

## **Food Insecurity Is Associated With Food-Related Psychosocial Factors and Behaviors Among Low-Income African American Adults in Baltimore City**

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*Using a sample of 175 low-income urban African American adults, we examined the relationship between food insecurity and knowledge, self-efficacy, intentions, healthy and unhealthy food getting, and preparation. Food security was positively associated with employment, possession of health insurance, and residence in West Baltimore. Contrary to expectation, food insecure adults had greater healthy eating self-efficacy and got healthy foods more frequently than food secure respondents. However, they were also less likely to prepare foods using healthy cooking practices. Respondents with higher healthy eating intentions prepared food in healthful ways and acquired unhealthy foods less frequently. Efforts to improve the nutritional health of the food insecure population should focus on psychosocial factors and food-related behaviors.*

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## INTRODUCTION

Ethnic minority populations in the United States have higher rates of obesity-related chronic disease morbidities and mortality than the general population.<sup>1,2</sup> From National Health and Nutrition Examination Survey (NHANES) 2003–2004 data, African American adults had one of the highest prevalence rates of obesity (45.0% had a body mass index > 30 kg/m<sup>2</sup>) and extreme obesity (10.5% had a body mass index > 40 kg/m<sup>2</sup>).<sup>3</sup> For women in particular, obesity is more prevalent among African Americans (53.9%) than either non-Hispanic whites or Mexican Americans.<sup>3</sup> In 2007, the prevalence of diabetes was as high as 14.7% among African Americans.<sup>4</sup>

Evidence on the association between obesity and food insecurity and hunger in the United States is mixed and based on cross-sectional data with varying methods of food insecurity measurements. However, some studies do show a relationship between food insecurity and increased body weight in women.<sup>5</sup> In 2006, 10.9% of all households in the United States were food insecure, with food insecurity being highest at 21.8% for African Americans.<sup>6</sup> The risk of obesity was reported to be almost 3 times higher among women from Asian, African American, and Hispanic communities experiencing food insecurity with hunger.<sup>7</sup> African American women seem to be particularly predisposed to obesity in combination with food insecurity.

The association between food insecurity and participation in food assistance programs is complex. Although one might expect that those who experience food insecurity would most likely use these programs, it is also likely that households participating in food assistance programs will become more food secure depending on when food security was measured.<sup>6,8</sup> A little over half of the food insecure households surveyed in 2006 by the United States Department of Agriculture (USDA) reported participating in at least 1 of the 3 largest federal food assistance programs in the previous month: the Food Stamp Program (FSP); Special Supplemental Nutrition Program for Women, Infants and Children (WIC), or National School Lunch Program (NSLP).<sup>6</sup>

### Food-Related Behaviors and Psychosocial Factors Among African Americans

African Americans consume fewer fruits and vegetables than do other racial ethnic groups<sup>9</sup> and tend to eat diets high in fat and calories.<sup>10</sup> Robinson and Hunter reported that the contributions of total fat and saturated fat to total energy consumption were high among urban African Americans (42.7% and

14.6%, respectively).<sup>11</sup> Kristal and colleagues reported that fat-related behaviors and sources of fat were different for African Americans than for Caucasians, with African Americans consuming more fat from meats than dairy.<sup>12</sup> We found that urban African American men and women consumed fewer servings of vegetables and dairy and far more servings of meat and meat alternatives as compared to the USDA recommendations.<sup>13</sup> In a cross-sectional study of African Americans in North Carolina, 76% of the sample reportedly ate at fast-food restaurants in the previous 3 months. Frequency of eating at fast-food restaurants was positively associated with total fat and saturated fat intakes, low self-efficacy for healthy eating, and perceived difficulties for preparing healthy meals at home or making healthier choices in restaurants and was negatively associated with fruit and vegetable intake.<sup>14</sup>

There is a need to consider psychosocial factors in order to understand dietary choices and eating behaviors of African Americans. Research on African American men showed that intrinsic benefits or positive outcome expectations (eg, positive psychological and physiological outcomes such as longevity, having greater energy levels, losing or maintaining weight) were associated with fruit consumption and extrinsic benefits (tangible rewards such as lower health insurance premiums) with vegetable consumption.<sup>15</sup> Greater self-efficacy has been shown to be positively associated with food nutrition label use.<sup>16</sup> Haralson et al reported a significant association between shoppers' purchases of foods with polyunsaturated-saturated fat ratio of less than 1 and their knowledge of nutrition.<sup>17</sup> Psychosocial factors have been examined to understand the factors associated with diet and food-related behaviors in different ethnic minorities; however, there are few studies of African Americans.<sup>18-22</sup>

This article reports on the baseline survey results of the Baltimore Healthy Stores project (round 1), a store-based nutrition intervention program to improve diet and reduce risk factors for obesity and chronic disease of low-income African Americans in Baltimore. The study was guided by social cognitive theory (SCT)<sup>23,24</sup> and addressed multiple individual (including psychosocial), behavioral, and environmental factors (see Figure 1). SCT has been extensively employed for nutritional interventions in the literature.<sup>23,24</sup>

In this article we explore the relationship between food insecurity and food-related psychosocial factors and behaviors. We address the following questions:

1. What are the levels of food insecurity among low-income African Americans in Baltimore City?
2. What is the relationship between food insecurity and food-related psychosocial factors?
3. How do low-income African Americans in Baltimore City acquire and prepare foods? How do these behaviors differ by food security status?
4. What is the impact of participation in food assistance programs on these patterns?

