Food Security Status of Older Adult Home-Delivered Meals Program Participants and Components of Its Measurement

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ABSTRACT. Food security status was assessed for 143 West Central Indiana community-dwelling older adults participating in a home-delivered meals program, using the national CPS-FSSM survey, based on economics, and augmented items, including such factors as ability to prepare and/or shop for food. Results showed that 74.8% were food secure, much lower than the national rate for households with elderly (94.0%). Gender and age were found to be statistically significant predictors of food security status (national items). Scores based on national versus augmented items were significantly correlated, but scores for augmented items showed more food insecurity, indicating these items

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identified more food insecure older adults than the national items alone.
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INTRODUCTION

Maintaining a good food security status in older adulthood is important because the negative effects of a lifetime can exert a cumulative effect in the older adult years, putting individuals at a higher risk for a variety of adverse health outcomes. Food security is defined as "access by all people at all times to enough food for an active, healthy life and includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods and (2) the assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, and other coping strategies)" (Klein, 1996). Conversely, food insecurity is defined as "the inability to acquire or consume an adequate quality or sufficient quantity of food appropriate for one's health in socially acceptable ways, or the uncertainty that one will be able to do so," as revised by Wolfe, Frongillo, and Valois (2003) for older adults (p. 2768).

Monitoring food security status is an important function for any public, or government food assistance program aimed at decreasing food insecurity (Nord, Andrews, & Carlson, 2005).

Measurement of Food Security Status

The standardized instrument, developed in 1993 for investigating food security status in the United States that is widely used today is the Current Population Survey–Food Security Survey Module (CPS-FSSM). The U.S. Department of Agriculture (USDA) collects data yearly on food security status of households, in collaboration with the U.S. Census Bureau. The CPS-FSSM has ten items for households without children and classifies food security into one of three categories; food secure, food insecure without hunger, and food insecure with hunger, which is further divided into moderate and severe (Bickel et al., 2000). It should be

noted that in the 2005 edition of Nord, Andrews, and Carlson's *Household Food Security in the United States, 2005*, the classifications for the food insecure categories changed from food insecure without hunger and food insecure with hunger, to low food security and very low food security. The CPS-FSSM is based on the premise that food security status of adults can be accurately assessed by using the ten items for households without children. However, Wolfe, Frongillo, and Valois (2003) have suggested that augmentation of the CPS-FSSM items may result in more accurate food security status assessment of older adults. They developed fourteen new items for possible augmentation of the CPS-FSSM. Augmented items addressed a variety of combinations of concepts, most of which dealt with eating the right food and meals for health. Using "health" in the item wording rather than "balanced meals," as used in the CPS-FSSM, was found by Wolfe, Frongillo, and Valois (2003) to have a higher sensitivity and to be more indicative of food insecurity in older adults. Derrickson, Sakai, and Anderson (2001) also questioned the validity and reliability of the term "balanced meals." When contacted by the current study's principal investigator, Frongillo noted that upon further reflection after publication of the article in 2003, the authors suggested eight items for inclusion in the current study. For a listing of the national and augmented items addressed in the current study, see Table 1.

Food Insecurity Prevalence in Older Adults

In 2005, 89.0% of U.S. households were food secure–up slightly from 2004 (88.1%). In 2005, households with elderly and elderly living alone had food secure rates of 94.0% and 93.6%, respectively (Nord, Andrews, & Carlson, 2006). In Indiana, 2002-2004, the percent of all households that were food secure was 89.9%, with 3.6% being food insecure with hunger (Nord, Andrews, & Carlson, 2005). It was estimated that 16.7% of the total population in Indiana was 60 years of age and over, as of July 1, 2004 (Administration on Aging, 2004).

The prevalence of food insecurity for older adults by age group, other than 65 years of age and older, is not well established because the majority of research on food insecurity has been done at the household level. The CPS-FSSM only addresses economic issues (Bickel et al., 2000), but for older adults there are many other factors that could affect food security status. Many of these factors could also affect an older adult's nutritional risk status. Nutritional risk deals with any factors associated with an increased probability of acquiring a disease, and many older

TABLE 1. National and Augmented Items Used in the Adapted Survey and Tally of Positive Responses

DIRECTIONS: "Circle" the answer that best describes how often these statements or questions were true for you in the last 12 months.
1. I worried whether my food would run out before I got money to buy more. 41 (28.7%)
2. The food that I bought just didn't last, and I didn't have money to buy more. 46 (32.2%)
3. I couldn't choose the right food and meals for my health because I couldn't afford them. 45 (31.5%)
4. I couldn't choose the right food and meals for my health because I couldn't get the food I needed even though I had money for food. 58 (40.6%)
5. I couldn't choose the right food and meals for my health because I was unable to prepare a meal even though I had food in the house. 67 (46.9%)
6. I worried that I would not eat the right food and meals for my health because I couldn't afford them. 42 (29.4%)
7. I worried that I would not eat the right food and meals for my health because I couldn't get the food I needed even though I had money for food. 53 (37.1%)
8. I worried that I would not eat the right food or meals for my health because I was unable to prepare a meal even though I had food in the house. 67 (46.9%)
9. I worried whether my food would run out because I couldn't get the food I needed even though I had money for food. 42 (29.4%)
10. Did you ever cut the size of your meals or skip meals because there wasn't enough money for food? 20 (14.0%)
11. Did you ever eat less than you felt you should because there wasn't enough money for food? 18 (12.6%)
11a. If yes, how many months of the year did this happen? _____ months 14 (9.8%)
12. Did you ever eat less than you felt you should because you couldn't get the food you needed even though you had money for food? 28 (19.6%)
13. Did you ever eat less than you felt you should because you were unable to prepare a meal even though you had food in the house? 48 (33.6%)
14. Were you ever hungry but didn't eat because you couldn't afford enough food? 15 (10.5%)
15. Did you ever lose weight because you didn't have enough money for food? 11 (7.7%)
16. Did you ever not eat for a whole day because there wasn't enough money for food? 8 (5.6%)
16a. If yes, how many months of the year did this happen? _____ months 5 (3.5%)

