Research Article

The Association Between Consumer Competency and *Supplemental Nutrition Assistance Program* Participation on Food Insecurity

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ABSTRACT

Objective: To examine whether *Supplemental Nutrition Assistance Program* (SNAP) participants exhibited lower food insecurity when they also demonstrated desirable behaviors in the areas of financial management, nutrition literacy, and conscientious food shopping.

Design: Using data from the US Department of Agriculture's newly launched National Household Food Acquisition and Purchase Survey, this study examined whether consumer competency is a factor that affects food insecurity.

Participants: A total of 4,158 participants were included. Sampling weights were applied to represent the population better.

Main Outcome Measure(s): Very low food insecurity was the dependent variable. Important independent variables were participants' financial management skills, nutrition literacy, and conscientious shopping.

Analysis: Logit and 2-staged least-squares models were used for empirical analyses. The significance of models was tested at .05, .01, and .001.

Results: Consumer competency-related factors such as financial management ability, not defaulting on bill payments within the previous 6 months, and using the nutrition panel frequently when shopping were negatively associated with food insecurity and very low food security after controlling for a number of other demographic, socioeconomic, and behavioral characteristics.

Conclusions and Implications: Policies that focus solely on consumer competency programs such as SNAP-Education might marginally achieve program goals but the effect would be modest owing to the unique challenges that SNAP participants may face. Further investigations are needed to understand better why SNAP participants do not benefit successfully from competent consumer practices.

Kew Words: food insecurity, *Supplemental Nutrition Assistance Program*, household finance, conscientious consumption, financial literacy (*J Nutr Educ Behav*. 2017;49:657-666.)

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INTRODUCTION

Millions of Americans are challenged with food insecurity. In 2014, 14% of US households (17.4 million households) were food insecure, meaning that their members did not always have access to enough food owing to lack of resources.[1] This included 5.6% of households with very low food security, in which "the food intake of one or more members was reduced and eating patterns disrupted"[1] because of resource insufficiency. Furthermore, food insecurity was associated with increased risk of obesity[2] and various chronic diseases.[3,4]

Although poverty and income reduction are among strongest determinants of food insecurity, income is hardly a definitive determinant of the risk of food insecurity. In 2014, 14% of households were food insecure, but 6.3% of households whose incomes were >185% of the poverty level were food insecure.[1] Apart from income, behavior signaling consumer competency, such as financial management, food resource management (eg, food shopping, food budgeting), and nutrition literacy, was linked to food insecurity.[5,6] Households (including those with an income < 200% of the family poverty level [FPL]) that have better financial management practices were less likely to be food insecure than others.[7] In addition, consumer attitudes and perceived effectiveness toward sustainable food consumption were associated with desirable food consumption behavior.[8] Food budgeting and food shopping were also linked to adequate food access.[7,9] In addition, better resource management skills were associated with reduced food insecurity among *Supplemental Nutrition Assistance Program*

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(SNAP) recipients.[10] A recent study found a causal effect of financial literacy on the probability of a household being food insecure or experiencing very low food insecurity.[6] In addition, nutrition literacy, "the degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed to make appropriate nutrition decisions,"[11] was also linked to better overall health outcomes. Another study found that the ability to read nutrition labels led to better health and nutrition outcomes.[12]

Whereas those studies suggested the importance of consumer practices as a potential strategy to reduce food insecurity, another study reported that a substantial number of low-income families already engaged in various thrifty food-shopping practices and efforts to maximize food dollars, often sacrificing the nutritional quality of their diet.[13] Substantial evidence indicated that SNAP participants' poor resource management was a factor in chronic cycles of overeating followed by food insufficiency within a benefit month, a phenomenon referred to as the SNAP cycle effect.[14] Another study argued that both SNAP participation and education on food resource management were needed to reduce food insecurity.[10]