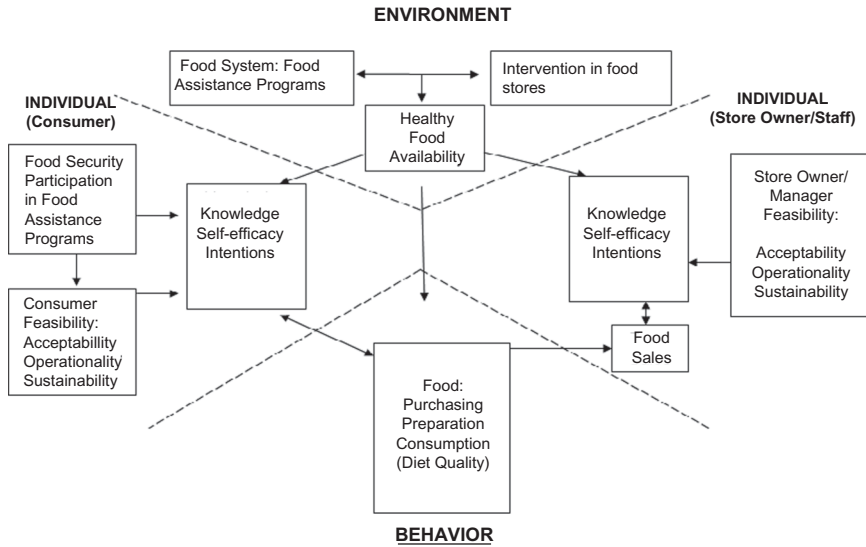


FIGURE 1 Conceptual framework.

## METHODS

### Study Setting

The study was implemented in East and West Baltimore, predominantly low-income areas of the city. In 2006, 64.8% of the city’s population was African American. In 2004, \$29,792 was the median household income and about 21.5% of the city’s population lived below the poverty line.<sup>25</sup> In 2002, Baltimore City had 12% of the state’s population but accounted for 43% of the state’s households that received food stamps.<sup>26</sup> In Baltimore City, low-income residents have limited access to supermarkets but high access to corner stores, carry-outs, and fast-food restaurants, which offer many high-sugar and high-fat foods.<sup>27,28</sup> In addition, Franco and colleagues reported that the supermarkets in predominantly black and low-income neighborhoods have lower healthy food availability than those in white and high-income areas. Overall, more than 40% of black and low-income neighborhoods were in the lowest tertile of healthy food availability.<sup>28</sup>

### Sampling

A convenience sample of 175 respondents was recruited from East and West Baltimore supermarkets, corner stores, and community action centers from April through November 2005 as part of the baseline evaluation of the

Baltimore Healthy Stores project nutrition intervention trial. Potential respondents were invited to participate in the survey and were screened for eligibility. Eligibility criteria included being a current resident of East or West Baltimore neighborhoods; intending to be in residence for the next 12 to 18 months; being the main food preparer and shopper of their household; and, if female, being non-pregnant and not having a child younger than 6 months. The refusal rate was 23%.

### Description of Consumer Impact Questionnaire

The 106-item Consumer Impact Questionnaire (CIQ) was developed based on an instrument used in a similar study<sup>21</sup> and on substantial formative research in the area.<sup>27</sup> The first section included sociodemographic information and a Material Style of Life (MSL) scale, which was used as a proxy for socioeconomic status (SES). The next section focused on “food getting,”<sup>21</sup> the procurement of food through monetary and non-monetary exchanges such as purchasing, getting food free, and/or by exchanging food stamps. For 37 foods (commonly consumed foods and healthier alternatives) the respondent reported the number of times he or she acquired each food in the past 30 days and the place where it was mostly obtained. The list was based on formative research and included foods such as regular and diet sodas; water, whole milk, 2% milk, and 1% milk; regular mayonnaise and lite mayo.<sup>29</sup> Questions about food preparation methods were covered in the third section. For each of 7 foods (ground beef, chicken, pork, fish, eggs, greens, and potatoes), respondents were asked to rank order their 3 most common preparation methods from a list of 18 possibilities. The focus of the next section was on *food knowledge*, *healthy eating self-efficacy*, and *healthy eating intentions*. Food knowledge questions were developed to assess the level of nutrition knowledge of the respondent and his or her ability to read nutrition facts labels. Self-efficacy questions were designed to elicit the respondent’s level of confidence in performing healthful cooking practices, using nutrition facts labels, and making healthier food choices. Through the intention questions we asked the respondent what food or cooking method he or she would “really choose” and not what he or she thought was healthy. The fifth section included information on participation in food assistance programs over the past month (except for food stamps, which was for 12 months). The sixth section included the Radimer/Cornell Hunger and Food Insecurity scale,<sup>30</sup> which was easily understood by the respondents during pilot testing. Anthropometry (measured and/or reported height and weight) was covered in the final section. Face validity of the CIQ was assessed by piloting the instrument on 15 randomly selected adult respondents who were further interviewed in depth to verify whether the questions were correctly and clearly understood.