Note. Questions were answered yes or no. Statements were answered often, sometimes, or never. Responses of often, sometimes, and yes were collapsed and scored as 1 for data analysis. Responses of never and no were collapsed and scored as 0. National items are numbers 1, 2, 3, 10, 11, 11a, 14, 15, 16, and 16a. Augmented items are numbers 4, 5, 6, 7, 8, 9, 12, and 13. National item number 3 was changed to reflect the wording suggested by Wolfe, Frongillo, and Valais (2003).

adults are concerned about issues that deal with their health (Boyle & Holben, 2006). Although there is a lack of agreed upon conceptualization and operational indicators used for defining and measuring nutritional risk and nutritional status in older adults, and an undefined relationship of both to food security status, food security status could be impacted by

many, but not all, of these factors. One of the many barriers to understanding the relationship among nutritional risk, nutritional status, and food security status is the limited understanding of the circular or reciprocal relationship between them. Therefore, nutritional status and nutritional risk encompass many of the factors used to determine food security status, but food security status is just part of an older adult's nutritional status and risk. Frequently, the same tools, or parts of the same tools, are used to screen for both nutritional risk and food insecurity. At a minimum, direct indicators of food security status, which are also indicators of nutritional risk, include, but are not limited to (1) inability to feed oneself, (2) inability to shop for food due to transportation problems or physical impairments, (3) having sensory impairments that would affect cooking or eating activities (e.g., hearing, vision, taste, smell), and (4) not having anyone to come in and help when sick in bed (Boyle & Holben, 2006; Niedert & Dorner, 2004; Schlenker, 1998). These items are included in the augmented items (right food and meals for health, inability to prepare meals, and inability to get food) (see Table 1). Due to the nature of the survey design, exploration into the reasons/ causes for having problems with these issues is not addressed. Further studies would need to be done to explore these issues.

Home-Delivered Meals Program

The Older Americans Act of 1965 was amended in 1972 to establish and fund the federal Elderly Nutrition Program (ENP). The program includes the congregate meals program, the home-delivered meals program, and other nutrition services (Boyle & Holben, 2006). Eligibility criteria include all persons 60 years of age or older and their spouses, regardless of age, and does not include a specific income level. Services are targeted toward older adults with the greatest economic or social need. The home-delivered meals program is provided to older adults who are temporarily or permanently confined to home, due to disability, illness, isolation, or other extenuating circumstance (Administration on Aging, 2004; Boyle & Holben, 2006; Neidert & Dorner, 2004; Schlenker, 1998).

Although the ENP is required to provide at least one meal a day, five days a week, and meet at least one-third of the recommended dietary allowances (RDA) for older adults, in practice, many participants are receiving 40-50% of most required nutrients (Administration on Aging, 2004; Reppas, Rosenzweig, & Silver, 2004). Approximately half of the home-delivered meals participants save part of the meal for use with an-

other meal, but 16% save part of the meal for use as an entire meal either that day or for the weekend. Nationally, 16% of home-delivered meals participants reported recent instances of food insecurity: an occasion within the last month of having no food, having no money to buy food, or having to choose between buying food or medications (Administration on Aging, 1996; Schlenker, 1998). This building of a food reserve may represent striving to attain or maintain food security.

Reason for Concern

Potential consequences of food insecurity include hunger, malnutrition, hospitalization, and, if experienced long enough, death (Klein, 1996; Kretser et al., 2003; Mowe & Bohmer, 1996). Possible consequences of food insecurity may be classified into physical impairments related to insufficient food (illness and fatigue), psychological issues due to lack of access to food (feelings of constraint to go against held norms and values, and stress at home), sociofamilial disturbances (modification of eating patterns and related ritual, disruption of household dynamics, and distortion of the means of food acquisition and management), and decreased quality of life (Holben, 2002; Lee & Frongillo, 2001). The ability to perform the activities of daily living (ADLs) and the instrumental activities of daily living (IADLs) has an impact on an older adult's quality of life and the ability to continue to live independently. Feeding oneself (ADL), meal preparation (IADL), handling money (IADL), and shopping (IADL) have a direct effect on an older adult's food security status as well as nutritional risk. A national study found that heavy housework, shopping, and preparing meals were mentioned most frequently as being problems. For older adults, 84 years of age and older, preparing meals and shopping were problems for 26-37% (Schlenker, 1998). Sixty-four percent of home-delivered meals participants had difficulty shopping for food, and 41% were unable to prepare meals (Administration on Aging, Executive 1996). Home-delivered meals program participants (77%) needed assistance with, or had much difficulty with, one or more ADLs or IADLs, and 43% had experienced a hospital or nursing home stay during the previous year (Millen et al., 2002). The reason for concern arises because, in contrast to the congregate meals, the demand for home-delivered meals is steadily increasing every year (Reppas, Rosenzweig, & Silver, 2004). From fiscal year 1988 to fiscal year 1998 there was a 27.2% increase in participation in the home-delivered meals program (Silver & staff, 2001) and the need continues to increase. The ENP can decrease the length and frequency of hospital stays

and assist older adults with the ability to remain independent and non-institutionalized. However, home-delivered meals program participants generally have more health problems than congregate meals participants (Kretser et al., 2003; Niedert & Dorner 2004; Reppas, Rosenzweig, & Silver, 2004).

