

**Predictors of Food Security Status in Older Adults
Living in the Northeast United States**

by

Claudia M. Kregg-Byers

BSN, University of Pittsburgh, 2004

MMPH, University of Pittsburgh, 2014

Submitted to the Graduate Faculty of
the School of Nursing in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

University of Pittsburgh

2014

UNIVERSITY OF PITTSBURGH

SCHOOL OF NURSING

This dissertation was presented

by

Claudia M. Kregg-Byers

It was defended on

November 25, 2013

and approved by

Willa M. Doswell, RN, PhD, FAAN, Associate Professor

Judith Tabolt Matthews, PhD, MPH, RN, Research Associate Professor

Lauren Terhorst, PhD, Assistant Professor

Eric G. Rodriguez, MD, MPH, Associate Professor of Medicine

Dissertation Advisor: Elizabeth A. Schlenk, PhD, RN, Associate Professor

Copyright © by Claudia M. Kregg-Byers

2014

Predictors of Food Security Status in Older Adults Living in the Northeast United

States Claudia M. Kregg-Byers, PhD, MPH, RN

University of Pittsburgh, 2014

Little is known about food security of older adults in the Northeast U.S. This study of existing data from the 2008 national Current Population Survey and Food Security Survey datasets used a descriptive correlational design to describe food security status and identify its predictors in 3,207 respondents ≥ 65 years of age in the Northeast U.S. Simple and multivariable binary logistic regression modeling examined nine predictors of food security status, based on environments of the Ecological Model of Health Behavior. Nearly 6% of the sample lacked adequate food security status. Respondents who were young old, non-white, Hispanic, less educated, below the poverty income range, lived in non-metropolitan areas, and participated in food assistance programs were at risk for inadequate food security status after controlling for all other variables in the model. Sex and marital status were significant predictors individually, but non-significant in the multivariable model. These findings create a profile of risk factors for inadequate food security status for older adults in this geographical area suggesting that health professionals assess food security status during all healthcare encounters with at-risk patients.

TABLE OF CONTENTS

PREFACE.....	XII
1.0 SPECIFIC AIMS.....	1
1.1 BACKGROUND AND SIGNIFICANCE.....	2
1.1.1 Causes and Consequences of Inadequate FS Status.....	4
1.1.2 Strategies for Coping with Inadequate FS Status	5
1.1.3 TargetPopulation.....	6
1.1.4 Cost Related to Inadequate FS Status	6
1.1.5 Geographic Distribution of Inadequate FS Status	6
1.1.6 Theoretical Framework	8
1.1.7 Literature Review and Synthesis.....	10
1.2 PRELIMINARY STUDIES	13
1.2.1 Anecdotal Observations	13
1.2.2 Clinical Observations	16
1.2.3 Community Support.....	17
1.2.4 National Black Nurses Association Support	17
1.3 RESEARCH DESIGN AND METHODS.....	18
1.3.1 Specific Aims	18
1.3.2 Research Questions.....	18

1.3.3	Hypothesis	18
1.3.4	Research Design.....	19
1.3.5	Definition of Terms.....	20
1.3.5.1	Food security	20
1.3.5.2	Age	21
1.3.5.3	Education	21
1.3.5.4	Family income	22
1.3.5.5	Food assistance programs participation	22
1.3.5.6	Marital status.....	22
1.3.5.7	Metropolitan size.....	22
1.3.5.8	Race	23
1.3.5.9	Sex.....	23
1.3.6	Setting.....	23
1.3.7	Sampling Procedures.....	24
1.3.8	Population	24
1.3.9	Sample and Sample Size Justification	25
1.3.10	Procedures for Data Collection	25
1.3.11	Instruments	26
1.3.11.1	CPS/FSS	26
1.3.12	Description and Selection of Variables.....	30
1.3.12.1	Independent variables.....	30
1.3.12.2	Dependent variable	31
1.3.13	Procedures for Data Analysis	33

1.3.13.1	Preliminary data screening	33
1.3.13.2	Primary data analysis	35
1.3.14	Data Interpretations.....	35
1.3.15	Implications of the Study	36
1.3.16	Study Limitations	37
1.3.17	Potential Problems with Proposed Procedures.....	38
1.3.18	Alternate Approaches to Achieve Specific Aims	38
1.4	RESEARCH PARTICIPANT RISK AND PROTECTION	39
1.4.1	Involvement of Human Subjects	40
1.4.2	Sources of Data	40
1.4.3	Recruitment and Retention.....	40
1.4.4	Potential Risks.....	41
1.4.5	Procedures to Minimize Potential Risks.....	41
1.4.6	Cost-To-Benefit.....	41
2.0	RESPONSE TO DISSERTATION COMMITTEE FEEDBACK ON THE PROPOSAL.....	42
2.1	MANUSCRIPT REORGANIZATION AND EXPANSION	42
2.1.1	Grammatical and stylistic changes	42
2.1.2	Justification for selection of Northeast U.S. region as an inclusion criterion.....	42
2.1.3	Justification of food security (FS) status as a behavioral variable to fit the theoretical framework	43
2.2	ADDED OR CHANGED VARIABLES	43

2.2.1	Ethnicity	43
2.2.2	Family income changed to income range	43
2.2.3	Metropolitan size changed to metropolitan status.....	44
2.3	SUGGESTED VARIABLES NOT INCLUDED.....	44
2.3.1	States of residence and employment status	44
2.4	REVISED DATA ANALYSIS	45
2.4.1	Study sample	45
2.4.2	Table 3 was developed comparing the analytical and non-analytical samples; response bias related to answering items about food assistance programs participation was acknowledged	45
2.4.3	Redefined food assistance programs participation (FAPP) variable.....	45
2.4.4	Weighting of variables.....	46
2.4.5	Distribution of data in the predictors	47
2.4.6	Redefined dependent variable, FS status	47
2.4.7	Missing cases on the dependent variable, FS status	48
3.0	MANUSCRIPT: PREDICTORS OF FOOD SECURITY STATUS IN OLDER ADULTS LIVING IN THE NORTHEAST UNITED STATES.....	49
3.1	ABSTRACT.....	49
3.2	INTRODUCTION	50
3.3	METHODS.....	55
3.3.1	Study Design.....	55
3.3.2	Sample.....	55
3.3.2.1	Parent Study Sample	55

3.3.2.2	Current Study Sample	56
3.3.3	Measures.....	56
3.3.3.1	Current Population Survey	56
3.3.3.2	Food Security Survey.....	57
3.3.3.3	Current Study Variables	58
3.3.4	Statistical Analysis.....	59
3.4	RESULTS	60
3.5	DISCUSSION.....	62
3.6	IMPLICATIONS AND CONCLUSIONS	67
3.7	TAKE AWAY POINTS	69
APPENDIX A: CPS/FSS VARIABLES CONSIDERED FOR INCLUSION		76
APPENDIX B: IRB APPROVAL LETTER		81
APPENDIX C: CERTIFICATES OF RESEARCH TRAINING		83
BIBLIOGRAPHY		88