## Administration of CIQ

Permission was obtained from the manager of the community action centers and supermarket/store owners for conducting interviews. Trained data collectors set up a table and chairs at a location within the store/center that would not disrupt the flow of customers/clients and was relatively private. The entire interview lasted for 60 to 70 minutes and included a food frequency questionnaire, the results of which are not reported in this article. Written consent was obtained from all the eligible respondents. They were compensated with a \$20 gift certificate for a local food store for participating in the survey. The study protocol was approved by the Johns Hopkins School of Public Health Institutional Review Board.

## Data Analysis

The data were analyzed using SAS 9.1 (SAS Institute Inc., Cary, NC). For all analyses (except analysis of variance, ANOVA)  $p < 0.05$  was the level of significance. A series of scores and scales was developed to assess the main psychosocial and behavioral factors. All scales were assessed for internal consistency reliability using Cronbach's alpha. Alpha equal to or greater than 0.7 implied that there was good internal consistency and that the scale has good reliability.<sup>31</sup>

## Food Security

Responses to the Radimer/Cornell food security questions were "not true," "sometimes true," and "often true." The response was considered as an affirmation if the respondent replied with a "sometimes true" or "often true." If there were no affirmative responses, the respondent was classified as food secure. If there were one or more affirmative responses to any of the household-level, adult food insecurity, or child hunger questions, the respondent was considered as experiencing food insecurity at that level, with more severe forms of insecurity overriding less severe (eg, child hunger overrides household food insecurity). Thus, based on the affirmative responses to the Radimer/Cornell items, the respondents were classified as belonging to households with food security, with food insecurity at the household level, with food insecurity at the adult level, or with child hunger (the most severe category).<sup>30</sup> We used food insecurity as a dichotomous variable (food insecure = 1 vs. food secure = 0) to examine the sociodemographic differences between the groups and to determine which of these characteristics were associated with food insecurity in linear regression (Tables 1 and 2). In Tables 3, 4, and 5 we have used all 4 levels of food security status.

## Participation in Food Assistance Programs

For regression analyses, we used separate categories of those participating in FSP only or WIC only or both. However, we also used food assistance as a dichotomous variable for overall comparison between participants and non-participants. The food assistance (FA) group included respondents who received food stamps or WIC benefits or both, and the no food assistance (NOFA) group included those respondents who did not participate in any food assistance program.

## Psychosocial Factors Related to Food

Food knowledge scores were calculated by adding the number of correct responses to 14 questions. The range for these scores was 0 to 14 with a mean of 8.7 (SD = 2.6,  $\alpha = 0.65$ ). A subset of food label questions was analyzed separately as a food label reading score. Mean scores for label reading were 1.9 (SD = 1.1,  $\alpha = 0.58$ ) and ranged from 0 to 4. High food knowledge scores reflect the respondent's good knowledge of food and nutrition.

The healthy eating self-efficacy score was based on 15 questions about how easy or difficult it would be for respondents to perform certain healthful behaviors on a regular basis; for example, eating baked chips rather than regular chips for a snack. A 4-item Likert scale of "very easy," "somewhat difficult," "very difficult," or "impossible" responses was used and scored from 4 to 1, respectively. Scores ranged from 28 to 60 with a mean of 50.7 (SD = 6.5,  $\alpha = 0.75$ ). A high healthy eating self-efficacy score indicates high confidence for making healthy food choices and willingness to switch to healthy eating habits.

The healthy eating intention score was calculated using 8 items that elicited the intention of the respondent to make a particular choice irrespective of whether it was healthy or not. Example: "If you had to fry eggs, what would you use to fry them with?" had options such as cooking spray, vegetable oil, and shortening. The responses were graded by assigning 3 points to the healthiest option, 2 points to a less healthy choice, and 1 to the least healthy choice. Scores ranged from 8 to 24 with a mean 15.2 (SD = 3.4,  $\alpha = 0.57$ ). Higher healthy eating intention scores indicated that the respondent had a positive inclination toward healthy eating.

## Food-Related Behaviors

The healthy food getting score was an additive scale that summed for each respondent the frequency of obtaining 26 healthy foods (eg. low-fat milk, diet soda, fruits and vegetables, whole wheat bread, high-fiber and low-sugar cereals, low-sodium pretzels, and cooking spray) in the past 30 days.

Scores ranged from 1 to 145 with a mean of 34.1 (SD = 27.2, alpha = 0.77). High healthy food getting scores indicate that healthy foods were acquired frequently. Similarly, the unhealthy food getting score was a sum of frequency of getting 9 unhealthy foods (eg. potato chips, soda, sugary drinks, whole milk, and canned tuna in oil) in the same recall period. Scores ranged from 0 to 147 with a mean of 28.4 (SD = 26.1, alpha = 0.73). High scores indicate that unhealthy foods were obtained very frequently.