Food insecurity remains a problem for many older adults, including those in home-delivered meals programs (Millen et al., 2002; Schlenker, 1998; Stevens, Grivetti, & McDonald, 1992). Therefore, the purpose of this study was to investigate the issue of prevalence of food insecurity for older adults participating in the Area 7 Agency on Aging and Disabled home-delivered meals program (includes six West Central Indiana counties). These findings are important to the Agency for determining the effectiveness of the existing program and for determining areas of food insecurity that can be targeted for improvement. Food security status was compared for gender, race, age, marital status, living arrangement, educational level, and income level in an attempt to explain the level to which each variable affected food security status for this target population. This study also attempted to relate the home-delivered meals program participants' food security status, as determined by the widely used standardized national CPS-FSSM items, to their tentative food security status as determined by Wolfe, Frongillo, and Valois's (2003) augmented items. This comparison, in addition to research previously conducted by Duerr (2006), can further assist in determining whether the addition of the augmented items to the CPS-FSSM would better reflect food security status of older adults than just the national items alone.

METHODS

This study utilized an exploratory research design (Gall, Borg, & Gall, 1996). A convenience sample of participants were recruited by telephone from among the 17 routes of Area 7 Agency on Aging and Disabled home-delivered meals program. Participants of the study were community-dwelling older adults, 60 years of age or older, who required meals to be delivered to their homes. Site directors were apprised of the study details at a Directors meeting and encouraged to support and assist the researchers in recruitment. Site Directors informed their route drivers about the study, and drivers in turn encouraged the home-delivered meals program older adults to participate.

For eight consecutive weeks, the Agency supplied the principal investigator with names and telephone numbers of potential participants.

First year Coordinated Program dietetics students from the principal investigator's Nutritional Assessment Practicum class were assigned specific older adults to contact. Each week prior to the students placing the telephone calls, a memo from the Agency was delivered to all home-delivered meals clients explaining the study and encouraging them to participate. To help alleviate fears about being contacted via the telephone by someone the older adults did not know or trust, the memo had the name of the student who was going to call, lending credibility to the caller and increasing the chances for participation. The memo contained contact information for the principal investigator and the University's Institutional Review Board, for any questions or concerns the older adults might have concerning the study.

Students were trained in the study's procedures and survey instrument, and given a script to follow for recruitment of study participants. The script was adapted from the one used with the CPS-FSSM (Bickel et al., 2000) to accommodate the current study's procedure of asking all items of all participants. Training included how to handle potential interviewee problems that might occur: (1) swearing, (2) trying to continue the conversation after the interview items were completed, (3) interviewee questions the student could not answer, (4) client's hearing difficulties, (5) client distrust of student, (6) inconvenient time for client, and (7) client concerns about the closing of additional meal sites, which had recently occurred, and loss of their home-delivered meals. When students contacted the older adults, the study was explained again. The older adults were then asked if they were willing to participate. Verbal consent was given by the study's participants.

Data were recorded on an anonymous survey form which was coded to the home-delivered meals program route. Therefore, the identity of participants was unavailable to the principal investigator and the Agency. Data were analyzed using the Statistical Program for the Social Sciences (SPSS). The ten CPS-FSSM items and the eight augmented items, suggested by Wolfe, Frongillo, and Valois (2003), were tallied as to number of affirmative and negative responses.

For the national items, *The Guide to Measuring Household Food Security* (Bickel et al., 2000) explains how to handle items not answered by participants. Supplying answers for items that have been left unanswered (imputation) is based on the ordered character of the CPS-FSSM, which lists items from least to most severe. For example, if all items above or below the unanswered item are negative (or positive), then the item should be imputed as being the same. Also, if all items above the unanswered item were positive and all items below were negative then

the item is to be imputed as negative. Other scenarios are also given. Imputation is methodologically conservative to minimize false positives. Although the ordering is not universal, it is consistent enough to provide a defensible basis for imputing unanswered items.

For the statistical analysis of the ten CPS-FSSM national survey items, responses were coded (0 negative, 1 positive) and food insecurity scale values were assigned, with a maximum total of 10 for the 10 items. The complex and multidimensional nature of food insecurity progresses through a continuum of successive stages as food insecurity becomes more severe. Each separate item reflects a different degree of severity. Participants with a zero did not experience any of the food insecurity situations represented by the items, and participants with a 10 experienced, at some level, all of the food insecurity situations represented by the items. Items 11a and 16a were coded as "no" for 0-2 months and "yes" if more than 2 months. Participants were grouped into one of the four food security status categories based on the total food insecurity score values. Participants with a score of 0-2 were considered food secure (coded 1), 3-5 food insecure without hunger (coded 2), 6-8 food insecure with moderate hunger (coded 3), and 9-10 food insecure with severe hunger (coded 4) (Bickel et al., 2000; Nnakwe, 2003).

To evaluate the augmented items, inferences and implications were extrapolated from the data to analyze the comprehensiveness of the CPS-FSSM in measuring the food security status of the participants. The augmented items were tallied and then each individual participant was very loosely assigned to a food security status level to more easily compare the ranking of food security status as measured by the two methods. Zero to 2 positive responses indicated food secure; 3-4, food insecure without hunger; 5-6, food insecure with moderate hunger; and 7-8, food insecure with severe hunger. These arbitrary rankings should not be construed as accepted segmentations for ranking, but rather just a method by which to compare the national and augmented items. They have no meaning beyond this purpose.

Cross-tabulation analysis was done to summarize food security status (based on food security level) by gender, race, age, marital status, living arrangement, educational level, and income level for both the national and augmented items. A chi-square test was used to compare how the participants varied in food security level for each of the seven variables, again, for both national and augmented items. Due to the homogeneous characteristics of the study sample, the three levels of food insecurity (without hunger, with moderate hunger, and sever hunger) were classified as food insecure. Therefore, statistical analyses were run

using only two levels of food security status (secure and insecure). A logistic regression analysis was conducted using the seven variables as predictors of the two measures of food security status for both national and augmented items. The closely related Cox-Snell R^2 and Nagelkerke R^2 statistics summarize how much variability in the data is successfully explained by the model. The closer these values are to 1, the better the model explained the variations in the data. A correlation analysis was also carried out to examine the relationship between the national items scores and the augmented items scores. In all analyses, a p-value of .05 was set a priori to identify differences in variables that were statistically significant.