The goal of SNAP is to decrease food insecurity for low-income individuals while improving the quality of their diets.[2] Although SNAP participants tend to have higher levels of food insecurity compared with those who are eligible but do not participate, studies that accounted for such an endogenous correlation showed that a 10 percentage point cut in SNAP participation rates increased the risk of food insecurity by 5%.[15,16] However, more needs to be understood regarding how some low-income households are food secure whereas others are not. Estimating the impacts of SNAP in addressing food insecurity was challenged with endogeneity or selection.[15,16] Moreover, according to the findings of a recent study, SNAP participation reduced the likelihood of being food insecure by 30%.[16] State and local policies related to eligibility matter in SNAP participation rates. Research found that food stamp participation increased with the leniency of eligibility rules such as vehicle exemption policies, lengths of recertification periods, and expansion of broad-based categorical eligibility and simplified reporting formats.[17,18] The association between SNAP and food insecurity is complicated by differences in eligibility criteria at the state level.[18]

A number of factors such as race/ethnicity, marital status, education, age, home ownership, presence of children, income, and asset ownership also need consideration when examining the association between SNAP and food insecurity, according to existing studies.[13,16,19] In addition, individuals' health and diet conditions have a bidirectional relationship with food insecurity. Furthermore, food access and food environment are considered to influence nutrition and health.[13] Participation in other assistance programs such as *Special Supplemental Nutrition Program for Women, Infants, and Children* or the *National School Lunch Program* were also found to ameliorate food insecurity.[16,20]

Based on findings from previous studies, it appears that consumer competency, as demonstrated by better resource management and nutrition literacy, may be associated with better health and well-being outcomes. It is therefore possible that desirable and competent consumer behavior will also have a role in reducing food insecurity among income-constrained consumers. However, there is little literature available that examined the association between SNAP and food insecurity while considering consumer competency. The purpose of this study was to extend the literature by examining whether SNAP participants experienced lower food insecurity when they also demonstrated desirable behaviors in the areas of financial management, nutrition literacy, and conscientious food shopping. Using data from the US Department of Agriculture's (USDA's) National Household Food Acquisition and Purchase Survey (FoodAPS), this study provides policy implications with more complete knowledge of how consumer competency serves as a tool for low-income households in dealing with food insecurity.

METHODS

Data

This study used the USDA's FoodAPS data set,[20] a nationally representative survey of households that included responses from participating households' main food shoppers or meal planners. The data contained detailed information on households' sociodemographic characteristics, food shopping behavior, observed shopping practices, food security status, nutrition knowledge, program use, food access, and acquisition and consumption behavior. Among the main household data files, household file, individual file, and food-at-home event file were used. The researchers extracted relevant food environmental information at the Census block group and county levels along with state-level policy variables. These geographic files were linked to household main data using household geocodes.

Among the 4,826 participating households, 667 observations were dropped owing to nonresponse or missing values. A total of 4,158 households constituted the final sample for analysis. Sampling weights were applied to represent the population by applying main household weights, strata, and pseudo-identifiers for primary sampling units as instructed in the FoodAPS documentation.[19] For some analyses, the sample was reduced to households with incomes $< 185\%$ of the federal poverty line. This study was reviewed and approved by the Internal Review Board at the University of Mississippi.

Variables

Food insecurity. Food insecurity status was determined by the number of affirmative responses to 10 questions from the USDA's 30-day adult food security scale.[1] This study used food insecurity and very low food security as dependent variables. Food insecurity was a dichotomous indicator of reporting ≥ 3 food-insecure conditions during the past 30 days. Very low food security was a dichotomous indicator of reporting ≥ 6 food-insecure conditions.

Supplemental Nutrition Assistance Program. Participation in SNAP was coded as 1 if anyone in the household currently received SNAP benefits, and 0 otherwise.

Consumer competency. This study investigated 3 competency areas, including financial management, nutrition literacy, and conscientious buying. First, financial management was a continuous variable, which was the mean of responses to 4 items: how often household reviews bills for accuracy, how often household pays bills on time,

how often household pays more than minimum payment, and household's reported financial condition (Cronbach $\alpha = .57$). Each of these was recorded on a 5-point scale, with greater values meaning better management. Second, no default was a dichotomous variable indicating that the respondent did not agree to any of the following statements: could not pay rent/mortgage, utility, or important medical bill within past 6 months, was evicted for not paying rent/mortgage within past 6 months, or could not pay full amount of utility bills within past 6 months. If the respondent in the household agreed with any of these statements, the variable was coded 0. Third, no loan was a dichotomous variable indicating that the members of the household had taken no credit card cash advance or payday-like loans within the past 6 months.