The healthy food preparation score evaluated the healthfulness of cooking methods used. The respondent provided information on the first, second, and third most common method of preparing seven commonly consumed foods (chicken, ground beef, pork, fish, potatoes, eggs, and greens) from a list of 18 cooking options. Cooking methods were assigned scores as follows: deep-fried: -2, pan-fried in oil, butter, lard, margarine: -1; broiled/boiled/grilled/steamed/microwaved/baked with added fat: -1; pan-fried without oil (nonstick pan): 0; broiled/boiled/grilled/steamed/microwaved/baked without added fat: 0; not prepared at home: 0; cooking spray: 1; drain and rinse method: 2. The healthy food preparation score was calculated by summing the scores for each food weighted at 60% (first method), 30% (second method), and 10% (third method). So, for example, if ground beef was mostly pan-fried, second most commonly baked with no fat, and third most commonly drained and rinsed, the score for ground beef would be  $(.60 \times -1) + (.30 \times 0) + (.1 \times 2) = -.1$ . In this manner the scores for all 7 foods were calculated and totaled to get the final score for each respondent. This scoring method was adapted from a similar one used by Gittelsohn et al. that had fewer cooking methods.<sup>21</sup> Total scores ranged from -8.4 to +1.6 with a mean of -3.9 (SD = 2.0, alpha = 0.58). Low healthy food preparation scores indicate common use of high fat cooking methods.

The Material Style of Life scale (MSL) was an additive scale where ownership of 14 material items was assessed. For each respondent the number of items was totaled and used as a score to be compared between the groups. Scores ranged from 0 to 48 with a mean of 12.0 (SD = 7.7, alpha = 0.83). A high MSL score approximates higher socioeconomic status.

## Statistical Tests

We used chi-square contingency table analyses for dichotomous variables and parametric t-test and nonparametric Wilcoxon-Mann-Whitney tests for continuous variables to examine the differences between the food insecure and food secure groups. ANOVA with p value of 0.008 (Bonferroni correction) was used to compare variables across 4 groups of food security status. Logistic regression was conducted to examine the relationship of demographic characteristics and participation in food assistance programs with food insecurity. Multiple linear regressions were conducted to examine the factors associated with psychosocial variables (food knowledge, healthy



eating self-efficacy and intentions) and food-related behaviors (healthy food getting and preparation). Because the healthy and unhealthy food getting score distributions were positively skewed, we used the natural log transformed form of these variables for regression analyses.

Logistic regression was employed to determine the factors associated with food insecurity (insecure = 1 and secure = 0). The backward elimination method with an exit significance level of 0.2 retained several explanatory variables, including area of residence (West Baltimore = 1 and East Baltimore = 0), employment status (employed = 1 and unemployed = 0), and possession of health insurance (insured = 1 and uninsured = 0) and dropped age, sex, and schooling. We later added the FA/NOFA variable, age, and sex into the model, although they were not significant.

In the multiple linear regression models for the psychosocial variables, the choice of independent variables was guided by our conceptual framework and the demographic characteristics of interest to the research team. Demographic characteristics like age, sex, years of schooling, employment status, and MSL score were used in the models. We included separate categories for food insecurity at household level, adult level, and child hunger, and food secure households were the reference group. Participation in food assistance programs categories were only FSP, only WIC, and both versus the reference group of nonparticipants. Per our conceptual framework, we included food knowledge score and healthy eating self-efficacy score as independent variables in the model for the healthy eating intention score and retained food knowledge score in the model for healthy eating self-efficacy. Although there was significant ( $p < 0.05$ ) intercorrelation between the 3 psychosocial factors (Pearson's correlation coefficient  $r$  ranging from 0.2 to 0.3), the variance inflation factor (VIF) in the regression models for these variables was less than 2.0, indicating that there were no issues of multicollinearity.

For the multiple linear regression analyses of food-related behaviors we used food security status, demographic characteristics, psychosocial factors, and participation in food assistance programs. To include significant explanatory variables, we used the backward elimination method with the  $p$  value of 0.2 as the exit significance level and retained significant variables and those of importance to the research team. Although there was significant correlation between healthy and unhealthy food getting scores (Pearson's correlation coefficient  $r = 0.3$ ), VIF for these variables in the healthy food preparation score regression model.

## RESULTS

### General Description of the Study Sample

We found high rates of food insecurity in our study sample. Thirty-two percent of the entire sample was food secure, 28.6% experienced household-level

**TABLE 1** Sociodemographic Characteristics of the Study Sample<sup>a</sup>

	Food insecure	Food secure
Participation in food assistance programs (%) <sup>b,c</sup>	53.8	39.3
Food stamps only (%)	37.8	28.6
WIC only (%)	2.5	3.6
Food stamps and WIC (%)	13.5	7.1
Individual characteristics		
Female (%)	80.7	82.1
Age (years), mean (SD)	48.3 (12.6)	49.6 (15.5)
Never married (single) (%)	55.5	55.4
Schooling: total years of education (years), mean (SD)	11.6 (1.9)	11.75 (2.1)
Education >12 years (%)	17.7	23.2
Employed (full-time and part-time) (%)	31.9 <sup>d</sup>	53.6 <sup>d</sup>
Household characteristics		
Annual household income up to \$20 000, <i>n</i> = 169 (%)	80.2	60.4
Household size, mean (SD)	3.3 (1.8)	2.7 (1.5)
Number of children under 10 years of age, mean (SD)	0.7 (1.1)	0.6 (0.9)
Number of adults over 65 years of age, mean (SD)	0.2 (0.5)	0.2 (0.5)
Material style of life score, mean (SD) <sup>e</sup>	11.2 (6.8)	13.8 (8.9)
Respondents without health insurance, <i>n</i> = 174 (%) <sup>c</sup>	66.4	80.0

<sup>a</sup>T-test and Wilcoxon-Mann-Whitney test were used for testing the significance of difference for continuous variables (normal and skewed distributions, respectively) and chi-square for dichotomous variables. SD indicates standard deviation.