RESULTS

National and Augmented Items

There were 143 home-delivered meals program participants surveyed. This was approximately 40% of the potential participants. The study's population was primarily female (79.0%), white/Caucasian (88.1%), between the ages of 75 and 84 (44.8%), and widowed (49.7%). Over two-thirds were living alone (69.7%); the largest percentage were high school graduates with no formal training beyond that (42.0%); and 90.2% had incomes less than $20,000. Fourteen percent of the participants did not respond to the income item, which will be discussed later in the discussion section. Since the home-delivered meals program targets those older adults who have much higher needs than the general population (economically and socially), it is not surprising that the demographics for the current study did not reflect the demographic characteristics of Indiana's general population for adults 60 years of age and older. The current study had a much higher representation for African-Americans, females, older adults living alone, widowers, and those in the lower income categories. Also, the higher age categories, 75 years and older, were more heavily represented in the current study (77%) than for Indiana's older adult population (35.9%). In general, the only category representative of Indiana's older adults was educational level (Administration on Aging, 2000). Again, due to the homogeneous nature of the study sample, many of the sub-categories under the demographic variables were collapsed for a more meaningful analysis of the data.

Previous research found that for households with older adults present, 65 years of age or older, 94.1% were food secure throughout the year

(Nord, 2002). Also, in 2005 for households with elderly, 94.0% were food secure (Nord, Andrews, & Carlson, 2006). These are much higher percentages than the 74.8% for the national items in the current study, based on individuals. This reflects the much higher level of need for home-delivered meals program participants. Based on the augmented items, only 55.2% of the home-delivered meals program participants were food secure. Tables 2 and 3 present the relationship between food security status and gender, race, age, marital status, living arrangement, educational level, and income level for the national and augmented items, respectively.

For the national items, the current study found that 90.0% of the males and 70.8% of the females were food secure. The same pattern was found for the augmented items with percentages of those that were food secure being much lower (males 73.3%, females 50.4%). A chi-square analysis, on the relationship between food security level and gender for both national and augmented items, showed there was a statistically significant difference between males and females for food security status (see Tables 2 and 3).

A national evaluation of the home-delivered meals program found that approximately 27% of participants were minorities (Reppas, Rosenzweig, & Silver, 2004); however, Indiana minorities only account for 7.4% of the 60 years of age and older population (Administration on Aging, 2000). For the current study, 88.1% of the participants were white/Caucasians and 11.9% were Other. Chi-square test analyses of both national and augmented items scores showed that the food security status did not vary significantly with race [χ^2 nat. (1, n = 143) = .18, p = .443; χ^2 aug. (1, n = 143) = .70, p = .447]. However, there was a statistically significant difference in food security status among age groups of this study based on national items scores [χ^2 nat. (3, n = 143) = 18.55, p < .001; χ^2 aug. (3, n = 143) = 3.44, p = .328]. This variation was accounted for by the difference between the 60 and 64 years of age group, who were least secure, and all other age groups. For the current study, the data seemed to indicate that as older adults age, they become more food secure. This is not what would be generally expected and will be discussed more under the discussion section. Based on the augmented items scores, food security status did not vary significantly with age.

Although married older adults are generally more food secure than those who are not married, this was not confirmed by this study using either the national or augmented items [χ^2 nat. (1, n = 143) = .71, p = .453; χ^2 aug. (1, n = 143) = 1.38, p = .308]. Unlike marital status, the living arrangement was not significantly different for the national items but was

TABLE 2. Relationship Between Food Security Status and Gender, Race, Age, Marital Status, Living Arrangements, Educational Level, and Income Level, Based on the National Items

Characteristic	Food Secure		Food Insecure		Total	χ^2 Value	p Value
	Freq.	%	Freq.	%			
Gender							
Male	27	90.0	3	10.0	30	4.641	.031*
Female	80	70.8	33	29.2	113		
Race							
White/Caucasian	95	75.4	31	24.6	126	.184	.433
Other	12	70.6	5	29.4	17		
Age							
60-64	1	14.3	6	85.7	7	18.546	< .001*
65-74	17	65.4	9	34.6	26		
75-84	49	76.6	15	23.4	64		
85 or over	40	87.0	6	13.0	46		
Marital Status							
Married	24	77.4	7	22.6	31	.707	.453
Not Married	83	74.1	29	25.9	112		
Living Arrangements							
Living Alone	75	75.8	24	24.2	99	.029	.511
Living with Others	32	74.4	11	25.6	43		
Educational Level							
Less than High School	26	63.4	15	36.6	41	4.000	.135
High School Graduate	48	80.0	12	20.0	60		
Higher than High School	33	78.6	9	21.4	42		
Income Level							
Less than $10,000	46	70.8	19	29.2	65	5.234	.073
$10,000 to $19,999	31	67.4	15	32.6	46		
$20,000 and above	12	100.0	0	0.0	12		

Note. Not married includes single, separated, widowed, and divorced.
*Significant at 0.05 level.

significantly different for the augmented items [χ^2 nat. (1, n = 143) = .03, p = .511; χ^2 aug. (1, n = 143) = 3.48, p = .045]. Generally speaking, living alone puts an older adult at higher risk for food insecurity. This was confirmed in the current study based on augmented items, but not the national.