LIST OF TABLES

Table 1: Predictors of Food Security Status	11
Table 2. Recoding Independent and Dependent Variables.....	32
Table 3. Comparison Table For Response Bias: Adult Food Security Responses	71
Table 4. Sample Characteristics as Percentages ($N = 3,207$).....	72
Table 5. Relationships Between Predictors and Food Security Status ($N = 3,195^b$)	73
Table 6. Simple Binary Logistic Regression for Predictors of Food Security Status ($N = 3,195^b$)	74
Table 7. Multivariable Binary Logistic Regression for Predictors of Food Security Status ($N = 3,195^b$).....	75

LIST OF FIGURES

Figure 1: Ecological Model of Health Behavior.....	9
Figure 2: Food Security (FS) Status.....	20

PREFACE

I would like to thank the following people for their inspiration, guidance, encouragement, support, and belief in me throughout this academic process. I would like to thank Dr. Valarie Carr Copeland for challenging me to select a population and research problem about which I was passionate since I would immerse myself in the dissertation topic during my entire PhD Program. I would like to thank Dr. Lynette Jack who first encouraged me to believe that my research interest in food security was worthy of study as a PhD student in Nursing. I would like to acknowledge the time and sincere interest shown by my dissertation committee, My Chair, Dr. Elizabeth A. Schlenk, who advised me throughout my PhD Program; Dr. Willa M. Doswell who instructed me on the importance of community-mindedness and community-based research; Dr. Judith T. Matthews who urged me to be clear and precise in my communications; Dr. Eric G. Rodriguez, who has known of my interest in clinical research since I enrolled in the University of Pittsburgh while practicing as a geriatric nurse; and Dr. Lauren Terhorst who made data analysis less daunting. I would like to acknowledge Dr. Mark Nord of the U.S. Department of Agriculture Economic Research Service who took my calls without hesitation clarifying questions and concerns I had while working with a very large national data set and offering suggestions about appropriate research methods. I would like to thank my three sons, Sebastian, Brian, and Christopher; my nine surviving siblings, Clarence, Margaret, Ethel, Gerald, Kenneth,

Barbara, Michael, Paula, and Brenda; and my eight grandchildren. Their love, patience, and support have inspired and sustained me in my goal to achieve the PhD degree. I would be remiss if I did not take this time to thank my parents in heaven, William Alonzo and Grace Ann, who sacrificed all for all of us and set the standard for education extremely high. Lastly, I would like to thank my friends and colleagues who have assisted me along the way, Dr. Betty Braxter, Dr. C. Dianne Colbert, Dr. James Butler, and Dr. Jerome Taylor.

1.0 SPECIFIC AIMS

Healthy People 2010 describes food security (FS) as all members of a household having access at all times to enough nutritionally adequate food for an active, healthy life, with sufficient resources for the acquisition of acceptable foods in socially acceptable ways, not acquired through severe coping strategies such as emergency food sources, scavenging, and stealing (Nord, Coleman-Jensen, Andrews, & Carlson, 2010; U.S. Department of Health and Human Services, 2000). A household is food secure if it has the following: adequate variety of fresh foods, sufficient personal or family funds (not including welfare funds, i.e., Temporary Assistance to Needy Families, unemployment insurance, Supplemental Security Income, etc.), and culturally and ethnically preferred foods that are physiologically useful to meet personal and household physical and health needs (Neff, Palmer, McKenzie, & Lawrence, 2009).

The specific aims of this proposal are to: (1) Describe the level of FS status of older adults living in the Northeast (NE) United States (U.S.), and (2) Identify variables that correlate with and predict FS status of older adults living in the NE U.S.

The research questions are: (1) What is the level of FS status of older adults living in the NE U.S. according to the Current Population Survey (CPS)/Food Security Survey (FSS)? (2) Which CPS/FSS characteristics significantly correlate with and predict FS status of older adults living in the NE U.S.?

It is hypothesized that variables based on environments of the Ecological Model of Health Behavior (EMHB) (age, education, family income, food assistance programs participation, marital status, metropolitan size, race, and sex) will correlate with and significantly predict FS status of older adults in the NE U.S.

The broad, long-term objectives of this program of research are to: 1) Raise consciousness and awareness of FS status issues with older adults and multi-levels of stakeholders in the NE U.S. region; 2) Inform health care providers that routine age-specific nutritional evaluations are necessary; 3) Investigate factors in environments that may account for differences in FS status of older adults; and 4) Encourage multidisciplinary initiatives involving nursing, medicine, dentistry, public health, aging organizations, community churches, as well as government and non-government organizations (NGOs) to develop and test community-based, culturally sensitive interventions to ameliorate negative FS issues for community dwelling older adults.

The short-term goals of this research are to (1) quantify FS status among older adults in the NE U.S. and (2) identify factors that contribute to lack of adequate and sustained FS status for older adults. Further, the goal of this research is to disseminate the findings to community stakeholders so that local and regional programs and senior-centered organizations will be more informed about the potential for nutrition deficits among older adults.

1.1 BACKGROUND AND SIGNIFICANCE

FS is an economic and social indicator of household health and well-being (Karpilow, Reed, Chamberlain, & Shimada, 2011). Freeman (2007) proposes that the lack of or denial of access to

healthy food is a form of food oppression. Nutrition became a part of the U.S. national health agenda with the 1990 National Nutrition Monitoring and Related Research Act (Cook, 2002), which created a useful framework for describing, researching, and designing policies that address poverty-related food access problems at the household level in the U.S.

In 2010, more than 14% of American households (17.2 million) did not achieve adequate FS status sometime during the year. Of these households, (6.4 million or 5.4%) were determined to have very low FS Status (food intake of one or more household members was reduced and their eating patterns were disrupted during the year) because of insufficient money for food (Coleman-Jensen, Nord, Andrews, & Carlson, 2011). Black (25.1%) and Hispanic (26.2%) households experienced low or very low FS status at much higher rates than the national average of 5.7% (Coleman-Jensen et al., 2011; Malbi, Cohen, Potter, & Zhao, 2010). Among households with seniors ≥ 65 years of age, 39.9% had low FS Status and 18.8% had very low FS status (Malbi et al., 2010).