<sup>b</sup>Participation in food assistance includes Food Stamp Program and Special Supplemental Nutrition Program for Women, Infants and Children (WIC).

<sup>c</sup>*p* = 0.07, *N* = 175.

<sup>d</sup>*p* < 0.05.

<sup>e</sup>Material style of life score is the measure we used as a proxy for socioeconomic status.

food insecurity, 29.7% experienced adult-level food insecurity, and 9.7% of households reported child hunger. The respondents did not differ between the food insecure and food secure groups with respect to age, sex, schooling, household size, number of children or elderly, or MSL (see Table 1). Food insecure respondents were significantly less likely to be employed. They were more likely to participate in either FSP or WIC and tended to not have health insurance, but these differences were not significant (*p* = 0.07). About 50% of all respondents used food stamps and/or WIC (46.3% participating in the Food Stamp program and 14.3% in the WIC program) and 28.7% participated in the NSLP, 22.9% in the School Breakfast program, and 4% in the Child and Adult Care Food program.

### Associations With Food Security Among Low-Income African Americans

Logistic regression results provided additional clarification of these relationships. Respondents living in West Baltimore (OR 0.43, 95% CI 0.22–0.87, *p* = 0.02),

**TABLE 2** Regression Analysis Examining Factors Associated With Food Insecurity (as Assessed by Radimer/Cornell Hunger and Food Insecurity Scale) in the Study Sample<sup>a</sup>

Variable	Food insecure = 1 vs. Food secure = 0	
	OR (95% CI)	p
Age (years)	0.99 (0.96–1.02)	0.50
Sex (female = 1 vs male = 0)	0.71 (0.28–1.83)	0.48
Area of residence (West Baltimore = 1 vs East Baltimore = 0)	0.43 (0.22–0.87)	0.02 <sup>b</sup>
Employment (employed = 1 vs unemployed = 0)	0.44 (0.21–0.95)	0.04 <sup>b</sup>
Material style of life score <sup>c</sup>	0.96 (0.92–1.01)	0.11
Health insurance (insured = 1 vs uninsured = 0)	0.41 (0.18–0.93)	0.03 <sup>b</sup>
Food assistance (FA = 1 vs NOFA = 0)	1.35 (0.61–2.98)	0.47

<sup>a</sup>OR indicates odds ratio; CI, confidence interval; FA, food assistance; NOFA, no food assistance.

<sup>b</sup>p < 0.05; N = 174.

<sup>c</sup>Material style of life score is the measure we used as a proxy for socioeconomic status.

those with health insurance (OR 0.41, 95% CI 0.18–0.93, p = 0.03), or those who were employed (OR 0.44, 95% CI 0.21–0.95, p = 0.04) were more than twice as likely to be food secure as those living in East Baltimore or those without health insurance or job (see Table 2). Regression analysis revealed that participation in food assistance programs was not significantly associated with food insecurity, although the odds of being food insecure were 35% higher in those on food assistance (OR 1.35, 95% CI 0.61–2.98).

### Food-Related Psychosocial Factors

Food knowledge was lowest in households with child hunger (see Table 3). Label reading scores were lowest in households with food insecurity at the adult level, and the healthy eating intention scores were lowest in the household-level food insecurity group. However, mean healthy eating self-efficacy scores were lowest in the food secure group compared to the food

**TABLE 3** Psychosocial Factors and Food Related Behaviors by Food Security Status<sup>a</sup>

	Food secure	Food insecure (household)	Food insecure (adult)	Food insecure (child hunger)
Food knowledge score	9.1 (2.3)	9 (2.4)	8 (2.6)	7.5 (3.4)
Food label reading score	2 (1.2)	2.2 (0.9)	1.6 (1.1)	1.8 (1.1)
Healthy eating self-efficacy score	48.8 (7.6)	52.4 (5.4)	50.1 (6.2)	52.8 (6.1)
Healthy eating intention score	15.1 (3.4)	14.8 (3.6)	15.7 (3.3)	15.1 (3.1)
Healthy food getting score	31 (28.9)	32.7 (25.4)	39.1 (27.8)	29.4 (20.1)
Unhealthy food getting score	25.2 (20.5)	33.3 (30.7)	29 (29.1)	22 (13.8)
Healthy food preparation score	−3.1 (1.8)	−3.9 (1.7)	−4.1 (2.2)	−5.1 (1.9)

<sup>a</sup>Analysis of variance was performed but none of the differences were significant at p value of 0.008.

insecure groups. None of these differences were significant at a  $p$  value of 0.008.

