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Predictors of Food Insecurity among Older Adults in the United States

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ABSTRACT ***Objective:*** Food insecurity among U.S. households is a national concern. Since 2010, the *U.S. Healthy People* goal has been to reduce food insecurity to 6%. Despite this goal, 14.5% of households remained food insecure in 2013 (U.S. Department of Agriculture). The purpose of this study was to examine the antecedents of food insecurity among older adults through the lens of the social ecological model. ***Design and Sample:*** This retrospective cross-sectional study utilized secondary data from the National Health and Nutrition Examination Survey (NHANES) from the years 2007 and 2008 from a sample that included 2,045 adults 60 years of age and older. ***Measures:*** Variables related to the constructs of the social ecological model were examined using descriptive, chi-square, and logistic regression analyses. ***Results:*** Analyses of the model indicated that the severity of depression, reports of financial support, and having ever received household food stamp benefits had statistically significant main effects on food insecurity among older adults. ***Conclusions:*** The study findings have implications for nursing practice, education, and research and could facilitate the development of screening methods, interventions, and policy evaluation that focus on food insecurity at multiple spheres of influence among the targeted population.

Key words: food insecurity, NHANES, older adults, social ecological model.

Food insecurity is a problem that affects the health of many individuals and populations in the United States. While the United States is one of the wealthiest nations in the world with a rich and abundant supply of food and resources, 14.3% of U.S. households were food insecure at some point during 2013 (United States Department of Agriculture [USDA], 2013). Defining attributes of the concept of food insecurity include uncertainty or worry about food, inadequate quality of food, inadequate quantity of food, food acquired through socially unacceptable means, and lack of consistent access to adequate food (Coates, 2004).

Food insecurity among U.S. households remains a significant health and social problem. The United States did not reach the *Healthy People 2010* goal of reducing household food insecurity by half, to 6%, but rather food insecurity in the United States has increased (United States Department of Health and Human Services [USDHHS], 2012a). *Healthy People 2020* addressed the problem of food insecurity under the topic of nutrition and weight status (NWS) with a goal of reducing household food insecurity (NWS-13), from a baseline of 14.6% to a targeted goal of 6%.

Research on food insecurity among older adults is limited. The purpose of this study was to examine the antecedents of food insecurity among older adults through the lens of the social ecological model. This article describes the intrapersonal, interpersonal, organizational and institutional, community, and policy factors that predict food insecurity among older adults.

Background

Overall, research on food insecurity that is nurse-authored is limited. Up until recently, there were few articles in the nursing literature about food insecurity. Two nurse-authored articles, one exploratory study (Stevens, 2010) and one literature review (Kregg-Byers & Schlenk, 2010) reflect the growing awareness of food insecurity as a nursing issue. There is limited research on this topic that focuses on older adults (Brewer et al., 2010; Duerr, 2006; Kim & Frongillo, 2007, 2009; Lee & Frongillo, 2001a; Nord, 2002; Quandt & Rao, 1999; Ziliak & Gundersen, 2011; Ziliak, Gundersen, & Haist, 2008). Overall, food insecurity among older adults is an understudied area of research.

The social ecological theory introduced by McLeroy, Bibeau, Steckler, and Glanz (1988) served as the framework for this study to examine some of the factors that are associated with food insecurity among older adults at multiple spheres of influence. This model provides a framework in which individuals are situated in the context of complex environments. According to this framework, health promotion needs to target the following five spheres of influence: intrapersonal, interpersonal, organizational, community, and public policy. The model supports the belief that the interface of people and their environment are interdependent and need to be considered when examining health issues.

This model has been successfully utilized in health promotion research to incorporate a multidimensional framework to understand health issues and health disparities. In one study, the ecological model was used to increase the understanding of the contextual variables associated with unintended pregnancy among married women (Koren & Mawn, 2010). The utilization of this health promotion theory enabled the consideration of contextual variables when examining factors associated with food insecurity (Figure 1).

A major limitation of the recent food insecurity research is that most studies did not include large nationally representative samples. In addition, many of the studies did not use the complete U.S. Food Security Module (USFSSM). The dearth of data on population-based samples using a social ecological model supported the need for additional research on food insecurity among this older adult population.