The study showed that educational level did not have a statistically significant effect on food security status for either the national or augmented items [χ^2 nat. (2, n = 143) = 4.00, p = .135; χ^2 aug. (2, n = 143) = 3.35, p = .187]. It is generally accepted that the higher the level of education, the higher the level of food security. This was loosely confirmed by the current study. For the national items, the high school graduates did tend to

TABLE 3. Relationship Between Food Security Status and Gender, Race, Age, Marital Status, Living Arrangements, Educational Level, and Income Level, Based on the Augmented Items

Characteristic	Food Secure		Food Insecure		Total	χ^2 Value	p Value
	Freq.	%	Freq.	%			
Gender							
Male	22	73.3	8	26.7	30	5.024	.025*
Female	57	50.4	56	49.6	113		
Race							
White/Caucasian	68	54.0	58	46.0	126	.698	.447
Other	11	64.7	6	35.3	17		
Age							
60-64	2	28.6	5	71.4	7	3.443	.328
65-74	13	50.0	13	50.0	26		
75-84	35	54.7	29	45.3	64		
85 or over	29	63.0	17	37.0	46		
Marital Status							
Married	20	64.5	11	35.5	31	1.376	.308
Not Married	59	52.7	53	47.3	112		
Living Arrangements							
Living Alone	50	50.5	49	49.5	99	3.484	.045*
Living with Others	29	67.4	14	32.6	43		
Educational Level							
Less than High School	24	58.5	17	41.5	41	3.354	.187
High School Graduate	28	46.7	32	53.3	60		
Higher than High School	27	64.3	15	35.7	42		
Income Level							
Less than $10,000	33	50.8	32	49.2	65	4.715	.095
$10,000 to $19,999	23	50.0	23	50.0	46		
$20,000 and above	10	83.3	2	16.7	12		

Note. Not married includes single, separated, widowed, and divorced.
*Significant at 0.05 level.

have a higher food security rate than participants with less than a high school education, but the participants with higher than a high school education had a lower rate of food security than those with a high school education.

An increase in income level would generally increase a person's food security status. The study showed that income level did not have a statistically significant effect on food security status for either the national or augmented items [χ^2 nat. (2, n = 143) = 5.23, p = .073; χ^2 aug. (2, n = 143) = 4.72, p = .095], probably due to the high percentage of participants in the lowest two income levels (90.2%). Participants with an income of less than $10,000 tended to be slightly more food secure than

those with incomes between $10,000 and $19,999. For both the national and the augmented items, food security status tended to increase with an increase in income level, as would generally be expected.

In order to better understand the food security status of participants, based on the national items, the demographic variables were used as predictors of two levels of food security status (secure or insecure). According to Cox and Snell R^2, statistics of logistic regression, the proportion of variance in food security status accounted for by the linear combination of gender, race, age, marital status, living arrangement, educational level, and income level was 27.6% (NagelKerte R^2 =.400). Overall, this model classified 77.9% of the participants into their correct food security status level, with 91.0% of the food secure but only 42.4% of the food insecure correctly classified. The model also showed that age and gender were the only statistically significant predictors of food security status for this study (see Table 4).

In order to better understand the food security status of participants, based on the augmented items, the demographic variables were used as predictors of food security status (secure or insecure) for the augmented items. According to Cox and Snell R^2, statistics of logistic regression, the proportion of variance in food security status accounted for by the

TABLE 4. Predictors of Food Security Level (National Items)

		B	S.E.	Wald	df	Sig.	Exp (B) (Odds Ratio)	95.0% C.I. for EXP (B)	
								Lower	Upper
Step 1[a]	Gender	2.780	1.156	5.779	1	.016	16.120	1.671	155.518
	Race 1 (1)	.356	.706	.255	1	.614	1.428	.358	5.703
	Age			13.470	3	.004			
	Age (1)	−4.963	1.526	10.579	1	.001	.007	.000	.139
	Age (2)	−2.151	.796	7.309	1	.007	.116	. 024	.553
	Age (3)	−1.342	.672	3.989	1	.046	.261	.070	.975
	MarStat 1 (1)	.385	.949	.165	1	.685	1.470	.229	9.447
	LivArra 1 (1)	.252	.776	.105	1	.746	1.286	.281	5.890
	EducLv			2.918	2	.232			
	EducLv (1)	.264	.648	.166	1	.684	1.302	.366	4.637
	EducLv (2)	1.037	.649	2.554	1	.110	2.822	.791	10.068
	IncomeLv 1			.083	2	.960			
	IncomeLv 1 (1)	−20.670	10033.053	.000	1	.998	.000	.000	
	IncomeLv 1 (2)	−20.520	10033.053	.000	1	.998	000	.000	
	Constant	21.218	10033.053	.000	1	.998	2E+009		

[a]Variable(s) entered on step 1: Gender, Race 1, Age, MarStat 1, LivArra 1, EducLv, IncomeLv 1.

linear combination of gender, race, age, marital status, living arrangement, educational level, and income level was only 13.7% (NagelKerte R^2 =.183). Overall, this model classified 60.7% of the participants into their correct food security status level, with 69.7% of the food secure, and 50.0% of the food insecure correctly classified. The model showed that none of the variables were statistically significant predictors of food security status for this study (see Table 5).