Table 4 presents the results of the regression analyses examining the variables associated with the food-related psychosocial factors. Food insecurity at the household and child hunger levels was associated with higher healthy eating self-efficacy but not with the other psychosocial factors. The models accounted for low to moderate variability, ranging from 16% to 26%. Being female ( $p = 0.002$ ), well educated ( $p = 0.03$ ), and belonging to higher SES (as measured by MSL score;  $p = 0.0003$ ) were associated with high food knowledge scores. Similarly, food label reading scores were higher for younger respondents ( $p = 0.02$ ) and those from high SES ( $p = 0.04$ ). Higher healthy eating self-efficacy scores were associated with older age ( $p = 0.02$ ) and higher food knowledge ( $p = 0.005$ ). Participation in WIC alone was independently associated with higher healthy eating self-efficacy ( $p = 0.04$ ). Healthy eating intentions scores were positively associated with older age ( $p = 0.02$ ), higher food knowledge ( $p = 0.04$ ), and higher healthy eating self-efficacy scores ( $p = 0.002$ ). However, respondents participating in both FSP and WIC programs had significantly lower healthy eating intentions ( $p = 0.03$ ).

## Associations With Food-Related Behavior

### HEALTHY FOOD GETTING

The majority of our sample used supermarkets (large stores with large volume of annual sales > \$2 million), corner stores (small stores mostly situated in inner cities carrying basic grocery items like bread, milk, cereals, canned vegetables), fast-food restaurants, and carry-outs (small, non-franchise food outlets selling inexpensive preprepared foods) to get food. Almost all respondents reported using supermarkets in the 30 days preceding the interview (99.4%), 70.3% used corner stores, 69.1% used carry-outs, and 64.6% used indoor markets to get food. About 41% used full-service restaurants to buy food. One third (30%–38%) of the respondents obtained food from wholesale, convenience stores, family or friends, and vending machines. Other sources used by the respondents were church (21.1%), specialty store (18.3%), food pantry (16%), community center (12%), bar (10.3%), soup kitchen (9.7%), and community garden (3.4%). Although a variety of sources were used, most of the foods were purchased from the supermarket by half or more of our sample. Overall, healthier foods were less frequently obtained than the less healthy alternatives in the previous 30 days. For example, on average respondents reported getting whole milk 2.7 times vs. 2% milk 0.8 times or 1%/skim milk 0.2 times; regular soda 7.5 times vs. water 2.5 times and diet soda 0.6 times; white bread 4.1 times vs. whole wheat bread 1.1 times.

**TABLE 4** Regression Analyses Examining Variables Associated With Food-Related Psychosocial Factors Among Low-Income Urban African Americans<sup>a</sup>

Variable	Food knowledge score		Food label reading score		Healthy eating self-efficacy score		Healthy eating intentions score	
	Std. $\beta$	p	Std. $\beta$	p	Std. $\beta$	p	Std. $\beta$	p
N	175	175	175	175	175	175	175	175
R <sup>2</sup>	0.26	0.16	0.16	0.18	0.18	0.21	0.21	0.21
Food insecurity = 1 vs food secure = 0								
At household level	-0.03	0.71	0.05	0.54	0.28	0.001 <sup>b</sup>	-0.04	0.67
At adult level	-0.1	0.22	-0.06	0.49	0.17	0.0595	0.08	0.31
With child hunger	-0.11	0.14	0.002	0.98	0.23	0.004 <sup>b</sup>	0.01	0.87
Age (years)	-0.12	0.1	-0.18	0.02 <sup>b</sup>	0.19	0.02 <sup>b</sup>	0.18	0.02 <sup>b</sup>
Sex (female = 1 vs male = 0)	0.22	0.002 <sup>b</sup>	0.11	0.14	0.17	0.028	0.13	0.09
Schooling (total years of education)	0.16	0.03 <sup>b</sup>	0.13	0.11	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>
Employment (employed = 1 vs others = 0)	— <sup>c</sup>	— <sup>c</sup>	0.04	0.63	0.09	0.26	— <sup>c</sup>	— <sup>c</sup>
Material style of life score <sup>d</sup>	0.28	0.0003 <sup>b</sup>	0.17	0.04 <sup>b</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>
Food knowledge score	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	0.22	0.005 <sup>b</sup>	0.16	0.04 <sup>b</sup>
Healthy eating self-efficacy score	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>	0.25	0.002 <sup>b</sup>
Food stamps only vs none	-0.02	0.78	-0.02	0.8	-0.02	0.81	-0.14	0.07
WIC only vs none	-0.12	0.09	-0.06	0.43	0.15	0.04 <sup>b</sup>	-0.04	0.60
Food stamps and WIC vs none	-0.08	0.28	-0.02	0.82	0.07	0.43	-0.17	0.03 <sup>b</sup>

<sup>a</sup>Std.  $\beta$  indicates standardized beta; R<sup>2</sup>, the variance in the outcome that is explained by the variables in the model.

<sup>b</sup>p < 0.05.

<sup>c</sup>Not included in the model.

<sup>d</sup>Material style of life score is the measure we used as a proxy for socioeconomic status.