The NE U.S. is the most food secure region in the country, yet urban areas are at higher risk of diminished FS Status, with central cities averaging 28.7% and metro areas not designated central cities averaging 28.3% (Malbi et al., 2010; Nord & Andrews, 2003). In this region, older adults are at risk for impaired FS status because they tend to be poor and experience high rates of disabilities (Coleman-Jensen et al., 2011; Wellman, 1994; Ziliak & Gundersen, 2011). Few research studies involving older adults, nutrition, and FS have been done at the local level (Lee & Frongillo, 2001). The proposed study will fill the gap in understanding of FS status and its predictors in older adults living in the NE U.S.

Nursing focuses on maintaining optimum health in older adults, yet it lacks research on the day-to-day household nutrition needs and nutritional status of older adults (Block & Kouba,

2006; DiMaria-Ghalili & Amella, 2005; Tscholl & Holben, 2006). Nursing professionals (e.g., nurse practitioners, staff nurses, researchers, private medical practice nurses, and home care nurses) are in positions to regularly screen and assess the nutritional status of older adults. Screening of dietary, clinical, and biochemical parameters would enhance the detection of causes and consequences of altered FS status and identify deficit-related nutritional conditions and diseases (Wellman & Kamp, 2004).

1.1.1 Causes and Consequences of Inadequate FS Status

The focus of earlier FS investigations has been primarily about food accessibility and food shortage strategies. In the U.S., causes of hunger brought on by unacceptable FS status include: (1) lack of adequate household purchasing power, (2) tolerance of widespread hunger within U.S. borders, and (3) marginal and intermittent progress against hunger in the U.S. (National Anti-Hunger Organizations, 2008). With the exception of family income, these causes are not directly related to the variables selected for this study, the theoretical framework, or the expectations of this study, but they are significant for suggesting the history, atmosphere, and economic conditions in which FS issues are viewed.

Consequences of poor FS status include malnutrition, as evidenced by lower nutrient intake and lower skin-fold thickness (Lee & Frongillo, 2001); aggravation of medical conditions such as increased risk of obesity, diabetic complications (Stuff, Horton, Bogle, Connell, Ryan, Zaghloul et al., 2004), high cholesterol, hypertension, physical impairments including arthritis and back problems (Stuff, Casey, Szeto, Gossett, Robbins, Simpson et al., 2004), and reports of fair or poor self-rated health (Vozoris & Tarasuk, 2003). Compromised food intake adversely affects mental health, contributes to psychological suffering, and is associated with signs and

symptoms of eating disorders (Frongillo & Horan, 2004; Kempson, Keenan, Sadani, Ridlen, & Rosato, 2002; Nord & Andrews, 2003; Stewart, Brochetti, Cox, & Clarke, 1998). Poor nutritional prognosis produces adverse circumstances and leads to poor and ineffective use of scarce health resources and health care dollars (Eberhardie, 2002; Gary & Fleury, 2002; Herbert, 1996; Kempson et al., 2002; Nord et al., 2010; Stewart et al., 1998). Low income older adults living independently with low and very low FS status are more likely to have a lower quality of life, be moved from home and familiar surroundings, and die (Gary & Fleury, 2002). These consequences demonstrate the significance of discovering the correlates and predictors of FS status so that practitioners can be aware of environments that increase the likelihood of inadequate FS status.

1.1.2 Strategies for Coping with Inadequate FS Status

As a home care nurse, I observed households using a variety of strategies to survive inadequate FS status including: finishing another person's food left on a plate, naming leftovers and fighting over them if the wrong person eats them, limiting meal sizes and second-helpings, and taking leftovers home from church suppers and other social functions. Renzaho and Mellor (2009) point out that particular reliance on evaluating coping strategies in general, as surrogate measurements of inadequate FS status, without taking into account the social, cultural, and political context in which they occur, is misleading. Viewing inadequate FS status from a food access perspective, without considering food utilization and asset creation as pillars of FS, paints an incomplete picture using current survey measures and assessments (Renzaho & Mellor, 2009).

1.1.3 TargetPopulation

Older adults are the focus of this study. Advancing age increases risks for malnutrition due to physical, social, economic, and psychological factors (Horwath, 1991; Lawton, 1999; Nord et al., 2010). In 2009, the older population (65+) numbered 39.6 million. About 30% (11.3 million) of non-institutionalized older persons lived alone (8.3 million women, 3.0 million men). Almost 3.4 million older persons (8.9%) were below the poverty level in 2009.

1.1.4 Cost Related to Inadequate FS Status

High and marginal food secure households spent 33% more on food than low and very low food secure households of the same size and composition. Fifty-seven percent of households with low and very low FS status participated in one or more federal food and nutrition programs during the month prior to the 2009 FSS (Nord et al., 2010). Estimated annual burden to the U.S. is more than \$90 billion for direct and indirect costs of hunger-related charities, illnesses, psychosocial dysfunction treatments, as well as impaired educational function and lowered productivity (National Anti-Hunger Organizations, 2008). On average, a citizen pays \$300 annually for hunger caused by low and very low FS status (Brown, Shepard, Martin, & Orwat, 2007).

1.1.5 Geographic Distribution of Inadequate FS Status

Many non-profit NGOs and private feeding organizations are rooted in more local and regional areas (Feeding America, 2011). This study will use a national data set to examine FS in the NE region. The state of New York, a part of the NE region, was one of ten jurisdictions with the

highest poverty rates for elderly during 2009 with 11.3% (Administration on Aging, 2010). This study will focus on the NE U.S. region (i.e., CT, ME, MA, NH, RI, VT, NJ, NY, and PA), where 19.5% and 17.2% of households have low and very low FS status, respectively (Nord et al., 2010). Little is known and few studies have been done about the FS status of older adults living in this region. Ovid Medline and Google Scholar database searches recovered no studies on FS specific to the NE U.S. published from 2008 to 2013. Most studies have focused on the rural Southeast, the Southwest, and non-urban areas (Bengle et al., 2010; Brewer et al., 2010; Duerr, 2006b; Quandt, McDonald, Arcury, Bell, & Vitolins, 2000; Vailas, Nitzke, Becker, & Gast, 1998) where the highest rates of inadequate FS status exist (15.8% in the South and 15.6% in the West compared to 12.2% in NE) (Feeding America, 2011; Nord et al., 2010). However, it has been found that older adults living in states with higher concentrations of persons under age 70 years tend to have higher rates of inadequate FS (Ziliak & Gundersen, 2009).