Frequencies of positive responses, for the augmented items, ranged from 28 to 67 (19.6-46.9%) as shown by individual item tallies in Table 1. When comparing results of the two survey measures, the number of food secure older adults decreased by 26.2% and the number of food insecure older adults increased by 77.8% when the augmented items were used (see Table 6). These frequency changes in food security status, from

TABLE 5. Predictors of Food Security Level (Augmented Items)

		B	S.E.	Wald	df	Sig.	Exp (B) (Odds Ratio)	95.0% C.I. for EXP (B)	
								Lower	Upper
Step 1[a]	Gender	.855	.535	2.549	1	.110	2.351	.823	6.716
	Race 1 (1)	−.258	.634	.165	1	.685	.773	.223	2.678
	Age			3.621	3	.305			
	Age (1)	−1.629	.991	2.699	1	.100	.196	.028	1.370
	Age (2)	−.809	.623	1.690	1	.194	.445	.131	1.508
	Age (3)	−.336	.476	.498	1	.480	.715	.281	1.817
	MarStat 1 (1)	.365	.771	.225	1	.636	1.441	.318	6.528
	LivArra 1 (1)	−1.071	.674	2.526	1	.112	.343	.092	1.284
	EducLv			3.533	2	.171			
	EducLv (1)	.106	.546	.037	1	.847	1.111	.381	3.239
	EducLv (2)	−.725	.501	2.095	1	.148	.484	.181	1.293
	IncomeLv 1			2.303	2	.316			
	IncomeLv 1 (1)	−1.276	.891	2.050	1	.152	.279	.049	1.601
	IncomeLv 1 (2)	−1.341	.893	2.254	1	.133	.262	.045	1.506
	Constant	2.578	1.141	5.103	1	.024	13.173		

[a]Variable(s) entered on step 1: Gender, Race 1, Age, MarStat 1, LivArra 1, EducLv, IncomeLv 1.

TABLE 6. Change in Food Security Status Between the Two Survey Measures

	Food Secure	Food Insecure
National Items	107	36
Augmented Items	79	64
% Change	26.2% ↓	77.8%↑

the national items to the augmented items, makes a compelling case for including all or part of the augmented items into the national CPS-FSSM, when surveying older adults.

The correlation analysis performed between the national items from the CPS-FSSM and the augmented items as suggested by E. Frongillo, was statistically significant ($r = .385$, $p \leq .001$). This highly significant correlation shows that while some participants were classified as food insecure based on economics alone (national items), their food security status was also further defined by the additional issues (augmented items).

Imputations/No Responses

For the current study, .28% of the CPS-FSSM items and.17% of the augmented items were imputed, for an average of .23% imputed items. Due to the nature of the augmented items, not necessarily ordered in the same manner as the CPS-FSSM items, imputation was based on the instructions for the CPS-FSSM items, and on responses to similar items from the CPS-FSSM (e.g., preparation items compared with preparation items). The experience to date with the CPS-FSSM is that the lack of response to an item is rare, about one-half of one percent (Bickel et al., 2000). Therefore, the current study required imputation for less than half of the national average. This is also much lower than that found in a previous study, where .9% of the national items and 1.3% of the augmented items, for an average of less than 1.1% for both items, needed to be imputed (Duerr, 2006). However, the previous study was conducted at congregate meal sites using self-administered surveys, whereas, the current study was conducted using telephone interviews. Vailas et al. (1998), who collected data from both congregate and home-delivered meals program participants, needed to impute 2.1% of the scale item values overall (one of six scales was food security). Therefore, the current study was more successful than other studies have been in obtaining complete information from participants.

DISCUSSION

Gender. The current study showed more food insecurity among females (29.2%) than males (10.0%) for the national items. The same trend was found with the augmented items, but to a much higher degree, where 26.7% of the males and 49.6% of the females were food insecure. Sharkey (2004) also found that home-delivered meals program females

were more food insecure (59.1%) than males (55.4%), but at a much higher rate than for the current study. This could be due in part to the larger percentage of minorities in his study (77%), as minorities are generally considered to be more food insecure than the overall older adult population (Hall & Brown, 2005). Conversely, the findings for the current study were not consistent with a previous study conducted with congregate meals program participants from the same geographic area, which found that males were more food insecure (29.0%) than females (15.1%) (Duerr, 2006). This could possibly be due to a larger percentage of females being drawn to the congregate meals sites for the social aspect of the program, while males chose to attend due to reasons that would make them more food insecure than females.

Race. Nationally, older black and Hispanic adults are more likely to live in food insecure households (18.9% and 15.4%, respectively) than older white adults (3.7%) (Hall & Brown, 2005). Although not a direct measure of food security status, a study of home-delivered meals participants found that almost 70% of all participants were at high risk for poor nutritional status, with the prevalence being greatest among blacks, and especially black women (Sharkey & Schoenberg, 2002). During another study (N = 279), Sharkey (2003) found that of the women who were food sufficient (n = 163), 41.1% were black, and of those that were food insufficient (n = 27), 74.1% were black. For the national items, the current study found that the minority participants ("others"), which were primarily African-American, tended to be more food insecure (29.4%) than the white participants (24.6%), but not to the degree of the previously cited studies. The augmented items found an even higher level of food insecurity for minority participants (35.3%) and the white participants (46.0%) than did the national items. Although the current study is more heavily representative of minority groups in Indiana than the general population, the previously cited studies had a much higher overall percentage representation of minority groups than did the current study.

Age. As older adults continue to age, it is generally expected that their food security status would continue to decline, meaning older adults 60-64 years of age would be more food secure than those 85 and older. Although previous research has shown this to be generally true (Davis et al., 1990), the current study did not confirm this. Food security status was progressively better with each age group, with the 60-64 years of age group being least food secure (national items) and the 85 and older group being the most food secure. Although not statistically significant, the augmented items showed the same trend, but with lower food security percentages for most of the age categories. Several other studies