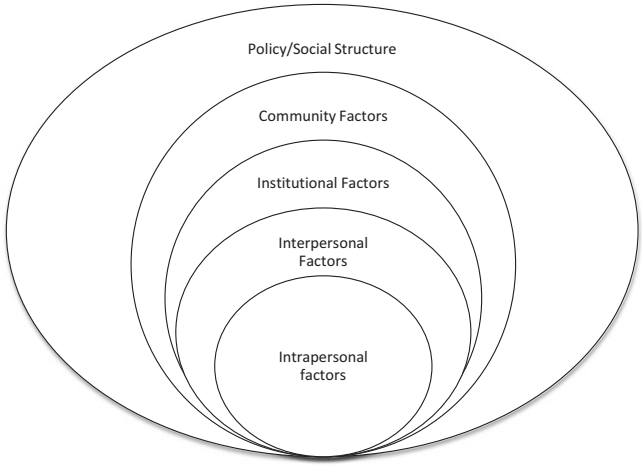

Figure 1. Factors Influencing Food Insecurity among Older Adults Using the Social Ecological Model

Figure developed by Shari Goldberg based on the social ecological model for health promotion developed by McLeroy et al. (1988)

Notes: Intrapersonal factors: Gender, age race/ethnicity, family monthly poverty level, length of time in United States, marital status, education level, BMI, depression, IADLs, and ADLs.
Interpersonal factors: Emotional support and financial support;
Institutional factors: Time to get to grocery store, private insurance, routine place for health care, and type of place for health care.
Community factors: Rural/urban location, geographic region, community/government meals delivered, and meals eaten at community/senior center.
Policy/Social Structure factors: Household food stamp benefits: ever received, received in last 12 mos., and time since last received.

Research question

The overarching research question in this study was: To what extent does the social ecological model predict food insecurity among older adults? The main hypothesis was as follows: The social ecological model will account for significant variance in predicting food insecurity among older adults. Based on the multiple social, economic, and biological issues facing the growing population of older adults in the United States, research on food insecurity that targets this population is important. The relevance of studies that target older adults is reflected in the objectives for *Healthy People 2020*. Understanding some of the antecedents of food insecurity among older adults will help to inform policies and practices that promote health in this population.

Methods

Design and sample

This study used a retrospective cross-sectional design using secondary data from years 2007 and 2008 of NHANES. The unweighted sample size for the 2007 and 2008 NHANES is 2,045 individuals aged 60 and older. This represents 20.9% of the total sample (Centers for Disease Control and Prevention [CDC], 2009). The participants were drawn from a national probability sample of 9,745 individuals who participated in the 2007 and 2008 NHANES. Approval for this study was obtained from the Institutional Review Board at the University of Massachusetts Lowell and the CDC Research Data Center.

The NHANES survey is a stratified, multistage probability sample with a target population of the civilian, noninstitutionalized U.S. population who are living in households or group quarters. The survey sample is selected to represent all ages of the U.S. population. Inclusion criteria included civilian noninstitutionalized adults 60 years of age and older.

Measures

The independent variables were examined through the lens of the social ecological model's five spheres of influence, and were determined based on conceptual definitions of each sphere of the model and a literature review of research studies that have utilized this framework. The intrapersonal level variables included marital status, race and ethnicity, educational attainment, body mass index, depression, and functional disability. Interpersonal variables included help with emotional and financial support. Institutional factors included time to get to a grocery store, private insurance coverage, and health care type and location. Community level variables included a rural or urban location, geographic region, delivery of community/government meals, and meals eaten at a community/senior center. Policy and social structure variables included Food Stamp Program benefits recipient. The Food Stamp Program is now known as the Supplemental Nutrition Assistance Program (SNAP) and will be the term used in this article.

The dependent variable, adult food insecurity, was defined as a dichotomous variable classified as food secure or food insecure. This variable was measured at the household level utilizing the 10-item adult USFSSM measuring food security over the past 12 months. Since 1995, this reliable and valid tool has been considered the gold standard for the measure of food insecurity (Nord, Andrews, & Carlson, 2009).

The food security survey refers to all members in the household and not just the NHANES respondent. A household with ≤ 2 affirmative responses to the USFSSM was categorized as food secure and a household with ≥ 3 affirmative responses was categorized as food insecure. Examples of survey items in the 10-item USFSSM include: "I worried whether our food would run out before we got money to buy more," (the least severe item), and "Did you ever not eat for a whole day because there wasn't enough money for food?" (the most severe item) (USDA, 2011).