Several survey questions were combined to create 3 dichotomous variables indicating nutrition literacy: knowledge of dietary guidelines, such as MyPlate or MyPyramid (know guideline); respondent attempted to follow MyPlate or MyPyramid recommendations (follow guideline); and respondent used the nutrition facts panel on food product packaging most of the time or always (use panel).

Conscientious or frugal food shopping behavior can also imply competency. This study used 3 such indicators: whether respondents shopped with a grocery list at least most of the time (grocery list), whether they used coupons (coupons), and whether they used other types of store savings (store savings). Whereas grocery list was based on a questionnaire item, the variables coupons and store savings were based on actual use reported or observed in the food acquisition events during the 7-day reporting period.

Other variables. The regression model accounted for various household-level and geographic-level covariates. Demographic and socioeconomic variables included age, gender, race, ethnicity, education, marital status, employment, presence of school-aged children, household size, income, years living in current residence, home ownership, and vehicle ownership. Variables indicating program participation included *Special Supplemental Nutrition Program for Women, Infants, and Children* and receipt by any child of free or reduced-rate school lunch (*National School Lunch Program*).

Food environment. Geographic controls included an urban tract indicator, number of miles to the nearest supermarket from the household's block group, whether the tract was characterized as having low food access (defined as at least 1 mile in urban areas and 20 miles in rural areas), and whether state sales and taxes exempted food. Because unobserved environmental characteristics can be correlated with consumer competency variables as well as regression residuals, the fixed-effect estimators with county effects were also obtained to isolate within-county variations.

Empirical Model

First, a linear model was specified to examine whether consumer competency varied by SNAP participation, given other household and environmental characteristics. That is consumer competency $= [\alpha_1\ (\text{SNAP})_i + \text{A2(household controls)}_i + \text{A3(environmental controls)}_s + \delta_c + u_{isc}]$ (Equation 1), where i, s, and c index household, block group, and county, respectively; δ stands for county-level fixed effects; and u denotes regression residuals. Linear regression coefficients were estimated for the dependent variable of financial management, and logit coefficients were estimated for the dichotomous competency variables. A positive α_1 would indicate that SNAP participants demonstrated more competent consumer behaviors.

Furthermore, the researchers estimated a 2-stage least-squares (2SLS) model to test whether this association represented a causal effect. In 2SLS models, state-to-state variations in SNAP policy were used as instrumental variables in the participation equation, with Equation (1) as the second-stage regression. Specifically, SNAP policy variables included state-specific, broad-based categorical eligibility policies regarding assets and income limits. Other variables included were statewide availability of SNAP call centers, a combined application process, whether households could be disqualified from SNAP for failing to perform actions required by the *Temporary Assistance for Needy Families* program, statewide availability of waivers to use a telephone instead of face-to-face interview at initial certification, requirements for fingerprinting SNAP applicants in at least some part of the state, availability of an online application submission process for SNAP, and whether the state disregarded all vehicles in the household from asset testing. These variables were chosen based on the hypothesized effects on households' participation decisions and were available from FoodAPS geographic component files. If SNAP disincentivized participants from using particular consumer skills, the SNAP coefficients in the second-stage regression would be significant and negative; in such a case, it could be concluded that SNAP made consumers behave less competently. On the other hand, if SNAP increased consumer competency for participants (eg, through training or information provision), the coefficient would be positive.

The model that tests whether consumer competency was significantly correlated with food insecurity Equation (2) was $Y_{isc} = \beta_1(\text{SNAP})_{isc} + \beta_2(\text{consumer competency})_{isc} + \beta_3(\text{household controls})_{isc} + \beta_4(\text{environmental controls})_{sc} + \delta_c + e_{isc}$, where Y is the latent variable of food insecurity and e denotes regression residuals. Both β_1 and β_2 were hypothesized to be negative. The parameters were estimated with logit models.

