the National School Lunch Program and School Breakfast Program), with only 6% of respondents not receiving assistance from any of these programs (Table 3). In contrast, relatively few reported using community food pantries and/or soup kitchens (15% and 3%, respectively). Participants differed in the degree to which they borrowed, pooled their resources, traded, and used credit as alternative food sources. About 56% of participants reported never using any of the four sources and the majority of the remaining participants reporting one or two sources (data not shown). On average, mothers used one of these sources (mean=0.97) (data not shown). More than half of participants reported eating at least once during the previous week at fast-food restaurants (57%), but far fewer ate at a full-service restaurant (22%).

In terms of their ability to manage resources (data not shown), mothers reported high levels of their abilities: 77% able to manage bills (agree or strongly agree), 70% able to keep within budget, 74% able to make money last throughout the month, and 92% able to make balanced meals.

Bivariate Associations between Household Characteristics, Food Acquisition Strategies, Maternal Ability to Manage Resources, and HHFSS as a Three-Level Variable

Results of the ANOVA examining the bivariate association between each demographic variable and HHFSS, as a three-level variable (FS, LFS, and VLFS) show that the number of children in a household, as well as maternal age, varies by food security status (Table 4). Households classified as VLFS had significantly more children (2.84) than either FS (2.20) or LFS (2.01) households. Mothers in VLFS households were significantly older than mothers in FS households. Bivariate analyses combining the two FI groups yielded similar findings.

Analysis by χ^2 yielded several additional demographic differences by HHFSS (data not shown). Households in which Spanish was spoken were significantly less likely to be classified as FS than households in which English or both English and Spanish were spoken (42.9% Spanish compared with 60% English and 83.3% English and Spanish). There were no differences in food security status by household size, ethnicity (ie, Hispanic or not), income, employment status, marital status, or overall use of assistance programs.

Results of the bivariate analyses (ie, ANOVA) of informal food sources, shopping strategies, and perceived ability to manage resources in relation to HHFSS (Table 5) show that there were significant differences by HHFSS in the use of informal sources of food (eg, borrowing, trading, pooling, and using store credit). VLFS households were significantly more likely to borrow, pool, exchange or trade foods, and use store credit than all other households. LFS households were also more likely to borrow food than FS households. Mothers in FI households (both LFS and VLFS) reported a greater inability to manage their household budget (F=20.10; P<0.001) than FS households.

Table 3. Alternative food sources used by low-income families in two urban Rhode Island communities (N=164) in a study to examine how maternal strategies to access food are related to household food security status

Alternative food source	Participation
	n (%)
Nutrition assistance program	
Child care/Head Start	119 (73)
Supplemental Nutrition Assistance Program	111 (68)
Special Supplemental Nutrition Program for Women Infants and Children	101 (61)
National School Lunch Program	79 (48)
School Breakfast Program	74 (45)
None	10 (6)
Community food program	**Any use**
Pantry	26 (15)
Soup kitchen	6 (3)
Informal sources of food	**Sometimes/ often use**
Pooling resources	58 (35)
Exchange/trading	20 (12)
Store credit	14 (9)
Borrowing	12 (7)
Restaurants	**Prior week use**
Full service	
Never	120 (73)
1	30 (18)
≥2	6 (4)
Fast food	
Never	69 (42)
1 or 2	75 (46)
≥3	18 (11)

Table 4. Bivariate association between demographic characteristics and household food security status[a] in low-income families from two urban Rhode Island communities (N=164) in a study to examine how maternal strategies to access food are related to household food security status

Status	No. of children	Maternal age	Maternal education
	←——*mean±standard deviation*——→		
Food secure	2.0[y]±0.12	28.9[y]±0.77	13.1±0.34
Low food security	2.2[y]±0.17	31.2[yz]±1.07	11.7±0.47
Very-low-food security	2.8[z]±0.26	32.8[z]±1.64	12.7±0.72
F value	4.2**	3.07*	2.71

[a]General linear model analysis of variance with differences in means tested using Duncan test.
[yz]Means with different superscripts (y, z) are significantly different from each other at *$P<0.05$ or **$P<0.01$.