Analytic strategy

The Statistical Analysis System (SAS) 9.2 statistical software was used for all data analyses. NHANES uses a complex probability sampling design, and the SAS SURVEY procedures account for this by incorporating strata, cluster, and weighting information. For unbiased estimates of population parameters, each NHANES participant is assigned a sample weight, which is the number of individuals in the target population that the sampled individual represents (CDC, 2012). For NHANES, the sample weight variable is determined by the number of years of data that one is analyzing.

Descriptive analyses were used to summarize the sociodemographic data of the targeted population as well as the studied variables at the conceptual model's spheres of influence. The bivariate analyses included chi-square analyses for ordinal and nominal variables and *t* tests and analyses of variance for continuous variables to study their relationship to food insecurity. Variables that differed significantly between food secure and insecure groups were interpreted in light of the social ecological model's five spheres of influence and included as predictors in the logistic regression analysis.

We chose to examine the odds ratios related to the risk of food insecurity from multiple levels and thus utilized logistic regression to examine the odds. All of the independent variables were treated simultaneously versus a hierarchical fashion. Logistic regression, using SAS's SURVEYLOGISTIC pro-

cedure, estimated the probability of food insecurity among older adults based on multiple independent variables and their interactions.

Results

Table 1 characterizes the participants in the study. Descriptive statistics were calculated based on demographic characteristics of participants in this study. Sample weights were used to reflect the unequal odds of being sampled, accounting for the complex probability sampling design of NHANES. More than 9% of the households in the study were food insecure. The mean age of the sample was 70.18 years of age. Females comprised 56% of the sample. The race and ethnicity of the subpopulation studied was predominantly non-Hispanic White (80%) followed by non-Hispanic Black (10%), Mexican-American (4%), and other Hispanic (3%). This differs from the race and ethnicity of the overall NHANES sample which was 41% non-Hispanic White, 22% non-Hispanic Black, 21% Mexican-American and 12% other Hispanic; reflecting a demographic shift in the United States.

TABLE 1. *Study Participant Descriptives*

Variables	*n*	Unweighted %	Weighted %
Food insecurity			
Food insecure	186	5.7	9.15
Food secure	1,847	94.3	90.85
Gender			
Female	1,037	51.01	55.86
Male	996	48.99	44.14
Age			
Mean	70.18		
Median	70		
≥ 60 and <70	955	46.97	49.63
≥ 70 and < 80	691	33.99	31.48
≥80	387	19.04	18.89
Race and Ethnicity			
Mexican-American	242	11.9	3.94
Other Hispanic	202	9.94	3.23
White	1,118	54.99	79.8
Black	412	20.27	8.66
Other including multi-race	59	2.9	4.38
Marital status			
Married, living with partner	1,178	57.97	61.83
Other	854	42.03	38.17
Education level			
<9th grade	421	20.75	11.94
9th–11th grade	325	16.02	13.56
High school graduate/ GED	506	24.94	27.94
Some college or AA degree	418	20.6	22.97
College graduate or above	359	17.69	23.6

Bivariate associations were estimated to examine the relationship between food insecurity and the independent variables. Rao-Scott chi-square tests were performed to determine statistically significant differences between groups (see Table 2). Tests for multicollinearity indicated that the independent variables were not highly correlated. Variables that were significantly related to food insecurity at the $p < .001$ level in the bivariate analyses were then included as independent variables in a binary logistic regression, and were entered simultaneously into the regression model (see Table 3).

The social ecological model accounted for significant variance in predicting food insecurity among older adults. The results from the logistic regression found significant direct effects of predictors from intrapersonal, interpersonal, institutional/organizational, and policy/social structure spheres of the social ecological model on food insecurity among older adults. It is important to note that the large sample size may have impacted the significance of some of the findings. The c-statistic value was 0.836 indicating that the model predicts food insecurity well (Hosmer & Lemeshow, 2000).