**TABLE 5** Regression Analyses Examining Factors Associated With Healthy Food Getting and Preparation Among Low-Income Urban African Americans in the Study Sample<sup>a</sup>

Variable	Healthy food getting score (log) <sup>b</sup>		Unhealthy food getting score (log) <sup>b</sup>		Healthy food preparation score	
	Std. $\beta$	p	Std. $\beta$	p	Std. $\beta$	p
<i>N</i>	174		174		171	
<i>R</i> <sup>2</sup>	0.17		0.38		0.24	
Food insecurity = 1 vs food secure = 0						
At household level	-0.01	0.90	-0.01	0.85	-0.10	0.22
At adult level	0.22	0.01 <sup>c</sup>	-0.07	0.39	-0.20	0.02 <sup>c</sup>
With child hunger	-0.03	0.73	-0.03	0.71	-0.28	0.0003 <sup>c</sup>
Age (years)	-0.12	0.14	-0.10	0.16	0.04	0.63
Sex (female = 1 vs male = 0)	-0.08	0.31	-0.06	0.39	0.03	0.72
Household size	0.12	0.18	0.17	0.03 <sup>c</sup>	— <sup>d</sup>	— <sup>d</sup>
Food knowledge score	0.15	0.07	-0.09	0.21	— <sup>d</sup>	— <sup>d</sup>
Healthy eating self-efficacy score	0.11	0.19	-0.10	0.17	— <sup>d</sup>	— <sup>d</sup>
Healthy eating intention score	0.11	0.18	-0.35	<.0001 <sup>c</sup>	0.22	0.01 <sup>c</sup>
Healthy food getting score (log)			0.36	<.0001 <sup>c</sup>	-0.19	0.02 <sup>c</sup>
Unhealthy food getting score (log)			— <sup>d</sup>	— <sup>d</sup>	-0.11	0.19
Food stamps only vs none	-0.05	0.53	0.03	0.69	-0.07	0.34
WIC only vs none	-0.20	0.01 <sup>c</sup>	0.03	0.70	0.04	0.63
Food stamps and WIC vs none	0.07	0.40	0.01	0.86	-0.08	0.31

<sup>a</sup>Std.  $\beta$  indicates standardized beta; *R*<sup>2</sup>, the variance in the outcome that is explained by the variables in the model.

<sup>b</sup>Natural log-transformed variable.

<sup>c</sup>*p* < 0.05.

<sup>d</sup>Not included in the model.

Minor differences were observed in terms of food source usage by food insecure versus secure respondents. Food insecure respondents tended to eat foods more often from carry-out or fast-food restaurants than did food secure respondents, with 21% stating they ate from these establishments more than 3 times a week, 18% eating there 2 to 3 times a week, and 28.6% eating there only once a week. For food secure respondents, these percentages were 18%, 14%, and 32.1%, respectively. In general, food insecure respondents got many of the 37 foods listed on the CIQ more frequently than their counterparts. Healthy and unhealthy food getting scores tended to be higher in household- and adult-level food insecure groups as compared to the food secure group, whereas the food insecure group with child hunger had lowest scores (Table 3). However, these differences were not significant. Regression analyses using dummy variables for different levels of food insecurity and controlling for demographic characteristics, psychosocial factors, and participation in food assistance programs showed that only the group with adult-level food insecurity had a significantly higher healthy food getting score (*p* = 0.01) and for unhealthy food

getting score there was no significant association (Table 5). Healthy food getting frequency tended to be associated with food knowledge, as every unit increase in the mean food knowledge score showed a 15% increase in the mean of this outcome variable ( $p = 0.07$ ). Respondents who participated only in WIC had 20% lower healthy food getting score ( $p = 0.01$ ); however, this group was small in size. Unhealthy food getting score was significantly and positively associated with household size ( $p = 0.03$ ). Those with high healthy eating intentions and those who got healthy foods with lower frequency had a significantly lower unhealthy food getting score ( $p < 0.0001$ ).

#### HEALTHY FOOD PREPARATION

The most common cooking method for most foods was pan-frying in oil, margarine, or butter. Chicken was usually deep-fried (37% of those who cooked chicken said that they deep-fried it most of the time), other meats were pan-fried, and greens were boiled with no fat added. Cooking spray and the drain-and-rinse method of cooking meats (methods promoted by the intervention of the program) were rarely used.

Food insecure households used less healthy food preparation methods, with the score getting worse with increasing food insecurity (Table 3). Households with child hunger had the lowest mean healthy food preparation score of  $-5.1$ , although it was not statistically significant. Regression analyses that controlled for demographic characteristics, psychosocial factors, and participation in food assistance programs showed that respondents experiencing food insecurity at the adult or child hunger levels had significantly lower healthy food preparation scores compared to food secure respondents (Table 5). The healthy food preparation score was positively associated with higher healthy eating intention score ( $p = 0.01$ ). However, those who did prepare food healthfully did not necessarily get healthier food from different sources as indicated by the negative association with healthy food getting score ( $p = 0.02$ ). Participation in FSP or WIC was not significantly associated with healthy food preparation scores.

#### DISCUSSION

This article presents new findings about the role of food insecurity and food-related psychosocial and behavioral factors among low-income urban African Americans. In our sample of low-income African Americans, respondents from both groups—food insecure and food secure—used diverse food sources to procure food and purchased most of their food from supermarkets. The food insecure respondents tended to acquire a variety of foods with greater frequency than the food secure respondents.

Food insecure respondents prepared foods using unhealthy cooking methods more frequently than the food secure respondents. Also, they ate more frequently from carry-out or fast-food restaurants. However, because the mean scores for healthy food preparation were negative in all groups, all respondents irrespective of their food security status need to employ more healthful methods of cooking.

