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Factors Within Multiple Socio-Ecological Model Levels of Influence Affecting Older SNAP Participants' Ability to Grocery Shop and Prepare Food

Abstract

The study identified and determined if factors within multiple levels of the socio-ecological model were effective in explaining older adult Supplemental Nutrition Assistance Program (SNAP) participants' ability to grocery shop and prepare food. Data were collected from 370 SNAP participants, 65 years and above, via a telephone survey. Factors within multiple levels of influence were significant in explaining both ability to grocery shop and prepare food, including physical and emotional wellbeing; self-reliance; finances; housing; family and friend interactions; social support; and food access. To effectively influence older SNAP participants, integrated SNAP education programs addressing multiple levels of influence are recommended.

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Introduction

Adequate nutrition is critical for maintaining older adults' independence, health, and quality of life (American Dietetic Association, 2010). However, maintaining a healthful diet can be especially challenging for low-income older adults (Guthrie & Lin, 2002). Indeed, low-income older adults have been reported to have poor dietary intakes (Bowman, 2007; Guthrie & Lin, 2002). Unfortunately, the proportion of low-income older adults is substantial. In 2010, 16% of older adults as a whole were at or below 130% of the poverty guideline, a level qualifying households to participate in the Supplemental Nutrition Assistance Program (SNAP); however, 19% of older adult householders and 29.5% of older adult householders living alone were at or below 130% of poverty guidelines (US Census Bureau, 2013a). Through SNAP Education (SNAP-Ed), Extension works to promote healthful diets among low-income older adults (Francis, Martin, & Taylor, 2011; Guthrie, Stommes, & Voichick,

2006).

Being able to grocery shop and prepare food are important food-related activities that can impact older adults' dietary intake (Keller, 2005; American Dietetic Association, 2010). While purchasing and preparing economical foods are topics often covered through SNAP-Ed (Francis et al., 2011; Hoover, Martin, & Litchfield, 2009), finances may not be the leading factor influencing low-income older adults' food access (Wolfe, Frongillo, & Valois, 2003). Several factors have been identified as affecting community-dwelling (those not in assisted living or nursing homes) older adults' ability to access and prepare food (Keller, Dwyer, Senson, Edwards, & Edward, 2006; Quigley, Hermann, & Warde, 2005); however, limited research has been conducted evaluating the effect of multiple factors specifically on low-income community-dwelling older adults' ability to grocery shop and prepare food. The socio-ecological model (SEM) can provide a framework from which to evaluate a complexity of factors affecting older adults' ability to perform food-related activities (Bronfenbrenner, 1977).

The purpose of the study reported here was to identify and evaluate if factors within multiple levels of the socio-ecological model were effective in explaining older SNAP participants' ability to grocery shop and prepare food.

Methods

Subjects

Subjects for the study were community-dwelling SNAP participants, 65 years of age and older. The Oklahoma Department of Health and Human Services provided a de-identified list of older SNAP participants from 45 counties whose population of older adults and poverty rates were above the average Oklahoma older adult population and poverty rate (US Census Bureau, 2013b). Of the counties included in the study, 44 were classified as rural, and one was classified as mixed (Oklahoma State University Centers for Rural Health, 2011).

Instrument

An instrument was developed to identify and evaluate the effect of factors within multiple levels of the SEM on older SNAP participants' ability to grocery shop and prepare food. The instrument included two dependent variable items addressing older adults' perception of their 1) ability to grocery shop *(How would you describe how well you are able to grocery shop)* and 2) ability to prepare food *(How would you describe how well you are able to prepare food)*, using a 5-point Likert scale response option: very poor, poor, average, good, and very good. In addition, the instrument included 49 independent variable items, hypothesized to impact older SNAP participants' ability to grocery shop and prepare food within the intrapersonal, interpersonal, and community SEM levels of influence, using the same 5-point Likert scale response option. Demographic questions were also included on gender, age, ethnicity, race, income, education, living arrangement, type of residence, and community size.

Expert face validity of the instrument was determined with a panel of four Oklahoma State University faculty with expertise in nutrition, nutrition education theory, and survey methodology. Indigenous

face validity of the instrument was determined with a group of six indigenous older SNAP participants. The final instrument was developed based on recommendations from these groups.

Data Collection

Data were collected via a telephone survey using the de-identified list of older SNAP participants, which was randomized using a random number generator. Three interviewers were trained to conduct the telephone survey. The telephone survey protocol was modeled after that used by the Oklahoma State University Bureau of Social Research (Stanley, Amato, Johnson, & Markman, 2006). Older adults who agreed to participate in the telephone survey gave their verbal consent. The interviewers read each instrument question, including response options, and recorded the participants' response. The study protocol was approved by the Oklahoma State University Institutional Review Board for Human Subjects.