with home-delivered meals participants have found the same pattern (Sharkey, 2003; Sharkey, 2004). The findings for the current study are also consistent with a study conducted with congregate meals program participants from the same geographic area, which found the highest percentage of food insecurity in the 60-64 years of age group (Duerr, 2006). Sharkey and Schoenberg (2002) found that age was inversely associated with increasing nutritional risk, which could affect food insecurity, for women in a home-delivered meals program, meaning that younger adult women (60-74 years of age) were at a higher nutritional risk than were older adult women ($\geq$ 85 years of age). They explained this contradiction to existing research, by noting that the home-delivered meals program is biased toward accepting those at greatest risk. This means when there is a new opening, relatively young, but more vulnerable individuals, are accepted before others with less of a need. These more vulnerable individuals would probably not survive to the older age groups. Sharkey and Schoenberg (2002) also suggested that the comparatively healthier participants that are able to stay within the community and continue to receive home-delivered meals, rather than become institutionalized, survive to the older age groups. Therefore, the younger age groups are at a higher level of food insecurity than the older age groups. Individuals admitted because of their advanced years, rather than health or functional reasons, may not be as food insecure when admitted as were the younger aged adults. Based on an understanding of the home-delivered meals system, this researcher concurs with the assessment of these seemingly contradictory findings of other researchers. Another possible reason why food security status increased as age increased is that neither life-savings nor paid off mortgages of older adults are reflected by income levels. Both free up money that could be used for food consumption, consequently making some older adults more food secure. Also, the CPS-FSSM is based on self-assessment and older adults who lived through the Great Depression are less likely to categorize current food deprivation as being an issue worth reporting (Rose, 1999). Since part of the food security status instrument addresses whether older adults "worried" about a variety of issues, these Great Depression survivors would not get to the "worrying" stage as quickly as younger older adults who did not experience this same life event.

Marital Status. Previous research with women receiving home-delivered meals found that of those that were married 40.5% were food sufficient, 54.1% were at risk for food insufficiency, and 5.4% were food insufficient, thereby not supporting the generally accepted idea that married older adults are more food secure (Sharkey, 2003). Another study

found that home-delivered meals participants that were not married had a slightly higher food insecurity status (53.0%) than those that were married (47.0%) (Sharkey, 2004), supporting the idea that married older adults are more food secure. Nnakwe (2003) also found that congregate meals participants followed what would generally be expected with married older adults, 96.6% were food secure as compared to those without a spouse who were 87.1% food secure. A previous study, conducted with older adult congregate meals participants from the same geographic area, found that 78.3% of married and 81.1% of not married participants were food secure (Duerr, 2006). This is not what would generally be expected. Conversely, the current study (national and augmented items) does loosely follow what would generally be expected with married participants tending to be more food secure than those that were not married.

Living Arrangements. The concept that living alone puts an older adult at increased risk for food insecurity was not fully supported by the current study. For the national items, participants living alone were slightly more food secure than those living with others, and for the augmented items, participants living with others were significantly more food secure. Therefore, this study supports, if only in part, the basic concept that living alone increases the risk for food insecurity. A previous study conducted with older adults from the same geographic area found that, of the participants that were food secure, 79.9% lived alone and 81.0% lived with others (Duerr, 2006). Sharkey and Schoenberg (2002) found that living alone was associated with increasing levels of nutritional risk for older black and white women receiving home-delivered meals, which could possibly put them at higher risk for food insecurity. For the above studies, food security rates were lower than the national rate (6.4%) for older adults 65 years of age or older living alone (Nord, Andrews, & Carlson, 2006).

Educational Level. Although food security level is expected to increase as educational level increases, the current study only found this to be partially true (national items). Overall, those with a high school education or higher tended to be more food secure than those with less than a high school education. A previous study within the same geographic area, but with congregate meals participants, found the same results. Similarly, those with a high school education or higher tended to be more food secure than those with less than a high school education (Duerr, 2006). Conversely, Nnakwe (2003) found that participants 55 years of age or older that had less than a high school education were significantly ($p \leq .05$) more food secure (92.1%) than those with a high

school or higher education (88.5%). This is similar to the findings based on the augmented items for the current study, which found that those with less than a high school education were more food secure than those with higher than a high school education, but less secure than those with higher than a high school education. This finding generally defies explanation, except that the augmented items have not been previously studied to determine their accuracy in measuring food security status.

Income Level. Income is the primary determinant upon which food security status is measured with the CPS-FSSM. As income increases, it is expected that the level of food security will increase. The current study generally confirmed this, but not in a linear manner for the national items. Participants with incomes less than $10,000 tended to be slightly more food secure than those with incomes $10,000 to $19,999. For the income category above these levels, all participants were 100% food secure. Although this confirms what would be expected, it should be noted that 90.2% of the participants were in the first two income groups, near or below the poverty level. Again, this reflects the prioritization system used to select home-delivered meals participants. The augmented items followed the same non-linear pattern as the national items. A study conducted in the same geographic area, with congregate meals participants, found similar results that were linearly consistent with what would be expected (Duerr, 2006). In previous research, Sharkey (2004) found that of the older adults that were considered as living in poverty, 65% were food insecure.

An interesting phenomenon that occurs when studying older adults is the reluctance of participants to give income information. This study was no exception; 14% did not respond to the income query. Sharkey (2004) encountered 17% of home-delivered meals participants, Duerr (2006) encountered 12.2% of congregate meals participants, and Vailas et al. (1998) encountered 15% of Title III participants that did not respond to the income query. Others have reported much higher rates. Neyman, Zidenberg-Cherr, and McDonald (1996) reported 35% of female and 48% of male congregate meals participants did not respond to the income query. On the surface, it would appear that participants of the ENP are more reluctant to give income information than older adults in general. However, Nord (2002) reported that nationally 21.4% of older adults did not respond to the income query. This would suggest that many older adults, irrespective of ENP participation, are unwilling to give income information. This is something for future researchers to remember when planning research projects with older adults.

According to the logistic regression analysis, using gender, race, age, marital status, living arrangement, educational level, and income level as predictors of the two levels of food security status (secure or insecure), the national items scores better classified participants into their correct food security status level than did the augmented items scores (national 77.9%, augmented 60.7%). This study also makes a compelling case for inclusion of all or part of the augmented items into the CPS-FSSM, when surveying older adults, based on the decrease in food secure status and increase in food insecure status as compared by the national versus augmented item frequencies.