The NE region has the largest percentages of people ≥ 65 years (14.1%) and ≥ 85 years (2.2%) (U.S. Census Bureau, 2011). By population, Pennsylvania had the fourth highest number of older adults in the U.S. (15.4%), trailing Florida, West Virginia, and Maine (U.S. Census Bureau, 2011). Allegheny County, PA, had the second highest rate of older adults ≥ 65 years of age among counties having 1 million residents before the 2010 census (Rotstein, 2011). This proportion is largely due to continued out-migration of the younger population and growth of the aging population related to the new phenomenon known as “aging in place” (U.S. Census Bureau, 2011). This phenomenon occurs when older adults are not institutionalized for inability to manage activities of daily living; rather they use products and services to remain home as their situation changes. Thus, the proposed study fills a gap in our understanding of FS status and its predictors in a vulnerable group residing in the understudied NE region.

1.1.6 Theoretical Framework

The U.S. is getting older and more ethnically and culturally diverse (U.S. Congressional Research Service, 2011). The demographic changes require researchers to consider multiple and varied physical and psychosocial factors in selecting theories to guide research. The demographic changes place emphasis on examining the influence of multiple environments on the health behaviors of households, especially those classified as low-income (Gregson et al., 2001; Stokols, 1992; Stokols, 1996). The Ecological Model of Health Behavior (EMHB) (Figure 1), which describes interrelations between environments and people that influence health behaviors, will be the theoretical framework guiding this study. The EMHB explains multiple factors such as biology, social relationships, culture, built-community, and policy that impact individual, group, and community health. The environments of the EMHB include intrapersonal environment, i.e., individual differences (LaVeist, Gaskin, & Trujillo, 2011; Sullivan, Clark, Pallin, & Campargo, 2008), interpersonal environment, i.e., social environment (Bowman, 2009; Frongillo, Valois, & Wolfe, 2003), physical environment, i.e., living space (Duerr, 2006a; LaVeist et al., 2011), and policy environment, i.e., legislation (Hinrichsen et al., 2010), as well as food and nutrition programs (Gorton, Bullen, & Mhurchu, 2010; Kantor, 2001; LaVeist et al., 2011; McQueen, 2011). These environments suggest variables that may predict FS status for older adults.

The EMHB is ideal to guide this proposed study because transactions between individuals and environments are recognized as useful and appropriate orientations for contemporary health promotion issues (Sallis & Nevil, 2002). Sallis and Nevil also report that the EMHB helps to explain behaviors and creates an effective basis for developing interventions in subsequent research. It is informational to point out an objection to the use of ecological

models by Schwartz (1994), who refers to the problem of the ecological fallacy in which a logical fallacy exists in trying to make causal inferences from group data to individual behaviors. In this proposal, I will resist drawing conclusions about the individual FS status of older adults from the FS score for household data, because the survey guide manual specifically states that inferences cannot be directly applied to an individual person's FS status as opposed to household FS status (Bickel, Nord, Price, Hamilton, & Cook, 2000).

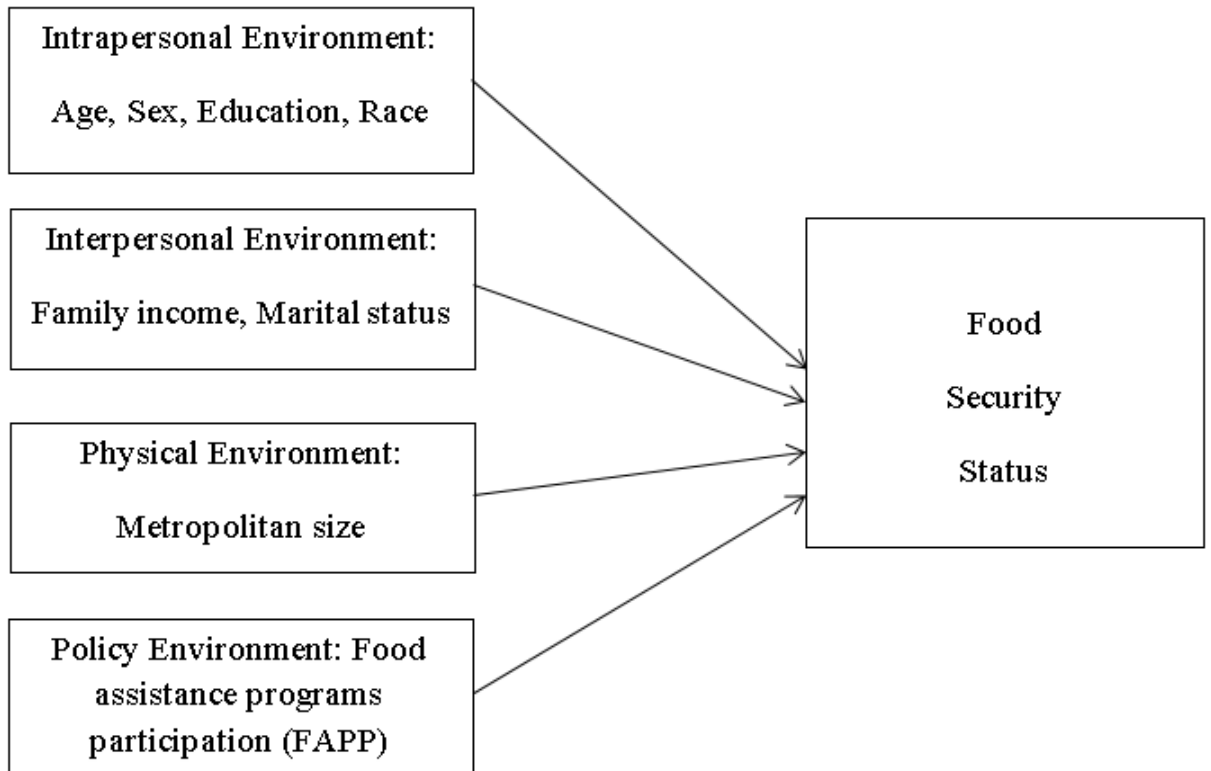


Figure 1: Ecological Model of Health Behavior

1.1.7 Literature Review and Synthesis

Literature searches were conducted in Ovid Medline (Current) and Google Scholar for this proposal using keywords of FS, and FS plus each of the eight independent variables being examined. The searches were limited to years 2007-2012 for currency. Fifty-five articles were identified by the literature search, and 14 data-driven studies were included in the literature review. Qualitative studies, reports, editorials, or commentary materials were not included for analysis and evaluation. Each article received full text screening by one reader. There existed in this review a language bias, as all articles were in the English language.