In terms of shopping behavior, mothers in VLFS households used a significantly greater number of strategies (eg, using coupons, going to different stores, and buying generic brands) than mothers in FS households (6.64 vs 5.53 strategies, respectively) whereas those in LFS households did not differ from either FS or VLFS households (Table 5). Post hoc analysis of the eight individual shopping strategies revealed that mothers in FI households (LFS and VLFS) more often reported that to save money, they reduced their purchases of fruits and vegetables, bought less junk food, and went to two or more grocery stores to find cheaper food than mothers from FS households.

Mothers in LFS and VLFS households reported food shopping significantly more often (36% and 40%, respectively, reported shopping daily to weekly) than mothers in FS households (18% reported daily to weekly food shopping) (χ^2=21.09; $P<0.05$; data not shown). There was a significant association between shopping in specialty stores and HHFSS (F= 2.994; $P<0.05$). An examination of the means indicated that none of the VLFS households reported shopping at specialty stores. FS households shopped significantly more often at specialty stores than LFS households. There were no significant differences in the frequency of shopping at any of the other types of stores, amount spent on food, or of eating at restaurants by HHFSS. Moreover, there were no significant differences in use of federal or community nutrition programs as a function of HHFSS.

Multivariate Analysis of the Associations between Predictors and HHFSS as a Two-Level Variable

The results of the multivariate logistic regression to predict HHFSS as a two-level variable (FS vs FI) are shown in Table 6. Significant predictors of HHFSS were mother's education and age, Spanish-speaking household, maternal perceived inability to manage resources, number of shopping strategies, and the number of informal sources of food. The final analysis resulted in a highly significant model (χ^2=67.06; $P<0.000$). The strongest predictor of risk of household food insecurity was whether or not the household was solely Spanish-speaking: Households that were Spanish-speaking were three and a half times as likely to be FI, compared with those who spoke English or both English and Spanish at home. Older maternal age was also associated with an increased risk of household food insecurity. Each additional informal food source used was associated with twice the risk of food insecurity and the use of additional shopping strategies was associated with an increase in food insecurity risk as well. Perceived inability to manage resources was associated with a higher risk of food insecurity. Due to concerns about combining LFS and VLFS, and lacking power to analyze the VLFS group separately, an additional analysis was run comparing FS with LFS (excluding VLFS). The results were similar, with one minor difference. In the latter model (data

Table 5. Bivariate association between informal food sources of food, shopping strategies, and ability to manage resources and household food security status in low-income families in two urban Rhode Island communities (N=164)[a] in a study to examine how maternal strategies to access food are related to household food security status

	Informal Source					
Status	Borrow	Pool Resources	Exchange or trade	Store credit	Shopping strategies	Perceived inability to budget
	←*mean*±*standard error*→					
Food secure	1.09[x]±0.07	1.82[x]±0.11	1.23[x]±0.08	1.17[x]±0.07	5.53[x]±0.20	6.90[x]±0.27
Low food security	1.42[y]±0.09	1.75[x]±0.15	1.38[x]±0.11	1.19[x]±0.10	6.02[xy]±0.28	9.23[y]±0.27
Very-low-food security	1.73[z]±0.13	2.59[y]±0.23	2.00[y]±0.17	1.64[y]±0.15	6.64[y]±0.41	10.09[y]±0.55
F value	11.09***	5.42**	8.75***	4.36**	3.28*	20.10***

[a]General linear model analysis of variance differences in means tested using Duncan test.
[xyz]Means with different superscripts (x, y, z) are significantly different from each other at *$P<0.05$, **$P<0.01$, or ***$P<0.001$.

not shown), maternal education significantly predicted HHFSS, with 1 more year of school associated with almost a 15% lower risk of LFS (adjusted odds ratio [aOR] 0.86, 95% CI 0.74 to 0.99).

DISCUSSION

We examined how shopping and resource management strategies and maternal characteristics are associated with HHFSS among low-income families. The findings provide support for the hypothesis that variations in maternal characteristics and behaviors are associated with food security status of households beyond their generally low-income status. Consistent with other literature on low-income households,[5,7,8] we found that low-income mothers shopped relatively frequently and used a range of both informal and formal strategies to feed their families. They also shopped most frequently at supermarkets and warehouse or discount stores, a finding that has also recently been reported nationally.[18] Our study also provided evidence that HHFSS was associated with some maternal characteristics and behaviors. Maternal age, number of children in the household, and being a solely Spanish-speaking household are demographic characteristics that were associated with an elevated risk of food insecurity. A greater number of informal sources of food, greater variety of shopping strategies, and a higher perceived inability to manage resources were associated with an elevated risk of food insecurity, and in several cases, these differences were specific to households with VLFS. The cross-sectional nature of this study precludes our ability to confirm the direction of these associations.