Sociodemographic factors were associated with the psychosocial variables (knowledge, self-efficacy, intention) and food security; however, none were directly associated with healthy food getting and food preparation. Larger households purchased unhealthy foods more often. On the other hand, those who had high healthy intention scores were more likely to get unhealthy food getting less often and prepare foods in healthier ways. Getting healthy foods frequently did not necessarily indicate that those respondents would cook foods in a healthful manner. Healthy eating intentions were associated with self-efficacy, a finding that has been seen in a similar study.<sup>21</sup> Anderson et al reported the importance of self-regulatory behavior in the healthier food choices of adults and their results supported the use of SCT for behavioral nutrition interventions.<sup>32</sup> Our results also support the potential of utility of SCT as a means of focusing intervention strategies on changing key psychosocial factors and thereby affecting food-related behaviors.

We believe the differences observed in the key behavioral measures are of public health significance. A 1-point change in the healthy food getting score, for example, means that at a minimum one additional healthy food was acquired in the past 30 days. A 1-point change in the positive direction in the healthy food preparation score means that one of the 7 marker foods was usually prepared in a more healthy manner (eg. using cooking spray instead of pan-frying). These differences at the household level have the potential to add up to significant differences in diet at the individual level.

The negative association between healthy food getting scores and healthy food preparation scores is of concern. Though people may purchase healthy foods, they do not necessarily cook using healthful methods. They may also be getting unhealthy foods with high frequency as seen in the positive association between healthy and unhealthy food getting scores. These findings support the need to focus attention on improving nutrition knowledge through education that builds skills in food preparation and food selection by way of point-of-purchase promotion of healthy foods, demonstration of healthy cooking methods, and distribution of recipe cards, flyers, or brochures.

Odds of being food insecure were higher among FA respondents than the NOFA respondents although not statistically significant. In some studies, participation in food assistance programs is associated with food insecurity.<sup>8,33</sup> In the USDA Household Food Security in the United States 2006<sup>6</sup> and in a study conducted in Los Angeles county,<sup>34</sup> demographic variables were reported to be associated with food insecurity. In our sample, people who



were employed and had health insurance were significantly more food secure. Residents of West Baltimore were also more food secure. When we looked at the sociodemographic characteristics between East and West Baltimore, they were not significantly different. Differences in food security between the two settings may be related to the food environment and the availability of healthy food options.

WIC participants had higher self-efficacy for healthy eating; however, they did not purchase or get healthy foods frequently. Respondents who participated in both WIC and FSP had lower intentions for healthy food choices or preparation. Thus, nutrition interventions that combine strategies to improve psychosocial factors and healthy food behaviors are important to bring about change. Oberholser and Tuttle concluded that participation in food assistance programs does not seem to improve nutritional status because the programs do not provide a nutritionally adequate food supply, especially to those who are at risk.<sup>8</sup> However, changes have recently been made to the WIC food package which now incorporates the 2005 *Dietary Guidelines for Americans* and infant feeding practices as proposed by the American Academy of Pediatrics—providing a wider variety of food and greater flexibility to state WIC agencies to cater to participants with special needs and preferences.<sup>35</sup> This could bring about improvements in the future.

The study has several limitations. Respondent selection was based on a convenience sample from local food stores and community action centers. We chose this sampling strategy for two reasons: (1) to study consumers who shopped in local stores where we planned an intervention trial and (2) to increase the likelihood of recruiting people who were low income and on food assistance. The healthy food getting and food preparation variables were based on frequency alone and hence do not account for portion size, total quantity consumed, or other factors that reflect the overall dietary quality. Further work is needed to examine the impact of these factors on actual diet. Our regression models account for a relatively small amount of variability, ranging from 16% to 38%. This could be partly attributed to a relatively low internal reliability of some of the scales. However scales with internal consistency reliability below 0.7 have been used successfully in some studies on psychosocial correlates<sup>19,20,22</sup> or models with variables accounting for low variance.<sup>21</sup> Because we present the results of the cross-sectional analyses, we are only able to describe associations.

## CONCLUSION AND IMPLICATIONS

Food insecurity is a major problem in urban Baltimore and employment, possession of health insurance, and residence in West Baltimore seem to positively influence food security status. Food insecurity in the inner city seems to be associated with food-related psychosocial and behavioral

factors. Food insecure adults had greater healthy eating self-efficacy and got healthy foods more frequently than food secure respondents. However, they were less likely to prepare foods using healthy cooking methods. Programs to improve nutritional health of food insecure Baltimore City residents should include components to increase nutrition knowledge, self-efficacy, intentions, and skills for healthful food-related behaviors. However, these programs must be responsive to economic factors that limit access to healthy food options. In Baltimore City, food stamps are distributed through community action centers, which provide an excellent venue for delivering nutrition education, teaching skills in nutrition facts label reading and healthy food preparation, and offering other resources that will increase food knowledge, self-efficacy, and intentions. In addition, programs that center on modifying the nutrition environment, like the Baltimore Healthy Stores project, are needed to increase availability and access to healthy food choices. Not only are there fewer supermarkets in predominantly black and lower income areas in Baltimore the healthy food availability is lower in supermarkets in these areas as compared to white or higher income areas. In January 2006, we initiated a pilot program in 9 food stores in East Baltimore to increase the availability of low-cost nutritious foods, introduce people to healthier foods and cooking methods through demonstrations, and provide nutrition education at the point of purchase. The focus of this program is on small stores that are commonly used by the low-income inner-city population and involves the use of materials promoting cost-effective means of eating healthy in the inner-city environment.

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