Results of the literature review and synthesis of relationships between the EMHB variables and FS status are presented in Table 1 (Kregg-Byers, Terhorst, & Schlenk, 2012). The studies were graded for strength of evidence based on modified McMaster criteria (Elizabeth A. Schlenk, personal communication, May 12, 2012). Each study was found to be grade V, indicating that it was an observational study as opposed to a randomized controlled trial, experimental study, or quasi-experimental study. According to the Agency for Healthcare Research and Quality, the overall grade of evidence for a group of studies is further rated as high, moderate, or low based on the level of confidence of the rater for effects on health outcomes and an assessment of the likelihood that future research results might affect the conclusion drawn in regard to information for patients, clinicians, and policy makers (Owens et al., 2009). The overall grade of evidence was moderate for this set of studies. Age was found to be a significant predictor in two studies in which FS status decreased as age increased (Duerr, 2006a; Duerr, 2006b). Education was a significant predictor of FS status in five studies (Alley et al., 2009; Duerr, 2006b; Kaiser, Baumrind, & Dumbauld, 2007; Laraia, Borja, & Bentley, 2009; Lee & Frongillo, 2001) and a non-significant predictor in one study (Duerr, 2006a).

Table 1: Predictors of Food Security Status

Studies	Age	Education	Family Income	FAPP	Sex	Marital Status	Race	Grade
Alaimo (1998)			< FS: low income OR = .46, 95% CI = .31 - .66 vs. low-middle income OR = .01, 95% CI = 0 - .01				NS	V
Alley et al. (2009)		< HS 5.5% have < FS vs. ≥ HS 2.0% have < FS, p ≤ .001			♀ 2.9% have < FS vs. ♂ 2.3% have < FS, p = .022		Not have FS: 7.0% Non-Hisp Black, 4.8% Hisp, 2.0% Non-Hisp White, p ≤ .001 each group	V
Bowman (2009)			AA 40.4% vs. Cauc 21.3% low-income households not have FS, p = .05		NS	NS	AA 15.6% vs. Cauc 4.9% households not have FS, p = .05	V
Duerr (2006a)	> Age have < FS X ² = 18.546, p = <.001	NS	NS		♀ had < FS than ♂ χ ² = 4.641, p = .031	NS	NS	V
Duerr (2006b)	> Age have < FS F = 7.37, p < .001	> HS have > FS, F = 7.49, p = .001	NS		♀ have > FS than ♂ t = 2.349, p = .021	NS		V
Gollub & Weddle (2004)				Non-FAPP have < FS (M = 2.44 ± 0.87) than FAPP (M = 2.14 ± 0.93), p = .002				V
Gunderson & Oliveira (2009)				NS				V
Hanson et al. (2007)						Divorced ♂ have < FS than never married ♂ OR = 2.8, p < .05		V
Kaiser, Baumrind, & Dumbauld (2007)		< HS have < FS OR = 2.03, 95% CI 1.52 - 2.72				Married have > FS OR = .64, 95% CI .52 - .80	Lat/Hisp have < FS OR 1.45, 95% CI 1.07 - 1.96 AA have < FS OR = 1.76, 95% CI 1.21 - 1.96	V

Table 1. Predictors of Food Security Status (continued)

Studies	Age	Education	Family Income	FAPP	Sex	Marital Status	Race	Grade
Laraia et al. (2009)		> HS have > FS RR = .0465, 95% CI .22 - .98				Living with child's father have < FS RR = 3.46, 95% CI 1.22 - 9.82		V
Sharkey & Schoenberg (2005)							Older Blacks not have FS OR = 3.05, 95% CI 1.22 - 7.51, p ≤ .001	V
Sullivan et al. (2010)					♀ 30.6% vs. ♂ 27.2% not have FS, p = .007 ♀ 29.4% vs. ♂ 27.9% have FS, p = .36			V
Vailas et al. (1998)				NS				V

Note. NS = Not Significant, AA = African American, Cauc = Caucasian, FAPP = Food Assistance Programs Participation, FS = Food Security Status, HS = High School, Lat = Latino, Hisp = Hispanic, ♀ = female, ♂ = male.

In two of the five studies, respondents with less than a high school education were 2 times more likely than those with a high school education and higher to have lower FS status (Alley et al., 2009; Kaiser et al., 2007). Family income was a significant predictor of FS status in three studies (Alaimo, 1998; Bowman, 2009; Lee & Frongillo, 2001). One study showed that those at 50% and 50%-100% of the poverty rate were 3.47 and 3.80 times more likely to have lower FS status, respectively, compared to households above the poverty line (Lee & Frongillo, 2001). Another study found that in low income households, 40.4% of African Americans and 21.3% of Caucasians had lower FS status (Bowman, 2009). In two studies, family income was not significant (Duerr, 2006a; Duerr, 2006b). Two studies found that participants without FAPP had significantly lower FS status (Gollub & Weddle, 2004; Lee & Frongillo, 2001), whereas two studies found FAPP to be non-significant (Gunderson & Oliveira, 2009; Vailas et al., 1998). Sex was found to have a non-significant association with FS status in one study (Bowman, 2009),

whereas being female was a significant predictor of lower FS status in three studies (Alley et al., 2009; Duerr, 2006a; Sullivan et al., 2010) and higher FS status than males in one study (Duerr, 2006b). Two studies showed that those who were not married were significantly less likely to have adequate FS status than married respondents (Hanson et al., 2007; Kaiser et al., 2007); in contrast, marital status was not significant in three studies (Bowman, 2009; Duerr, 2006a; Duerr, 2006b). Race was not significant in two studies (Alaimo, 1998; Duerr, 2006a); however, five studies found that non-whites and Hispanics were more likely to have lower FS status than whites (Alley et al., 2009; Bowman, 2009; Kaiser et al., 2007; Lee & Frongillo, 2001; Sharkey & Schoenberg, 2005). The literature search did not uncover any studies involving metropolitan size as a predictor of FS status.

Of these predictors, provision of FAPP is a modifiable variable in that it could be altered or changed based on appropriate or effective interventions. The overall purpose of examining this set of predictors is to identify those older adults who are vulnerable to inadequate FS status and, thus, could most benefit from interventions to improve FS status.

1.2 PRELIMINARY STUDIES

1.2.1 Anecdotal Observations

Informal focus group discussions were held with 45 grandparents from an organized, structured, grandparent support group, which was sponsored by a national NGO and an after-church service support group located in a NE American city. The participants from the self-declared multiracial groups consisted of predominantly African American women between 45 and 85 years of age.

All were custodial or full-time grandparents acting in the role of primary caregiver in their homes for their grandchild/grandchildren. The purposes of the discussion were to examine if the grandparents had perceptions of social, personal, emotional, financial, and health needs for sustaining successful grand parenting; identify what elements of grand parenting support need be addressed for successful child rearing; and explore if grandparents would participate in a research study concerning FS.