Finally, the researchers tested in Equation (3) whether SNAP participants with higher competency were less likely to be food insecure, by adding an interaction term to Equation (2): $Y_{isc} = \gamma_1(\text{SNAP})_{isc}\,\Gamma_2 + \Gamma_3(\text{SNAP})_{isc} \times (\text{consumer competency})_{isc} + \Gamma_4(\text{household controls})_{isc} + \Gamma_5(\text{environmental controls})_{sc} + \delta_c + e_{isc}$.

If SNAP and consumer competency both improved food security, γ_1 and Γ_2 would be significant and negative. A significantly negative Γ_3 would mean that consumer competency worked more effectively for SNAP participants than for nonparticipants.

RESULTS

Table 1 lists the variables used in the empirical analyses. On average, SNAP participants had a higher prevalence of food insecurity than did

Table 1. Summary Statistics: Key Variables

Variables	Description	All Participants (n = 4,158) Mean	(SD)	Income < 185% Family Poverty Level (n = 2,363) Mean	(SD)	*Supplemental Nutrition Assistance Program* Participant (n = 1,342) Mean	(SD)	*t* Test
Food insecurity								
Food insecurity†	Adults experienced low or very low food security during past 30 d	.15		.32		.44		7.24**
Very low food security†	Adults experienced very low food security during past 30 d	.06		.15		.21		4.27**
Financial literacy								
Financial management	4-item average of responses to questions on financial management practices, with 5 being most engaged in management practice and 1 being least	4.06	(.75)	3.74	(.81)	3.46	(.80)	7.50**
No default†	Have not failed to pay rent/mortgage, medical bills, or full amount of utility; and have not been evicted on past 6 mo	.86		.73		.60		8.45**
No loan†	Did not use cash advance service on credit cards or payday-like loans within past 6 mo	.96		.93		.92		2.19*
Nutrition literacy								
Know guideline†	Familiar with MyPlate or MyPyramid	.58		.55		.59		1.06
Follow guideline†	Tried to follow guideline recommendations	.24		.21		.22		1.37
Use panel†	Used nutrition facts panel most of the time or always	.42		.34		.28		1.33
Conscientious buying								
Grocery list†	Shopped with grocery list most of the time or always	.55		.47		.42		2.48*
Coupons†	Coupon use observed or reported	.31		.24		.26		0.58
Store savings†	Store savings observed or reported	.66		.56		.57		0.71

*$P < .05$; **$P < .001$; †Dummy variable.
Note: Means and SD were adjusted for survey weights.

nonparticipants, and SNAP participants engaged less in financial management practices. A lower percentage of SNAP participants followed adequate financial management skills. Descriptive statistics in Table 2 suggest that SNAP participants showed a prevalence of socioeconomically vulnerable groups, such as female headship, racial and ethnic minorities, lower educational attainment, unmarried head of households, joblessness, and poor health status.

Participation in SNAP and Consumer Competency

As shown in Table 3, bivariate correlations between SNAP participation and consumer competency revealed that

SNAP participation was negatively correlated with all consumer competency factors except know guideline and follow guideline ($P < .001$). The fixed-effects regression coefficients, which accounted for county effects, indicated that SNAP participation was negatively associated with financial management and no default in the overall group and in the group with < 185% of FPL ($P < .001$). The last 2 rows in Table 3 show the results of 2SLS regressions with instrumental variables of state-level SNAP rules. The findings suggested that negative associations between SNAP participation and financial management practices or not defaulting may have been mostly

Table 2. Summary Statistics: Demographic, Socioeconomic, Environmental, and Other Characteristics