At the intrapersonal level, marital status, race and ethnicity, education attainment, and severity of depression were all found to have significant effects on household food insecurity status. At the interpersonal level, not having help with financial support was found to have a significant effect on household food insecurity status. At the institutional/organizational level, private insurance coverage was found to have significant effects on household food insecurity status. At the policy/social level, having received household food stamp benefits had a significant effect on household food insecurity status. Predictors of food insecurity (marital status, race/ethnicity, education attainment, help with financial support, private insurance coverage, and SNAP recipient) were identified at all levels of the social ecological model with the exception of the community sphere. As hypothesized,

TABLE 2. *Bivariate Analyses: Food Insecurity and Independent Variables*

Variable	%FI	*n*	χ^2	*p*-value
Intrapersonal sphere				
Gender				
Female	8.23	2,033	2.5689	.1090
Male	9.86			
Family monthly poverty level				
(≤1.3)	19.97	1,899	75.04	<.0001
(>1.3 and <1.85)	10.24			
(≥1.85)	2.14			
Age				
(≥60 and <70)	11.83	2,033	23.89	.1082
(≥70 and <80)	7.53			
(≥80)	5.43			
Race/Ethnicity				
Mexican-American	18.6	2,033	144.42	<.0001
Other Hispanic	18.32			
Non-Hispanic White	5.01			
Non-Hispanic Black	8.98			
Other	18.64			
Education				
<9th grade	19.72	2,029	69.4524	<.0001
9th–11th grade	12.92			
High school grad./GED	6.92			
Some college or AA degree	5.98			
College graduate or above	0.28			
Marital status				
Married/living with someone	5.94	2,032	1.29	<.0001
Other	13.58			
BMI				
Underweight	14.77	2,033	62.42	<.0001
Normal weight	8.2			
Overweight	7.92			
Obese	10.34			
Depression				
None	6.29	2,033	36.25	<.0001
Minimal	8.17			
Mild	13.87			
Moderate	17.11			
Moderately severe	31.58			
Severe	50			
Managing money difficulty				
Yes	20.37	2,032	39.12	<.0001
Other	8.13			
House chore difficulty				
Yes	14.68	2,032	27.79	<.0001
Other	7.43			
Preparing meals difficulty				
Yes	17.88	2,031	30.65	<.0001
Other	8.26			
Walking between rooms, same floor				
Yes	17.19	2,032	26.82	<.0001
Other	8.12			
Getting in and out of bed difficulty				

(continued)

TABLE 2. *(Continued)*

Variable	%FI	*n*	χ^2	*p*-value
Yes	19.68	2,032	1.77	<.0001
Other	7.2			
Using knife, fork, drinking from cup				
Yes	16.15	2,032	9.98	.0016
Other	8.62			
Dressing self-difficulty				
Yes	17.47	2,032	20.98	<.0001
Other	7.83			
Interpersonal sphere				
Anyone to help with emotional support				
Yes	8.55	2,028	4.32	.0376
Other	14.78			
Anyone to help with financial support				
Yes	6.86	2,013	40.82	<.0001
Other	15.07			
Institutional/Organizational Sphere				
Time to grocery store				
0 to <15 min	7.88	1,995	4.42	.2196
15 to <30 min	9.62			
30 to <60 min	11.66			
≥60 min	14.75			
Covered by private insurance				
Yes	4.12	2,029	68.26	<.0001
No	15.05			
Routine place for health care				
Yes	8.9	2,033	2.63	.1048
No	14.14			
Type of place most often go to for health care				
Emergency department	17.86	1,934	3.01	.0828
Other	8.76			
Community sphere				
Geographic region				
Northeast	8.11	2,033	8.34	.0395
Midwest	4.65			
South	11.12			
West	10			
Urban/rural location				
Metropolitan	9.4	2,033	1.48	.4765
Nonmetropolitan (micropolitan)	6.34			
Nonmicropolitan (noncore)	9.88			
Community/government meals delivered				
Yes	7.39	2,031	7.65	.0057
No	8.82			
Eat meals at community/senior center				
Yes	15.18	2,031	1.58	.2085
No	8.75			
Policy sphere				
HH food stamp benefit ever received				
Yes	23.49	2,032	70.22	<.0001
No	6.46			

predictors of food insecurity were represented at individual and contextual spheres of the social ecological model.