Data Analysis

Instrument data were only included in the data analysis if all instrument Likert scale questions were completed. Item response options were coded as: very poor = 1, poor = 2, average = 3, good = 4, and very good = 5. Statistical analysis procedures were conducted with PC SAS, Version 9.1 for Windows (SAS Institute, Cary, NC). The level of significance was set at $p \leq 0.05$.

Participant demographic data were analyzed using frequency procedure. Exploratory factor analysis with varimax rotation was used to identify independent variable items that loaded into factors. Factor analysis produces orthogonal (i.e., independent) factors that are equally weighted and avoids problems with multicollinearity (McDermeit, Funk, Foss, & Dennis, 2000). Criteria used to retain factors were eigenvalue greater than 1.0 and containing at least three items loading at ≥ 0.4 (McDermeit et al., 2000). Cumulative multiple logistic regression analysis was used to determine how effective factors were in explaining older SNAP participants' ability to grocery shop and ability to prepare food. Cumulative multiple logistic regression analysis was used because it fit the ordinal nature of the item response options (Allison, 1995).

Results

Participants

Four hundred and twelve older adults participated in the telephone survey; however, only 370 completed all instrument Likert scale questions. The usable response rate was 21%. Demographic characteristics of participants who completed all Likert scale questions are presented in Table 1. The majority were females (84%), 65 to 74 years of age (55%), and Caucasian (84%). Eighty-five percent reported an annual income of less than $11,000, and 70% reported high school or less as the highest level of education. Sixty-eight percent reported living alone, and 65% percent reported living in a house. Only 2% reported living in a retirement center, all of whom reported living in their own apartment that included kitchen facilities. Seventy percent reported living in communities of less than 10,000.

Table 1.

Demographic Characteristics of Older Adult SNAP Participants

Variable	n	% [1]	Variable	n	% [1]
Gender			**Highest Level of education**		
Male	57	16%	Less than high school	127	35%
Female	310	84%	High school	125	35%
Age			Technical school	30	8%
65 – 74 years	203	55%	Some college	68	19%
75 – 84 years	137	37%	Bachelor degree	8	2%
85 + years	30	8%	Some graduate work	4	1%
Ethnicity			**Living arrangement**		
Non-Hispanic	269	96%	Live alone	246	68%
Hispanic	12	4%	Live with others	115	32%
Race			**Type of residence**		
Asian	1	<1%	House	230	65%
African American	27	7%	Apartment	57	16%
Native American	29	8%	Mobile home	52	15%
Caucasian	305	84%	Retirement center	7	2%
Other	1	<1%	Other	10	3%
Annual income			**Community size**		
Less than $11,000	297	85%	< 10,000	253	70%
$11,000 - $15,000	46	13%	10,000 – 50,000	103	28%
$15,000 - $18,000	4	1%	> 50,000	6	2%
> $18,000	2	1%			

[1]Percents for a demographic category may not total to 100 due to rounding.

Factors

Exploratory factor analysis with varimax rotation identified 11 factors. The independent variable items that loaded into each of the 11 factors are presented in Tables 2, 3, and 4. Five factors were within the intrapersonal SEM level of influence and were termed "Physical wellbeing," "Emotional

wellbeing," "Self-reliance," "Finances," and "Housing" (Table 2). Three factors were within the interpersonal SEM level of influence and were termed "Family interactions," "Friend interactions," and "Social support" (Table 3), and three factors were within the community SEM level of influence and were termed "Food access," "Public transportation," and "Free or reduced price transportation" (Table 4). One item (*How would you describe the benefit of the Supplemental Nutrition Assistance Program to you*) did not load into a factor.

Table 2.