	All (n = 4,158)		Income < 185% Family Poverty Level (n = 2,363)		SNAP Participant (n = 1,342)	
Variables	**Mean**	**(SD)**	**Mean**	**(SD)**	**Mean**	**(SD)**
Age	50.90	(16.00)	50.70	(17.10)	45.50	(15.80)
Female head†	.29		.42		.41	
Race						
White†	.82		.72		.64	
Black†	.11		.19		.26	
Asian†	.02		.02		.01	
Other†	.05		.08		.10	
Hispanic†	.13		.20		.24	
Education						
Less than high school†	.11		.21		.26	
High school†	.28		.32		.38	
Some college†	.17		.18		.17	
Bachelor's degree†	.19		.11		.06	
Graduate degree†	.13		.07		.01	
Marital status						
Married†	.47		.29		.24	
Widowed†	.08		.12		.08	
Divorced or separated†	.24		.31		.31	
Never married†	.21		.28		.37	
Employed†	.64		.43		.44	
Have child in school†	.26		.30		.40	
Household size (people in household), n	2.50	(1.50)	2.60	(1.90)	3.10	(1.90)
Household income, $/mo	5,211.50	(5,846.30)	1332.30	(1,098.80)	2,156.30	(3,045.60)
Years lived in current residence	13.20	(13.60)	12.10	(13.90)	9.90	(13.90)
Home ownership†	.63		.44		.33	
Vehicle ownership†	.90		.76		.69	
SNAP participant†	.13		.33		1.00	
Special Supplemental Nutrition Program for Women, Infants, and Children participant†	.04		.08		.14	
National School Lunch Program (free or reduced rate)†	.11		.22		.35	
Have member with fair/poor health†	.24		.35		.46	
Weekly average dinners out, n†	1.60	(1.50)	1.30	(1.30)	1.30	(1.40)
Food environment						
Urban tract†	.66		.69		.74	
Miles to nearest supermarket from block group center	2.90	(4.60)	2.70	(5.00)	2.20	(3.60)
Low access tract (1 mile for urban, 20 miles for rural)†	.29		.27		.29	
Food exempt from state sales tax†	.93		.94		.92	
State food tax rate (%)	.40	(1.30)	.40	(1.30)	.40	(1.50)

SNAP indicates *Supplemental Nutrition Assistance Program*.
†Dummy variable.
Note: Means and SDs were adjusted for survey weights.

attributable to nonrandom participation in SNAP.

Consumer Competency, SNAP, and Food Insecurity

Results of the logit models as shown in Table 4 indicated that SNAP participants were more likely than were nonparticipants to be food insecure ($P < .01$). This association remained strong even after the environmental and consumer competency–related controls were included in the model in the overall population ($P < .001$). Financial management was negatively associated with being food insecure or having very low food security in the overall population and in the group with income < 185% of FPL. Similarly, respondents who did not default on bill payments were significantly less likely either to be food insecure or to have very low food security in the general population as well as in the population with income < 185% of FPL. Similarly, those who did not engage in high-cost borrowing were significantly less likely either to be food insecure or to have very low food insecurity in the overall population, and were less likely to be food insecure among those with income < 185% of FPL.

Participation in SNAP and Competency Interaction Effects on Food Insecurity

Results shown in Table 5 indicated that SNAP participation was negatively associated with food insecurity and very low food security for the overall group ($P < .001$) and the group with < 185% FPL ($P < .01$). Financial management and no default were also negatively associated with food insecurity and very low food security in the overall population ($P < .001$). However, financial management was significantly associated with food insecurity in the group with income < 185% of FPL but not no default. Use of nutrition panels was negatively associated with food insecurity and very low food security in the overall sample when environmental variables were included as controls.

The interaction between SNAP participation and financial management was positively associated with food insecurity and very low food security in the overall model and with food insecurity in the group with

Table 3. *Supplemental Nutrition Assistance Program* (SNAP) Participation and Consumer Competency