Community level factors did not meet the study significance level and were not entered into the regression model (see Table 2). Although the rela-

TABLE 3. *Multivariate Model Predicting Food Insecurity among Older Adults*

Variables	Wald	df	*p*-value	Odds ratio	95% CI
Intrapersonal sphere					
Marital status	19.0519	1	<.0001	*0.463*	*0.328–0.654*
Race/Ethnicity	37.0053	4	<.0001		
White (ref)					
Black				1.242	0.618–2.495
Mexican-American				3.557	1.982–6.384[a]
Other Hispanic				2.541	1.390–4.644[a]
Other inc. multi-race				4.921	2.337–10.365[a]
Education attainment	9.7211	3	.0211		
<9th grade				3.282	1.486–7.250[a]
9th–11th grade				3.163	1.346–7.432[a]
High School graduate/GED				1.68	0.747–3.779
Some college or more (ref)					
BMI	1.8799	3	.5977		
Underweight				1.723	0.343–8.649
Normal weight				1.083	0.740–1.585
Overweight				0.815	0.498–1.331
Obese (ref)					
Depression	25.5605	3	<.0001		
None (ref)					
Minimal				1.412	0.889–2.242
Mild				2.75	1.781–4.248[a]
Moderate to severe				2.446	1.069–5.596[a]
Functional Disability (IADL domain)					
Managing money difficulty	3.0134	1	.0826	2.155	0.906–5.130
House chore difficulty	0.2851	1	.5934	0.913	0.655–1.274
Preparing meals difficulty	0.0044	1	.9474	1.031	0.413–2.578
Functional Disability (ADL domain)					
Walking bet. rooms, same floor diff.	0.0065	1	.9357	1.031	0.489–2.177
Getting in/out of bed difficulty	2.6486	1	.1036	1.63	0.905–2.938
Dressing self-difficulty	0.1419	1	.7064	1.119	0.623–2.013
Interpersonal Sphere					
Help with financial support	6.0157	1	.0142	*0.492*	*0.279–0.867*
Institutional/Organizational Sphere					
Covered by private insurance	3.9893	1	.0458	*0.572*	*0.331–0.990*
Policy Sphere					
Household food stamps	11.5919	1	.0007	3.323	1.664–6.632

[a]Denotes risk factors, and italics denote protective factors.

tionship between a rural-urban location and food insecurity was not significant ($p = .4765$), the results revealed that urban and rural locations had a higher percentage of food insecure households, 9% and 10%, respectively, as compared with micropolitan locations (6%). Persons who ate meals at a community/senior center were more likely to be food insecure than persons who reported not eating meals at community/senior centers; however, this relationship was not statistically significant ($p = .2085$). People living in the south were more likely to be food insecure than those living in the other regions of the United States; however, these results did not meet the study significance level ($p = .0395$) and the variable was not entered into the multivariate analysis.

Variables from multiple spheres of influence made substantial contributions to predicting food insecurity. These findings contribute to the understanding of the multidimensional nature of food insecurity. When significant factors were simultaneously tested in a model, variables emerged from multiple spheres of influence as significant. Predictors of food insecurity were represented at individual and contextual spheres of the social ecological model.

Discussion

The findings of this study contribute to the understanding of the factors at multiple spheres of influence that are predictive of food insecurity among the targeted population. At the intrapersonal level of the social ecological model; race and ethnicity, level of education attainment, and severity of depression were predictive of food insecurity. A Mexican-American or Hispanic ethnicity was significantly associated with food insecurity when controlled for other variables. These results support other studies that indicate that race and ethnicity are predictors of food insecurity among older adults (Brewer et al., 2010; Lee & Frongillo, 2001b; Ziliak et al., 2008); however, the results of this study are not consistent with findings that non-Hispanic Blacks are more likely to be food insecure when compared with non-Hispanic Whites (Brewer et al., 2010; Lee & Frongillo, 2001b; Ziliak et al., 2008). These differences may be, in part, due to the more granular categorization of the race and ethnicity variable in this study (Mexican-American, other Hispanic, non-Hispanic White, non-Hispanic Black, and other) compared with other studies (minority vs. nonminority and White vs. non-White). The results underscore the importance of research examining the health disparities among Hispanic and Latino Americans. The findings also suggest that severity of depression was predictive of food insecurity, and are supported by a study by Kim and Frongillo (2007); however, there were no other known studies that used the Public Health Questionnaire-9 (PHQ-9) to correlate severity of depression with food insecurity among older adults. The results of this study found a significant negative correlation between education attainment and food insecurity and were supported in the literature (Brewer et al., 2010; Lee & Frongillo, 2001b; Ziliak et al., 2008).