In addition to these topics, the participants were informed about the proposed dissertation study to investigate older adult issues related to FS. Secondary to the grand parenting discussions, the group participants were given an explanation of FS and a description of the dissertation topic (Doswell & Kregg-Byers, 2009). Specific questions were introduced about knowledge or lack thereof, involvement, and concerns the group had regarding FS. Sample questions included: (1) What did you know or not know and now understand about FS? (2) Would you answer questions about your own FS status and that of your household? Why or why not? (3) Would you be able to identify someone of your generation whom you suspect of having poor FS status? (4) What measures do you use to ensure your own FS status? (5) What conditions or characteristics do you identify with inadequate FS status?

The results of the discussion showed an interest and a need for the dissertation study of FS as verbalized by grandparents in the group:

1. "I don't know if I understand the difference between FS stuff and being hungry or starving." "I don't think I'm either all the time, though I come up short some time."

"I'm not sure I would expose myself about whether I eat enough or not."

2. "I would, cause it seems that FS for me would mean FS for my grands and visey versy."

3. “I know of people in my church who I think sometimes go without good food.”

4. “I have a small garden and always have had.”

“My grown kids sometimes bring me extras so I won’t be without.”

5. “I guess if I saw or heard somebody always talking about not having enough money so that they were hungry sometimes.”

The common themes expressed during the discussion indicated that the participants were “not all that sure about all the research but would have an interest in the dissertation study for the sake of education and clarification to understand the concepts of FS status and hunger.” They additionally communicated concern for confidentiality issues and privacy matters about food and hunger for themselves, friends, and family while participating in a study. Participants said they were not sure about “the social nature of FS status, or if trying to figure out my own FS status is possible.” Thematic conclusions drawn from these discussions were: 1) unclear understanding of the concept of FS, 2) cautious willingness to participate in such a study, 3) lack of understanding about basic research processes, and 4) being leery about sharing personal circumstances about food and the family. The significance of the results of this group discussion and implications for this proposed dissertation study are that 1) self-report bias may be present in data collected by the CPS/FSS, 2) dissemination of findings of the study to the general older adult community of interest is important, and 3) the researcher will need to inform stakeholders in the NE U.S. about the findings of the study in light of the meaning of FS to older adults living in the region.

1.2.2 Clinical Observations

Clinically, in professional home care delivery of services, the investigator of this study observed on several occasions that older adults diagnosed as being in fair to compromised health status ate canned cat food because “sometimes it cost cheaper than tuna fish,” and, likewise, stored excessive quantities (whole cupboards full) of dry-package commodities like macaroni and cheese mix. Older clients were observed drinking pre-sweetened “Kool-Aid”, declaring that it is “a substitute for fruit juice,” and having little or no fresh fruit, vegetables, or meat in their homes. During some home visits, it was noted that refrigerators or freezers were full of uneaten Meals-on-Wheels because the residents said they “can’t eat that stuff,” “wouldn’t eat that kind of food,” or “are saving them in case a visitor comes over and I’d have something to offer them or feed them.” Many of these individuals or families considered themselves adequately fed “because I could eat these foods if I wanted to.”

Though senior food vouchers and Meals-on-Wheels are components of the food assistance programs of federal, state, and local governments, and NGOs, home care patients and participants in the informal discussion groups (Doswell & Kregg-Byers, 2009) indicated the “inappropriateness” of the programs’ contents or that the programs lacked input “from people like us who might use the programs.” Patients informed the investigator that the Senior Farmers Market Nutrition Program vouchers provided eligible recipients four \$5.00 checks to be used between May and September annually. “The food and services don’t always fit our needs or likes.” During a late morning assessment meeting at a chain restaurant, a client said that “at certain points in the day the young manager would let us old folks have a meal at much less the price or for free after the morning rush was over. That’s how I get my meals sometimes.”

1.2.3 Community Support

This proposed study was presented to the University of Pittsburgh Center for Minority Health (now known as the Center for Health Equity) Community Research Advisory Board (CRAB) in November, 2009. The CRAB encouraged and fostered community-based participatory research. The Board functioned as a committee to translate evidence-based research into community-based interventions and innovative outreach practices for addressing health issues among ethnic and racial minority and other vulnerable and underserved populations (Ford, Thomas, Carr Copeland, & South-Paul, 2004). The Board offered support, suggestions, and recommendations for this proposal and future post-doctoral work involving the local community. The CRAB additionally suggested serious efforts for dissemination of the findings of the dissertation to the community via church meetings, senior citizen organizations, and the local media in conjunction with local grocery chains and public forums.

1.2.4 National Black Nurses Association Support

Results of this preliminary work were presented to the National Black Nurses Association Annual Institutes and Conference in Toronto, Canada, in August, 2009. At that seminar, participants commented that FS is a fundamental food and nutrition issue concerning minority communities that is especially important, given the attention that is growing about obesity, diabetes, and other nutrition-related ailments. Feedback on the focus group discussions and clinical observations presented at this conference provide evidence that the study of FS as related to older adults is useful and necessary. Conference attendees recognized that there exists a lack

of attention and research overall for evidenced-based information that makes health care providers aware that inadequate FS could be a significant basis for poor overall health.

1.3 RESEARCH DESIGN AND METHODS

1.3.1 Specific Aims

The specific aims of this proposal are to: (1) Describe the level of FS status of older adults living in the NE U.S., and (2) Identify variables that correlate with and predict FS status of older adults living in the NE U.S.

1.3.2 Research Questions

The research questions are: (1) What is the level of FS status of older adults living in the NE U.S. according to the Current Population Survey (CPS)/Food Security Survey (FSS)? (2) Which CPS/FSS characteristics significantly correlate with and predict FS status of older adults living in the NE U.S.?

1.3.3 Hypothesis

It is hypothesized that variables based on environments of the Ecological Model of Health Behavior (age, education, family income, food assistance programs participation, marital status, metropolitan size, race, and sex) will correlate with and significantly predict FS status of older adults in the NE U.S.

1.3.4 Research Design

A descriptive correlational design in which a secondary analysis of data from the micro-data reflecting responses to the CPS/FSS on CD-ROM of the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) (2008) will be performed. Descriptive correlation is a suitable design because the functions of description and correlation can accurately portray interrelationships among selected independent variables and FS status (Rebar, Gersch, Macnee, & McCabe, 2011). Secondary analysis has been selected because existing data incur no cost and save time for collection and compilation of data. The major difficulties of secondary analysis are the lack of control of data set conception, data generation, and data recording. In addition, the lack of a researcher's involvement in the initiation and collection of data inhibits insight into factors that may influence outcomes of research foci, which could lead to invalid conclusions or misinterpretation in analyses that deviate from the original intent of the parent study (Jacobson, Hamilton, & Galloway, 1993). The drawbacks in using secondary analysis include the lack of opportunities for the researcher to influence selection of the sample. It is sometimes necessary for the researcher to rephrase and recode original survey questions to align with the theoretical framework. These data manipulations run the risk of undermining integrity of a well-established survey instrument. Using this particularly large public data set (CPS/FSS) requires computer storage space large enough to contain the expansive amount of data.