Variables	Financial Management	No Default†	No Loan†	Know Guideline†	Follow Guideline†	Use Panel†	Grocery List†	Coupons†	Store Savings†
Bivariate correlations[a]									
SNAP†	−.326**	−.291**	−.066**	−.026	−.001	−.107**	−.104**	−.058**	−.075**
Fixed-effect regression coefficients with county effects[b]									
SNAP†	−.207** (.029)	−.013* (.005)	.000 (.035)	.002 (.020)	.021 (.024)	−.028 (.019)	−.001 (.018)	.016 (.021)	.009 (.019)
Fixed-effect regression coefficients with county effects for income < 185% FPL[b]									
SNAP†	−.178** (.038)	−.024* (.011)	.023 (.040)	.007 (.020)	.046 (.030)	−.016 (.022)	−.022 (.023)	.005 (.029)	.013 (.025)
2SLS regression coefficients with food environment controls[c]									
SNAP†	.582 (.587)	−.101 (.193)	.148 (.124)	−.067 (.471)	.067 (.346)	−.509 (.369)	.912* (.367)	.132 (.377)	.745 (.498)
P for Sargan's score	.022	.742	.096	.000	.392	.000	.248	.000	.000
2SLS regression coefficients with food environment controls for income < 185% FPL[c]									
SNAP†	.154 (.316)	−.190 (.148)	.152 (.108)	−.012 (.251)	−.045 (.160)	−.048 (.193)	.207 (.191)	−.289 (.222)	.143 (.247)
P for Sargan's score	.551	.551	.925	.000	.028	.154	.751	.058	.000

2SLS indicates 2-stage least-squares; FPL, family poverty level.
[a]Pairwise correlation coefficient between each of the consumer competency variables and SNAP; [b]Regression coefficients and SEs from linear regression for the dependent variable of financial management, and marginal effects and delta-method SEs from logit regressions for dichotomous dependent variables; [c]Coefficients and SEs from 2-stage least-square linear regression models, using state SNAP policies as instrumental variables; *p < .05; **p < .001; †Dummy variable.
Notes: Sargan's score tested for overidentifying restrictions. See Supplementary Data for first-stage regression estimates. All regressions included demographics, program participation, and environmental controls. Full regression estimates can be made available upon request.

Table 4. Consumer Competency, *Supplemental Nutrition Assistance Program* (SNAP), and Food Insecurity

	All Participants						Income < 185% Family Poverty Level	
Variables	**Food Insecurity**			**Very Low Food Security**			**Food Insecurity**	**Very Low Food Security**
SNAP	.051** (.016)	.004 (.002)	.045*** (.011)	.018 (.012)	.000 (.001)	.010 (.007)	.004 (.005)	−.005 (.004)
Financial management		−.008** (.003)	−.083*** (.008)		−.004* (.002)	−.026*** (.005)	−.019** (.007)	−.011* (.005)
No default†		−.018** (.007)	−.097*** (.014)		−.012* (.006)	−.059*** (.011)	−.046* (.019)	−.037* (.019)
No loan†		−.009** (.003)	−.045 (.023)		−.006* (.003)	−.035*** (.010)	−.024* (.010)	−.011 (.006)
Know guideline†		−.002 (.001)	−.007 (.012)		−.001 (.001)	−.015 (.008)	−.007 (.004)	−.004 (.004)
Follow guideline†		.001 (.001)	.027 (.027)		.001 (.001)	.014 (.009)	.002 (.004)	.004 (.004)
Use panel†		−.001 (.001)	−.015 (.010)		.000 (.001)	−.008 (.010)	.001 (.004)	.000 (.004)
Grocery list†		.000 (.001)	−.001 (.013)		.001 (.001)	.008 (.008)	−.001 (.004)	−.001 (.004)
Coupons†		−.002 (.002)	−.010 (.012)		−.001 (.001)	−.013 (.008)	−.002 (.005)	−.002 (.004)
Store savings†		−.001 (.001)	−.005 (.011)		−.001 (.001)	−.009 (.007)	−.004 (.004)	−.004 (.004)
Environment	No	No	Yes	No	No	Yes	No	No
County fixed-effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Total	**4,121**	**4,121**	**4,158**	**3,949**	**3,949**	**4,158**	**2,344**	**2,244**

*$P < .05$; **$P < .01$; ***$P < .001$; †Dummy variable.

Notes: Data represent marginal effects and delta-method SEs from logit models. All models controlled for demographic characteristics and program participation. Full estimates are available upon request. Yes and no indicate whether the model included control variables or fixed-effect terms. See Table 1 for explanation of the variables.

income < 185% of FPL. The interaction of SNAP participation and no default was positively associated with the risk of food insecurity for the overall sample ($P < .05$) and for those with < 185% FPL ($P < .05$). Similarly, the interaction between SNAP participation and use of nutrition panels was positively associated with food insecurity and very low food security for the overall and low-income (<185% of FPL) groups.