A strong positive correlation was found between family monthly poverty level and food insecurity ($p < .0001$) (the further the family income falls below poverty level, the more likely to be food insecure). Poverty level was defined according to the 2006 USDHHS poverty guidelines (USDHHS, 2006). These results support previous studies that suggest a relationship between food insecurity and poverty among the general population (Laraia, Siega-Riz, Gundersen, & Dole, 2006) and older adults (Lee & Frongillo, 2001b; Ziliak et al., 2008). More than 5% of the survey respondents did not respond to the item, family monthly poverty level, and the variable was not included in the multivariate analysis. According to Polit (2010), people who do not report self-information about family income are often of higher or lower income brackets. Other socioeconomic variables (including education) are often used as a proxy for income (Polit). Education was determined to be a strong predictor of food insecurity among older adults and supports the association of food insecurity and poverty.

At the contextual levels of the social ecologic model (interpersonal, institutional and organizational, and public policy), lack of help with financial support, lack of private insurance coverage, and participation in SNAP were found to be predictors of food insecurity among older adults. Having someone to help with financial support was found to be a predictor of food insecurity, that is, having help with financial support would make one less likely to be food insecure compared with someone who does not have someone to help with financial support. This appears to be a new finding, and further research that examines social support in more depth would add to the existing food insecurity knowledge base among this population at the interpersonal sphere of influence.

The results of this study found that households that reported having ever received SNAP benefits were more likely to be food insecure compared to those that had never received SNAP benefits; these results were supported by a previous study (Kendall, Olson, & Frongillo, 1995). In addition, older adults with private insurance coverage were less likely to be food insecure than those who did not have private insurance coverage. These results point to the need for additional research on health insurance coverage among older adults with the implementation of the Affordable Care Act (ACA).

The weighted percent of food insecurity for the population 60 years of age and older was 9.15% and the baseline for the general population is 14.6%. The prevalence of food insecurity among older adults, while less than the general population (which includes children), is concerning. The United States has been in the midst of a profound demographic transition; the rapid aging of its population. In 2000, 16.3% of the total U.S. population was age 60 and older and 1.5% was age 85 and older (Federal Interagency Forum on Aging-Related Statistics, 2010). Projections for 2050 indicate that

25.5% of the U.S. population will be age 60 or older and 4.3% will be age 85 and older (Federal Interagency Forum on Aging-Related Statistics, 2010). As a result, prevalence trends of food insecurity among older adults will be important to track.

A limitation of this study is that the NHANES originally collected the data for purposes other than analysis using the social ecological model. Variables at each level of the social ecological model did not comprise an exhaustive list, and were limited by what was included in NHANES. Another limitation is that in secondary data, the researcher lacks control of the collection of data collection and the appropriateness of the data to address the study research questions (Nicoll & Beyea, 1999). The NHANES survey data could be threatened in terms of internal validity due to various types of biases: nonresponse bias; self-report bias; and social desirability bias. In addition, with the use of a cross-sectional design, the researcher cannot infer causation as the relationship of variables over time is limited (Crosby, DiClemente, & Salazar, 2006). At the time of the study, 2007–2008 NHANES data were the latest that were available for public use; however, sociopolitical changes as that time may not be reflected in the data. A final limitation is that some of the most vulnerable older adults are not included in NHANES (homeless, living in institutionalized settings).

While the results of this study add to the understanding of those who may be more likely to be food insecure among the targeted population, the translation of this knowledge to practice is needed. The development of a knowledge base among nurses and other clinicians about the issue of food insecurity will need to include assessments that help to identify older adults who are at risk for being food insecure. The dissemination of research among nurses and other health professionals will help to raise awareness of the issue of food insecurity among older adults.

Efforts need to be made to educate nurses on the antecedents and health outcomes of food insecure older adults. The integration of health issues, related to access to adequate food in the context of vulnerable populations, into undergraduate and graduate nursing curricula would better prepare nurses to identify those who may be food insecure. Advocating for older adults who are food insecure begins when awareness among nurses and other health care providers is raised through education.

This study identified factors that support changes in nursing assessment that could ultimately reduce the prevalence of food insecurity among older adults. Nurses and other health care providers are in a position to identify vulnerable populations through screening, and provide information and resources that help to alleviate the burden of food insecurity. Screening for food insecurity for those older adults who are at risk may begin with an overarching question, “Have there been times in the past 12 months when you did not have enough money to buy food you or your family needed” (Food Research & Action Center, 2012)?