1.3.5 Definition of Terms

1.3.5.1 Food security

The description of the dependent and predictor variables (and categorizations used in the current investigation) are explained in the Selection and Creation of Variables section of this document.

Food security status is the dependent variable. Predictor variables include age, education, family income, FAPP, marital status, metropolitan size, race, and sex.

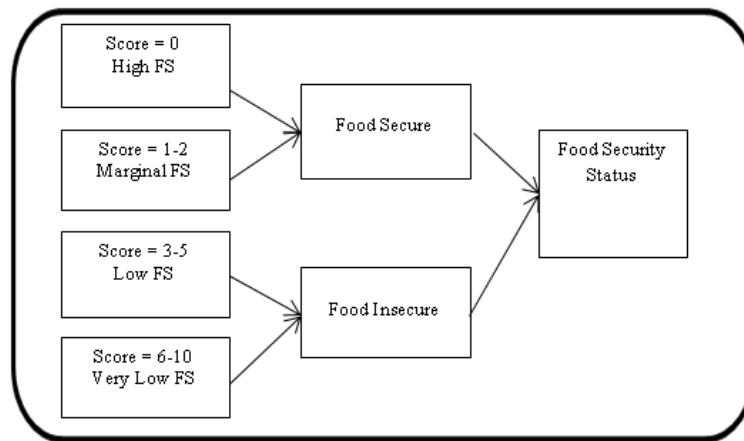


Figure 2: Food Security (FS) Status

FS is defined as access by all household members, at all times, to enough food for an active, healthy life, at minimum, which assures availability of nutritionally adequate and safe foods. FS includes the ability to acquire acceptable foods in socially acceptable ways without resorting to emergency food supplies, scavenging, stealing, or other coping strategies (U.S. Department of Agriculture Economic Research Services, 2012a). The term “FS score” refers to the single numerical (0-10) score obtained from the sum of answers to the FSS questions, while

the term “FS status” refers to the dichotomized level of FS in the household derived from the FS score (Figure 2). Thereby, FS status is the name of the dependent variable.

In 2006, the USDA introduced and reconfirmed language for the FSS to describe ranges of severity of FS status (National Research Council, 2006) that would assess household FS status as: high FS (no reported indications of food-access problems or limitations); marginal FS (one or two reported indications, typically of anxiety over food sufficiency or shortage of food in the house with little or no indication of changes in diets or food intake); low FS (reports of reduced quality, variety, or desirability of diet with little or no indication of reduced food intake); very low FS (reports of multiple indications of disrupted eating patterns and reduced food intake). This terminology aligns with the concept of FS as a household measure as opposed to hunger, which is considered to be a personal measure. A household consists of all related or unrelated individuals whose current residence is in one place at the time of the survey interview. The new terminology was recommended by a panel of experts of the Committee on National Statistics, of the National Academies and accepted by the USDA.

1.3.5.2 Age

The respondent’s age in years as of the end of the survey. In this study, age will be categorized as: young old (65-74 years), old (75-84 years), and old old (≥ 85 years) (Hiramatsu et al., 2012).

1.3.5.3 Education

The level of education of the respondent reflecting “less than 1st grade” education to “doctorate degree.” Education is dichotomized as high school or less and post high school.

1.3.5.4 Family income

Monetary income to the household from “less than \$5,000” to “\$150,000 or more.” In this study the level of family income is dichotomized based on the 2008 poverty rates (PR) (\$10,400/family of one, \$14,000/family of two, \$17,600/family of three, \$21,200/family of four, and \$24,800/family of five) established by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2010). Family income is dichotomized as \leq \$24,999 and \geq \$25,000.

1.3.5.5 Food assistance programs participation

FAPP consists of those programs provided by the Food and Nutrition Service of the USDA for children and low-income people, which gives access to food, a healthful diet, and nutrition education (U.S. Department of Agriculture Food and Nutrition Service, 2012). FAPP is dichotomized as does not participate and does participate.

1.3.5.6 Marital status

Married, widowed, divorced, separated, or never married; couples who live together (unmarried people, people in common-law marriages) report the marital status they consider the most appropriate (U.S. Census Bureau, 2012). Marital status is dichotomized as unmarried and married.

1.3.5.7 Metropolitan size

Not identified, nonmetropolitan, not a central city, and various population sizes up to 5 million or greater. The basis for dichotomization of this variable into < 1 million people vs. ≥ 1 million people is based on media reports that in 2008 slightly more than one-half of the nation's

population lived in jurisdictions, i.e., cities, towns, boroughs, villages and townships, with fewer than 25,000 people or in rural areas (Cox, 2008). This dichotomy was chosen for analysis purposes with this knowledge in mind as well as preliminary analysis for this variable, which indicated 55% of the sample lived in metropolitan sizes ≥ 1 million people.

1.3.5.8 Race

Per the U.S. Census Bureau (2012), race is based on self-identification by people according to the race or races with which they most closely identify. These categories are socio-political constructs and are not to be interpreted as scientific or anthropological in nature. Race is dichotomized as white and non-white.

1.3.5.9 Sex.

The sex, male or female, of the responding participant.

1.3.6 Setting

Approximately 53,000 households completed the CPS comprising a representative sample of the U.S. civilian population of 118 million households (Nord, Andrews, & Carlson, 2008). Of this sample, about 44,000 households completed the FSS; the remaining households either could not or would not complete the FSS. The FSS was conducted in the home setting by a trained interviewer.

1.3.7 Sampling Procedures

The parent data set for the CPS was comprised of 149,687 records/respondents. Some households in the original survey were lost due to relocation, the dwelling becoming vacant, no eligible person being available at the follow-up visit based on the inclusion criterion of being old enough to respond, or no one being at home during the time allocated for the follow-up visit. In late fall of 2008, the FSS was administered for the thirteenth time to a subset of respondents to the CPS. Interviewed households for the FSS include 131,026 person records. Of the interviewed households, 109,364 respondents completed the CPS and FSS.

1.3.8 Population

Initial examination of the data set identified a sub-sample of 3,520 respondents from the total of survey respondents who lived in the NE U.S. and were ≥ 65 years of age. At the discretion of the survey staff, a few of the five possible items about food assistance programs were not answered by the respondents who reported having incomes above 185% of the federal poverty line. Those respondents who gave no indication of food-access problems on either of two preliminary screening questions were deemed food secure and were not asked the questions in the food security assessment series (Nord, Andrews, & Carlson, 2009). This step produced missing values on those variables. A policy variable (FAPP) was created, so that if respondents answered at least one item about FAPP, they were included in the final sample subset for this study.