Factors Within the Intrapersonal Level of the Socio-Ecological Model

Factors and Corresponding Items[1]	***Cronbach Alpha[2]* Item Loading[3]**
Physical wellbeing: How would you describe…	**α = 0.76**
your physical health.	0.75
your vision.	0.53
your muscle strength.	0.76
how well can you walk or stand.	0.78
how well can you use your hands or fingers.	0.66
your energy level.	0.74
Emotional wellbeing: How would you describe…	**α = 0.75**
your emotional wellbeing.	0.74
your fulfillment with life.	0.77
your attitude about life.	0.84
your level of happiness.	0.80
your peace of mind.	0.74
how you feel about your future.	0.73
Self-reliance: How would you describe…	**α = 0.76**
how well you can deal with health issues.	0.78
how well you can manage money.	0.79
how well you can make decisions.	0.74
Finances: How would you describe…	**α = 0.76**
the amount of money you have for your basic needs.	0.79
the amount of money you have for transportation.	0.86

the amount of money you have for food.	0.79
the amount of money you have for medical.	0.64
Housing: How would you describe…	**α = 0.77**
the amount of dry food storage space you have in your home.	0.77
the amount of cold food storage space you have in your home.	0.71
the appliances you have for cooking in your home.	0.67

[1]Factors and corresponding items based on exploratory factor analysis with varimax rotation. [2]Factor Cronbach alpha. [3]Item loading into factor.

Table 3.

Factors Within the Interpersonal Level of the Socio-Ecological Model

Factors and Corresponding Items[1]	***Cronbach Alpha[2]* Item Loading[3]**
Family interactions: How would you describe…	**α = 0.76**
the number of personal contacts you have with your family.	0.79
the quality of personal contacts you have with your family.	0.80
the number of telephone contacts you have with your family.	0.75
Friend interactions: How would you describe…	**α = 0.76**
the number of personal contacts you have with your friends.	0.83
the quality of personal contacts you have with your friends.	0.87
the number of telephone contacts you have with your friends.	0.78
Social support: How would you describe…	**α = 0.77**
the help you get with household tasks.	0.68
the help you think you would get with household tasks if	0.67

you needed it.	
the help you get with transportation.	0.76
the help you think you would get with transportation if you needed it.	0.65
the help you get with finances.	0.63
the help you think you would get from with finances if you needed it.	0.59
the emotional support you get.	0.51
the emotional support you think you would get if you needed it.	0.49

[1]Factors and corresponding items based on exploratory factor analysis with varimax rotation. [2]Factor Cronbach alpha. [3]Item loading into factor.

Table 4.

Factors Within the Community Level of the Socio-Ecological Model

Factors and Corresponding Items[1]	***Cronbach Alpha[2]*** **Item Loading[3]**
Food access: How would you describe…	**α = 0.76**
how well you are able to drive.	0.46
the availability of grocery stores in your community.	0.54
your ability to get to the grocery store.	0.71
the number of times you are able to go to the grocery store.	0.65
food prices at the grocery store.	0.41
customer service at the grocery store.	0.52
Public transportation: How would you describe…	**α = 0.79**
the availability of public transportation in your community.	0.88
your ability to get to public transportation.	0.85
your use of public transportation.	0.65
Free or reduced price transportation: How would you	**α = 0.79**

describe…	
the availability of free or reduced cost transportation in your community.	0.89
your ability to get to free or reduced cost transportation.	0.89
your use of free or reduced cost transportation.	0.69

[1]Factors and corresponding items based on exploratory factor analysis with varimax rotation. [2]Factor Cronbach alpha. [3]Item loading into factor.

Factors Effective in Explaining Ability to Grocery Shop and Prepare Food

Cumulative multiple logistic regression analysis identified several factors within multiple SEM levels of influence as being significant in explaining older SNAP participants' ability to grocery shop and prepare food. Factors significant in explaining older SNAP participants' ability to grocery shop were "Physical wellbeing," "Emotional wellbeing," "Self-reliance," "Finances," "Family interactions," "Friend interactions," "Social support," and "Food access" (Table 5), which represent multiple SEM levels of influence. Factors significant in explaining older SNAP participants' ability to prepare food were "Physical wellbeing," "Emotional wellbeing," "Self-reliance," "Housing," "Family interactions," "Friend interactions," "Social support," and "Food access" (Table 5), which also represent multiple SEM levels of influence.

Table 5.

Effect of Factors in Explaining Older Adult SNAP Participants' Ability to Grocery Shop and Prepare Food Within Multiple Socio-ecological Levels of Influence

Ability to Grocery Shop	**β Estimate**	**Chi-Square**	**Probability**
Intrapersonal level			
Physical wellbeing	1.3220	119.8419	<0.001
Emotional wellbeing	0.4701	21.9214	<0.001
Self-reliance	0.5759	31.5648	<0.001
Finances	0.3918		<0.001
Housing	0.0908	0.8348	0.361
Interpersonal level			
Family interactions	0.2375	5.8205	0.016
Friend interactions	0.3433	11.9627	<0.001
Social support	-0.5333	27.2527	<0.001

Community level			
Food access	1.0273	86.1556	<0.001
Public transportation	-0.0102	0.0108	0.917
Free or reduced price transportation	0.1086	1.2148	0.270