Nurses are well positioned to make the assessment of food insecurity a part of the nursing process when working with older adults in community-based settings. In January of 2011, a new benefit under the ACA became available for Medicare beneficiaries. The Annual Wellness Visit (AWV), a preventive wellness visit, provides a potential opportunity to include a screening question for food insecurity during the AWV and would provide information on not only individual factors but contextual factors that may affect access to adequate food and overall health.

Future research integrating the social ecological model across disciplines will advance the effort to identify the factors that predispose older adults to be food insecure. In addition to implementing screening measures to assess for food insecurity among vulnerable older adults, it is important for nurses and other allied health professionals to track the trends of food insecurity in this population. Identifying and referring those at risk to social services and governmental agencies is essential. Future research needs to examine what nursing interventions are the best means to ensure follow through with such referrals as well as the role of family and other community level support groups. Nurses are well positioned to make meaningful use of clinical data to inform population health policy recommendations.

Based on the findings of this study, additional research is needed to explore the factors identified in this study that predicted food insecurity among older adults. Qualitative studies are needed that examine the experience of older adult food insecurity among those who were found to be the most

vulnerable. Qualitative studies would also increase understanding of some of the factors that were difficult to interpret. Help with financial support ("if you need some extra help financially, could you count on anyone to help you; for example, by paying any bills, housing costs, hospital visits, or providing you with food or clothes?"), was found to be predictive of food insecurity among older adults. An increased understanding of the specific type of financial support that was available (which bills, types of food and clothing) and who was helping with the financial support would provide direction for studies on food insecurity that included the interpersonal sphere of influence.

In addition, future longitudinal cohort studies using a social ecological framework are recommended to examine the relationships of cause and effect of the predictors of food insecurity. They could be targeted for persons at high risk based on race and ethnicity, and socioeconomic status. Intervention studies could also be designed for those at risk to determine which social and public interventions could reduce the risk of food insecurity.

One of the goals of the ACA is to increase efficiency in the SNAP enrollment process for those who are eligible. Data-based strategies include the ability to help programs reach out to vulnerable populations. Examining the prevalence of food insecurity among those receiving SNAP benefits over time (before and after the implementation of the ACA), would give an indication if the ACA's plan to add efficiency to the SNAP enrollment process results in a lower prevalence of food insecurity. A longitudinal cohort study could also help to identify the impact that policies have on food insecurity. With the implementation of the ACA, methods of evaluating the outcomes are essential.

As the social ecological approach is guiding a number of current national health initiatives, including *Healthy People 2020*, the need for national surveys that include variables that are psychometrically sound at all levels of the model becomes more important. NHANES was not developed with the social ecological model as the guiding framework. The development and use of a national survey or surveys designed using this model, would be beneficial and allow for the analysis of predictors at all spheres of influence.

As multiple national surveys are used to evaluate *Healthy People 2020* objectives to determine if benchmarks have been met, a theoretical alignment between national surveys and the *Healthy People 2020* initiative would aid in outcome evaluation. Replicating this study comparing the 2007 and 2008 data with later datasets would also be useful in assessing changes in predictors of food insecurity over time. Because NHANES excludes the homeless and those living in nursing homes and other institutionalized settings, studies that capture these older adults would increase the understanding of food insecurity among this target population.

The purpose of this study was to increase understanding of the antecedents of food insecurity among older adults through the lens of the social ecological model. This was accomplished through the examination of variables at the social ecological model's multiple spheres of influence. While individual (intrapersonal) factors were studied, contextual variables were also considered at interpersonal, institutional/organizational, community and policy/social structure spheres of influence. The results of this holistic approach, using multivariate analysis and a national survey, are generalizable to the target population of older adults living in noninstitutionalized settings in the United States. Multiple logistic regression analysis showed that race and ethnicity, level of education attainment, severity of depression, lack of help with financial support, lack of private insurance coverage, and participation in SNAP were significantly associated with food insecurity.

The recommendations for nursing education, practice, health promotion research, and policy support an emerging paradigm that is supported by national initiatives including *Healthy People 2020* and the ACA. The study of social determinants of health and food insecurity in particular through the lens of the social ecological model, requires cross-disciplinary perspective, and is aligned with the frameworks of *Healthy People 2020* and the ACA. Nurses are well positioned to take a leadership role in this work through interdisciplinary collaboration, contributions to the development of a growing evidence base, and a continued focus on a vulnerable and growing older population.

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