Mothers reported shopping in a variety of stores, although most did the majority of their shopping at supermarkets or large warehouse or discount stores. This is noteworthy because these types of stores offer more choice, better prices, and greater availability of healthy foods at affordable prices than the types of stores that are often considered most accessible to low-income populations (eg, corner stores).[2] Mothers reported using a range of recommended strategies to support their food purchases. This included high percentages reporting that they buy in bulk, shop for sales and at different stores, and use shopping lists. We were encouraged to see that the majority of mothers reported buying less junk food as a shopping strategy, a finding that is consistent with a recent study that found that compared with high-income families, low-income families (<130% poverty to income ratio) had a lower availability of salty snacks in the home.[19] The strategy that was least-often reported was the reduction in the purchase of fresh fruits and vegetables. Taken together these findings provide support for the notion that mothers are making informed decisions when shopping, both in terms

Table 6. The association between informal sources of food, maternal behaviors, and family demographic characteristics and risk of household food insecurity[a] in low-income families in two urban Rhode Island communities (N=152) in a study to examine how maternal strategies to access food are related to household food security status

	Adjusted odds ratio (95% CI)	*P* value
Family demographic characteristic		
No. of children in the household	1.28 (0.87-1.91)	.29
Maternal age (y)	1.10 (1.03-1.17)	<.006
Maternal education (y)	0.89 (0.77-1.03)	.135
Spanish only spoken in the household[b]	3.57 (1.25-10.18)	<.02
No. of informal sources of food (ie, borrowing, pooling, and trading)	1.98 (1.28-3.07)	<.03
No. of food shopping strategies	1.17 (0.92-1.49)	.102
Perceived inability to manage resources	1.60 (1.30-1.98)	<.000

[a]Results based on a multivariate logistic regression, controlling for all variables listed in the table.
[b]Spanish only vs English and English/Spanish combined.

of managing their limited resources as well as trying to optimize the nutritional value of their purchases.

Despite this optimism, it is important to note that a little more than a quarter of mothers did endorse reducing their purchase of fruits and vegetables, and the most-often reported strategy involved purchasing lower-cost foods. Although lower-cost foods are by no means necessarily less healthy, it may also be that some of these families, when opting for lower-cost foods, may also be purchasing higher calorie, less-nutrient-dense foods. This has been reported elsewhere.[20] The fact that about half of mothers also reported eating frequently at fast-food restaurants is an additional cause for concern. Others have noted less-frequent rates of eating out among low-income mothers, although the meals that were eaten out were almost always from fast-food restaurants.[5] An additional concern is that mothers from FI households reported that they reduced their fruit and vegetable purchases to save money more often than FS mothers, which may put the most vulnerable at greater risk of poor nutrition. We do not have any data about the baseline frequencies of these types of strategies and future research may want to examine how often mothers engage in these actual behaviors. It is impossible to estimate what role nutrition knowledge may have played in the mothers' purchasing behaviors. Many of the mothers in this study participated in WIC (61%) and SNAP (68%) and likely have received some nutrition education; unfortunately, data were not collected on nutrition knowledge or exposure to nutrition education. Edin and colleagues[8] found that most of the 90 participants in their qualitative study reported that they got helpful nutrition education at WIC, but really no nutrition education from SNAP.[8] Thus, it may be reasonable to expect that many of our mothers might have benefited from nutrition education provided by WIC.

Mothers reported wide use of federal assistance programs for food as well as for other types of programs for which they were eligible (ie, heating assistance, health care, and child care) but relatively low use of the emergency food network (eg, pantries and soup kitchens). Because most of the mothers were employed, they may have been more able to manage their food budgets without having to resort to emergency food sources. The data collection period coincided with a period of increased SNAP benefits as the result of the American Recovery and Reinvestment Act of 2009, so among households receiving SNAP, they may have experienced less need. It is important to note that two-thirds and more than half of respondents were aware of local pantries and meal sites, respectively, indicating that they had knowledge of and access to their services, although no data are available to know whether the hours of operation were consistent with those of these working families. These findings are consistent with others who noted high levels of participation in federal assistance programs, but relatively low reporting of pantry use among similar low-income populations.[5,7] Other factors, including pride and embarrassment, may account for the fact that participants reported low use of the emergency food network.