Ability to Prepare Food	**β Estimate**	**Chi-Square**	**Probability**
Intrapersonal level			
Physical wellbeing	1.3900	126.8064	<0.001
Emotional wellbeing	0.4533	20.7058	<0.001
Self-reliance	0.4830	23.3067	<0.001
Finances	0.1576	2.4932	0.114
Housing	0.2782	7.8225	0.005
Interpersonal level			
Family interactions	0.2816	8.1931	0.004
Friend interactions	0.4157	17.5764	<0.001
Social support	-0.3886	15.0759	<0.001
Community level			
Food access	0.5430	28.6916	<0.001
Public transportation	-0.0459	0.2197	0.639
Free or reduced price transportation	0.0861	0.7627	0.383

The factors that were significant in explaining both ability to grocery shop and prepare food were almost identical with the exception that, although logical, "Finances" was only significant in explaining ability to grocery shop, and "Housing" was only significant in explaining ability to prepare food (Table 5). In addition, all significant factors, except "Social support," were positively associated with both ability to grocery shop and prepare food. This indicates ability to grocery shop or prepare food increased with increasing physical wellbeing, emotional wellbeing, self-reliance, housing, family interactions, friend interactions, or food access. "Social support," however, was negatively associated with both ability to grocery shop and prepare food, indicating as ability to grocery shop or prepare food declined, social support increased (Table 5).

Discussion

The results of the study indicated several factors within multiple SEM levels of influence were significant in explaining older SNAP participants' ability to grocery shop and prepare food, which are consistent with a qualitative study by Keller et al. (2006), who also identified several themes within

multiple levels of the SEM as influencing lower-income older adults' food access.

An intriguing observation from the study results was, even though subjects were SNAP participants, the item "*How would you describe the benefit of the Supplemental Nutrition Assistance Program to you*" did not load into a factor. It was hypothesized that this item would fall into the factor "Finances." Additionally, while the factor "Finances" was significant in explaining older SNAP participants' ability to grocery shop, the factors "Physical wellbeing," "Food access," "Self-reliance," "Social support," and "Emotional wellbeing" all had greater β estimates than "Finances" (Table 5). This indicates that, although important, "Finances" was not the leading factor explaining older SNAP participants' ability to grocery shop. In fact, the three factors "Physical wellbeing," "Food access," and "Self-reliance" had the highest β estimates for both ability to grocery shop and ability to prepare food.

Another observation was that, although "Food access" was significant in explaining both ability to grocery shop and prepare food, the β estimate for "Food access" was almost twice as large for ability to grocery shop as for ability to prepare food (Table 5). Although reasonable, this indicates "Food access" explained more of older SNAP participants' ability to grocery shop than ability to prepare food. Similarly, both "Family interactions" and "Friend interactions" were significant in explaining ability to grocery shop and ability to prepare food. However, interestingly, the β estimate for "Friend interactions" was slightly larger than "Family interaction" in both cases, indicating "Friend interactions" explained slightly more of older SNAP participants' ability to grocery shop and prepare food than "Family interactions" (Table 5).

Although city transportation was identified by Keller et al. (2006) as a theme affecting food access, surprisingly, neither "Public Transportation" nor "Free or reduced price transportation" were significant in explaining older SNAP participants' ability to grocery shop. It is possible the participants in the study had already established strong social support from family and friends to provide transportation for grocery shopping.

Implications for Extension

The significance of several factors being effective in explaining older SNAP participants' ability to grocery shop and prepare food within various levels of the SEM demonstrates the importance of developing integrated SNAP educational programs addressing multiple levels of influence. In addition to providing education on purchasing and preparing economical foods, including education on maintaining overall wellbeing (physical, emotional, and self-reliance), purchasing and preparing foods within kitchen restrains, maintaining social interactions, availability of social supports and services, and overcoming barriers to access food could effectively impact older SNAP participants' overall ability to grocery shop and prepare food. Providing integrated approaches addressing multiple levels of influence can widen the scope and variety of programs offered which can then further enhance older adults' health, independence, and quality of life (American Dietetic Association, 2010; Rainey & Cason, 2001). Such integrated programming would require the collaboration and cooperation of Extension professionals from multiple disciplines to maximize program outcomes and lead towards improvements in older adults' ability to grocery shop and prepare food.

Limitations

A limitation of the study was the subjects were from a targeted audience of older Oklahoma SNAP participants. Therefore, the results of the study cannot be extrapolated to older adults as a whole.

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