DISCUSSION

This study found that many SNAP participants remained food insecure even though they used some resource management skills. The findings also suggested that consumer competency such as financial management, no default in bill payment, and using nutrition panels were associated with a decreased risk of food insecurity. These results were consistent with previous studies that found better resource management skills or financial literacy was associated with reduced food insecurity among participants.[6,7,21] However, contrary to previous research, food-shopping behaviors such as using a grocery list and coupons, knowing nutrition guidelines, and store savings were not significantly associated with being less food insecure.[9–11] This may be because a substantial number of low-income families have difficulty affording enough healthy food although they practice a number of strategies to stretch food dollars.[7,22] Participation in SNAP is linked with lower levels of consumer competency such as financial management and nutrition literacy, which may contribute to a higher risk of food insecurity in this group, as previous studies suggested.[5,6] However, findings displayed in Table 3 (2SLS) show that SNAP participation did not cause incompetency; thus, if SNAP participants were less competent as consumers, this probably resulted from the inherent qualities of the participants rather than from faulty incentive structures of the program.

The interaction models provided some explanation regarding the positive correlation between SNAP and food insecurity, because the correlation between SNAP and food insecurity became negative once the interaction terms were introduced. Previous literature

Table 5. Food Insecurity: *Supplemental Nutrition Assistance Program* (SNAP) × Competency Interaction Effects

	Food Insecurity			Very Low Food Security		
Variables	**All (n = 4,121)**	**All (n = 4,121)**	**Income < 185% FPL (n = 2,344)**	**All (n = 3,499)**	**All (n = 3,499)**	**Income < 185% FPL (n = 2,244)**
SNAP†	−.226*** (.019)	−.009** (.003)	−.022* (.009)	−.102*** (.028)	−.006* (.003)	−.019* (.010)
Financial management	−.105*** (.011)	−.004* (.002)	−.010* (.005)	−.037*** (.006)	−.002* (.001)	−.007 (.004)
No default†	−.111*** (.017)	−.008* (.004)	−.020 (.011)	−.072*** (.014)	−.005* (.002)	−.019 (.013)
No loan†	−.031 (.028)	−.002 (.001)	−.006 (.004)	−.026 (.014)	−.002 (.001)	−.004 (.004)
Know guideline†	−.003 (.015)	−.001 (.001)	−.002 (.002)	−.013 (.009)	−.001 (.001)	−.002 (.002)
Follow guideline†	.018 (.016)	.001 (.001)	−.002 (.003)	.025 (.013)	.000 (.001)	.002 (.003)
Use panel†	−.038* (.016)	−.002 (.001)	−.008 (.005)	−.025* (.013)	−.001 (.001)	−.006 (.005)
Grocery list†	−.002 (.015)	.000 (.001)	−.001 (.002)	.005 (.010)	.000 (.001)	−.002 (.003)
Coupons†	−.014 (.018)	−.001 (.001)	−.003 (.003)	−.013 (.009)	−.001 (.001)	−.003 (.004)
Store savings†	.001 (.014)	.000 (.001)	.000 (.002)	−.004 (.010)	.000 (.000)	−.003 (.004)
SNAP × Financial management	.072*** (.017)	.002* (.001)	.005* (.003)	.029*** (.008)	.001* (.001)	.004* (.002)
SNAP × No default†	.043* (.017)	.003* (.001)	.005* (.002)	.039 (.039)	.001 (.001)	.005 (.005)
SNAP × No loan†	−.036 (.031)	−.002 (.001)	−.003 (.006)	−.015 (.019)	.000 (.001)	−.002 (.005)
SNAP × Know guideline†	−.011 (.018)	.000 (.001)	−.000 (.003)	−.002 (.013)	.000 (.001)	−.000 (.003)
SNAP × Follow guideline†	.015 (.023)	−.000 (.001)	.004 (.004)	−.005 (.019)	−.000 (.001)	−.001 (.004)
SNAP × Use panel†	.078** (.024)	.004* (.002)	.014* (.007)	.041** (.016)	.002* (.001)	.010* (.005)
SNAP × Grocery list†	−.001 (.024)	.001 (.001)	.002 (.003)	.008 (.012)	−.000 (.001)	.002 (.003)
SNAP × Coupons†	.023 (.031)	.001 (.001)	.004 (.004)	.005 (.015)	.000 (.001)	.004 (.005)
SNAP × Store savings†	−.006 (.026)	−.001 (.001)	−.003 (.003)	−.006 (.017)	−.001 (.001)	−.003 (.004)
Environmental	Yes	No	No	Yes	No	No
County fixed-effects	No	Yes	Yes	No	Yes	Yes