A correlation analysis was carried out to examine the relationship between the national items scores and the augmented items scores. It showed a statistically significant positive relationship ($r = .385$, $p \leq .001$). As the scores for the national items increased to a progressively more severe level of food insecurity, so did the scores for the augmented items. Therefore, the augmented items are a representative indicator of the national items.

As with a previous study (Duerr, 2006), the findings from the current study strongly suggest that augmentation of the CPS-FSSM with several or all of the augmented items would make the CPS-FSSM a more comprehensive tool for assessing the food security status of older adults, even though the combination of the two do not completely measure all factors that could affect food security status in older adults. Health issues and having difficulties with accessing food, meaning shopping and preparing food, are common concerns among older adults. Wolfe, Frongillo, and Valois (2003) found that "having the right food and meals for health," and "having difficulty in reliably obtaining these foods" was in fact very important to older adults. They concluded that the augmented items containing "couldn't afford right foods for health," "couldn't get the food I needed," and "unable to prepare," should be added to the CPS-FSSM when surveying older adults. This includes all eight augmented items and the reworded #3 item from the CPS-FSSM (see Table 1). For the current study, the items mentioning "the right food and meals for health" generally had the highest percentages of participants giving positive responses; from 29.4% to 46.9%. This finding is similar to a previous study (Duerr, 2006), but percentages of positive responses for the current study were higher for all augmented items. This is predictable since home-delivered meals participants are generally at a higher risk for food insecurity than congregate meals participants. The repetitive nature of the items on the survey made it difficult for the older adult participants to distinguish between them. Rearranging several of the

items may make the survey less confusing for them. Therefore, it is suggested that putting like items together and arranging all 18 items to a more ordered level of severity, like putting "I worried" items before their "I couldn't" counterparts, may help with this issue (e.g., put #2 before #9, #4 before #7, and #5 before #8).

CONCLUSIONS

The current study showed that level of food security varied significantly for gender and age (national items). Although previous studies have shown differences in levels of food security based on race, marital status, living arrangements, educational level, and income level (Davis et al., 1990; Duerr, 2006; Hall & Brown, 2005; Nnakwe, 2003; Sharkey, 2003; Sharkey, 2004), the current study showed that level of food security did not significantly differ with these variables.

Based on the national items, the current study found that 74.8% of the participants were food secure and 25.2% were food insecure. These percentages were higher for the current study, as compared with the 2005 national percentages for households with elderly and elderly living alone, for food insecure rates (6.0% and 6.4%) (Nord, Andrews, & Carlson, 2006), and for Indiana food insecure rates for all households (9.9%) (US Census Bureau, 2006). This is logical since the home-delivered meals program accepts older adults at higher risk for nutritional problems than the older adult population in general.

Another important finding from this study was that for the food secure level, almost all categories within the variables had a lower percentage for the augmented items than for the national items. Although the combined impact of the national items (economics) and the augmented items (other issues) was not tested, implications of this suggest that the addition of the augmented items to the national survey would indeed identify more older adults as being food insecure, than what are currently being identified by using just the CPS-FSSM. Although combining these two measures may not identify all factors affecting food security status in older adults, they would come a bit closer than what is currently being done to determine true comprehensive food security status. Future studies could develop a tool that would evaluate the food security status of older adult participants using the combined national and augmented items, and then compare those findings with food security status using just national items alone.

A limitation of this study was that home-delivered meals program participants may not respond truthfully to the survey items for fear of losing services. Another limitation is that only those who were willing to participate were surveyed. Individuals that chose not to participate may have had a different impact on the final results of this study.

A further limitation of this study is that an in-depth investigation of functional status and health issues, two factors that could have an affect on food security status, were not included. It is acknowledged that they are not constants, but rather other variables that could have an effect on food security status. However, only items that Wolfe, Frongillo, and Valois (2003) included in their study were included in this study. Their study did not include these two issues beyond what was addressed by the augmented items (having the right food and meals for their health, inability to prepare meals, and inability to get the food) (see Table 1). Since the purpose of this study was to determine food security status of older adult home-delivered meals program participants using the standardized CPS-FSSM, and then to examine whether the addition of the augmented items would better reflect the food security status of older adults than just the national items alone, a true completely comprehensive picture of the food security status of the participants was not collected and is not known. There are far more factors that could affect food security status in older adults than just those represented by the CPS-FSSM and the augmented items. Therefore, it is suggested that further studies be done that include all of the national items, augmented items, and other factors that could affect food security status, such as additional functional status and health issues.

An important issue to address is the generalizability of food security status of home-delivered meals participants based on age. The current study, as well as others, found that contrary to what would generally be expected, home-delivered meals programs seem to have participants that are less food secure at the younger ages and more food secure at the older ages. Therefore, maybe this is what should be expected in future studies that address food security status of home-delivered meals participants. More studies need to be done with this population to determine if this generalization would continue to be confirmed.

Having the right food and meals for health, and having difficulty in reliably obtaining these foods, has implications for home-delivered meals program interventions. These issues should be addressed by policymakers to decrease the number of older adults having difficulties with these two issues, thereby decreasing the overall number of older adults experiencing food insecurity. Further studies need to be conducted with

a variety of older adult groups so that findings could be generalized to more of the older adult population. Studies need to be conducted using all or some of the augmented items along with the CPS-FSSM items, in order to determine which, if not all, of the augmented items would provide a more comprehensive assessment of older adult food security status. Based on their performance in additional studies, further suggestions could be made as to which augmented items should eventually be added to the national survey.

Data collected from the current study can assist the Area 7 Agency on Aging and Disabled in educating local communities and policymakers at all levels about the extent of food insecurity among local older adults. Findings will provide insight and increase understanding of the consequences associated with food insecurity, and will provide guidance for improving the nutrition meal service to older adults. The findings from this study can also be used to assess current and future program planning and policymaking.

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