It was not unexpected that households with fewer children and higher levels of maternal education would be less likely to be FI and is in keeping with current data on food security.[1] Households in which only Spanish was spoken were more likely to be FI than non–Spanish-speaking households, possibly reflecting factors related to language (ie, information is less available and accessible in Spanish), income (ie, employment opportunities favor nonimmigrants), immigration status (ie, barriers to federal food assistance for noncitizen individuals with limited residence in the United States), and acculturation (ie, lack of familiarity with processes related to food access), to name just a few.[21] Contrary to expectations, income was not significantly related to HHFSS. Most of the families were low-income households and therefore variability was considerably reduced. Limitations in the measurement (ie, maternal self-report or incomplete reporting on other sources of income to the household) likely also limited the ability to capture variation as precisely as needed.

Maternal food-acquisition behaviors were most strongly linked to HHFSS and in particular to VLFS. Those who were most FI (ie, VLFS) were engaging in a variety of behaviors to maximize their purchasing power (eg, shopping at various stores, following sales, and using coupons) and cope with the situation of food insecurity. The use of informal sources (eg, borrowing, trading, and pooling resources) as well as the use of shopping strategies (eg, coupons and sales) by VLFS households is notable and in contrast to what others have reported. Edin and colleagues[8] found that the most FI households reported fewer strategies, and less planning, and that those who were less severely FI used more informal networks. Differences between the two samples, with the Edin and colleagues[8] sample having much higher rates of VLFS, may account for some of this discrepancy.

Not surprisingly, mothers in all FI households also reported feeling less efficacious in being able to manage their resources in their households. This is consistent with Edin and colleagues[8]; however, their findings were reports of actual behaviors not perceptions. They found that those least FS were less likely to research the best prices on particular products, travel to multiple stores, capitalize on sales, and plan meals around their budgets.

One of the strengths of this study is that it is the first quantitative study that examines shopping patterns, food resource management, and maternal behaviors in relation to HHFSS in a diverse, low-income population. It provides important information on the prevalence of a variety of coping strategies in such a population while quantitatively examining how these differ under conditions of LFS and VLFS. This is important, given that these different levels of food security are thought to reflect different conditions of food availability. The fact that mothers reporting VLFS use a greater number of both informal food sources and shopping behavior strategies than mothers in FS households provides support that mothers in households with insufficient resources use additional means to access food for their families. One of limitations of this study is that it is a cross-sectional study; therefore, the temporal relationship between the independent and outcome variables cannot be established. However, it is a starting point from which future longitudinal research can be designed.

It is important to note that the mothers who participated in this study were predominantly low-income, with >60% falling below $18,000 annual income, and Hispanic, and results may not generalize beyond this population. However, the rates of food insecurity among our sample are comparable to national data (ie, households below 185% of the federal

poverty level with young children report 41% food insecurity[1]), indicating that our sample was similar to other low-income populations with young children.

Although the interviewers were trained and the questions were worded to reduce any influence of social desirability on the responses, it is possible that some of the responses related to well-known healthy practices (eg, fruit and vegetable consumption) were influenced by social desirability bias. If this were the case, it would influence mean values, but unless the magnitude of the bias varied as a function of food security status, it would not affect the association between these questions and risk of HHFSS. Finally, participants were asked about a variety of behaviors over several different time periods: HHFSS is collected annually, general shopping patterns asked respondents to report on the past 30 days, and specific shopping behaviors asked about the week prior. Edin and colleagues[8] reported variability in food security over time and noted that those who were more FI had often experienced sudden and unexpected events. These findings reinforce the need for longitudinal research that incorporates changes over time as well as variability across time periods.

CONCLUSIONS

These study results suggest that low-income mothers use many coping strategies to feed their families and that FI households use a greater number of shopping strategies and informal sources of food than FS families. These findings imply that mothers are consciously attempting to balance their scarce resources to provide food for their families. Because some strategies may have negative consequences on dietary quality, providers and community nutrition educators serving these high-risk populations must provide guidance as to the most cost-effective strategies to purchase a healthy diet.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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