FPL indicates family poverty level.

*$P < .05$; **$P < .01$; ***$P < .001$; †Dummy variable.

Notes: Data represent marginal effects and delta-method SEs from logit models. All models controlled for demographic characteristics and program participation. Full estimates are available upon request. Yes and no indicate whether the model included control variables or fixed-effect terms.

indicated that having a higher financial burden increased the likelihood of food insecurity among low-income participants.[13] Consistent with this, findings from the current study suggested that low-income households that did not participate in SNAP appeared to benefit most from engaging in financially and nutritionally competent consumption practices in avoiding food insecurity. However, those practices may not improve food security for SNAP participants as much as for nonparticipants. This may indicate that although low-income households struggle to meet many competing needs beyond food owing to resource constraints, there may be challenges unique to SNAP households that make food insecurity particularly persistent, so that competent consumption practices cannot ensure improved food security sufficiently. Furthermore, this study concluded that the lower competency among SNAP participants was not caused by SNAP participation but rather was the result of unobserved characteristics.

Supplemental Nutrition Assistance Program–Education (SNAP-Ed) is an educational outreach program focused on improving the food choices of SNAP recipients.[23] A few recent studies argued that nutrition education for a low-income audience should incorporate topics on food resource management (eg, food budgeting and food shopping) that teach people how to manage food dollars and stretch their budget.[10,11] Improving resource management skills through effective nutrition education programs could enhance food security of low-income households.[10,11] Furthermore, consumer competency may have multifaceted benefits related to a person's health and well-being.[9]

As suggested in a previous study, perhaps including financial education within the SNAP-Ed curriculum will benefit SNAP recipients.[24] One limitation of this study was the use of secondary data set. As in most secondary data sets, many responses to the questionnaires were self-reported. In addition, the FoodAPS data set was cross-sectional, and hence changes in the association among SNAP participation, consumer competency, and food insecurity across time could not be modeled. Another limitation was the low Cronbach α of the financial management variable.

This could have occurred because the variable was constructed from only 4 underlying financial management–related questions that were available in the FoodAPS data. Recent studies showed that variables constructed from a lower number of questions can have a low Cronbach α.[25]

IMPLICATIONS FOR RESEARCH AND PRACTICE

The effect of financial management competency on food insecurity creates a potential policy challenge for how these skills can be enhanced among low-income families, especially among SNAP participants. Some evidence supports the effectiveness of resource management skills in food security among participants in the *Expanded Food and Nutrition Education Program*[7,11,22] and SNAP.[10] Inclusion of financial management skills in SNAP-Ed or coordination with other financial education programs targeting vulnerable groups may be considered. Policy focusing solely on consumer competency programs such as SNAP-Ed might achieve program goals at the margin, but findings from this study indicated that the effect would be modest owing to the unique challenges SNAP participants may face. Participants in SNAP were found to have greater financial needs[23] and to be more financially strained than were nonparticipants.[26] Furthermore, poorer physical health[3] and mental health (ie, depression) may increase the food insecurity of SNAP participants compared with those who do not participate in SNAP.[27,28] The current study suggested that policies that incentivize competent or conscientious consumption might contribute to a decrease in food insecurity; nevertheless, further investigations are needed to understand better why SNAP participants may not benefit successfully from competent consumer practices.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jneb.2017.01.008.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.