1.3.9 Sample and Sample Size Justification

From the sub-sample of 3,520 community-dwelling, non-institutionalized respondents representing the condition of household members as a group, not necessarily the condition of any particular person in the household, the investigator of this study identified respondents who (1) lived in the NE U.S., (2) were ≥ 65 years of age, and (3) answered at least one item of the FAPP questions. Preliminary initial analysis of these three inclusion criteria netted a final sample size of 1,246. A sample size of 1,246 will allow for the detection of an odds ratio as low as 1.46 in a logistic regression model using two-tailed tests of significance with .80 power and an alpha of .05 (Institute for Experimental Psychology, 2007). All analyses in this proposal will utilize 1,246 respondents. Women are included in the sample without bias. Minority respondents have been included in this study as per the parent study design. The sample in this study has a low number of minority respondents due to the sampling protocol of the parent study.

1.3.10 Procedures for Data Collection

CPS data in the original survey were collected monthly. FSS data were collected usually beginning in late fall to December of the year. All surveys are completed in the home. If a family reported no issues with access and purchase of food and or had a high enough income, they were allowed to opt out of answering successive FS questions.

1.3.11 Instruments

1.3.11.1 CPS/FSS

The records will be accessed from micro-data from the CPS/FSS CD-ROM, Economic Research Service of the USDA for December, 2008 from <http://www.census.gov/prod/techdoc/cps/cpsdec08.pdf>. The CPS is sponsored jointly by the Census Bureau and the U.S. Bureau of Labor Statistics and is the country's primary source of labor force statistics for the entire population. The CPS sample is based on 2000 decennial census information. The CPS sample was selected so that specific reliability criteria were met nationally (U.S. Census Bureau, 2009). The purpose of the CPS is to collect demographic and work force information. Many of the variables in the CPS pertain to labor force demographics and other data that will not be useful for answering the research questions or testing the hypothesis. The CPS also annually collects demographic information and characteristics of the general population to update information from the decennial census. The CPS, a 50- to 60-item survey, is conducted monthly by professionally trained survey staff.

The USDA sponsors the FSS as supplemental questions to the CPS in the fall (U.S. Census Bureau, 2009). In late fall, all households that were surveyed by CPS participate in the FSS for four consecutive months, which is repeated one year later. The FSS includes information collected in late fall of 2008, but reflects information about FS over the course of the entire year.

The FSS is a self-report assessment tool about food-access conditions and coping behaviors used to determine household FS status. The FSS is intended to research the full range of FS as experienced in U.S. households. The FSS generates information on the spending, access, adequacy, sufficiency, and sources of food assistance for the U.S. population (Nord et al.,

2009). FSS queries concerns about ways of coping with not having enough food. One adult respondent in each household is asked a series of questions about experiences and behaviors that indicate FS status. The FS status of the household is assessed based on the number of food-insecure conditions reported (e.g., being unable to afford balanced meals, cutting the size of meals because of too little money for food, or being hungry because of too little money for food). Survey respondents also reported the amounts their households had spent on food and whether they had used public or private food and nutrition assistance programs (Nord et al., 2009).

The Census Bureau field-tested and carried out the first FSS in 1995 as an addendum to the CPS. Since that time, the FSS has helped to inform U.S. national nutrition policy (Nord et al., 2008). The FSS has become a benchmark tool used as a template for valid and reliable assessments of FS status throughout the nation and the globe (Frongillo, 2003; Radimer, 2002). These surveys have been conducted by the U.S. Census Bureau for the USDA since 1940 (CPS) and 1995 (FSS) (U.S. Department of Agriculture Economic Research Service, 2012b). The surveys are collected in households in 278 core-based selected areas that are scientifically designed to represent the nation as whole, individual states, and other specified areas.

The first evaluation of the instruments, by Abt Associates, Inc., Tufts University Center on Hunger, Poverty, and Nutrition Policy, Cornell University Division of Nutritional Sciences, and C.A.W. and Associates (Hamilton et al., 1997), entailed performance of linear factor analysis to replicate analyses reported in the literature at the inception of the survey's uses. Because many responses to questions in the survey are dichotomous, non-linear factor analysis was done. The results indicated the unidimensional model to be most appropriate. A Rasch Model of analysis provided reliability and validity examination showing all subpopulations examined (households with children, households with children and older adults, households

without children or older adults, and older adult only households) could be measured from the same scale (Hamilton et al., 1997). This analysis is relevant to the FS scales (full 18-item form, short 6-item form, and adult form) because over 80% of the population has the lowest possible score on the same scale administered at 12 months and over 90% on the same scale administered at 30 days.

The Rasch Model has been especially applied to evaluate validity, reliability, and robustness over sub-populations and time related to the survey's characteristics implying levels of severity of FS, in addition to issues of missingness of the data. The validity and reliability found in other models include: Spearman .899, .794; Rulon .932, .878; and Alpha .856, .743 (Hamilton et al., 1997; Opsomer, Jensen, & Pan, 2003). Subsequent research studies found that the FSS, when administered as supplemental to the CPS, was an appropriate measure of FS status (Frongillo, 1999) including FS status of older persons. Further, there was no indication that the scale underrepresented inadequate FS or hunger among older adults in spite of the fact that some older adults interpreted or responded to questions in the FSS differently than did non-older adults. These differences have been expressed ethnographically as older adults reporting "they just don't worry about such things". In addition, the FSS asks FS questions focused on insufficient money or other resources for food. However, this constraint regarding age issues is compounded by reports of varying interpretations of health problems, mobility problems, and lack of transportation for older adults, thus confounding the responses affecting the FS score (Frongillo & Horan, 2004; Nord, 2003).

The FSS has been examined and accepted in subsequent studies in the U.S. and abroad (Frongillo, 1999; Frongillo, 2003). It has been noted that this scale has been scrutinized when applied to older adults who may not be replying knowledgeably to the FSS because of their

beliefs, attitudes, and values (Frongillo & Horan, 2004). By developing 14 new items for the FSS, Wolfe, Frongillo, and Valois (2003) suggested that augmentation of the FSS Module may produce a more accurate assessment for older adults. Alternative forms of the survey suggested by these authors reportedly greatly reduce the participant burden, especially for older adults. However, this augmented scale is not being used in this proposed study because there is not extensive evidence in the literature that it can be compared to other previous research as with the CPS/FSS.

The FSS Module to be used in this proposed study will be the U.S. Adult FS Module of the FSS (Economic Research Service, 2008), which is the 10-item survey that produces a scaled measure of FS ranging from 0 to 10 (reproduced below). The number of food secure conditions determines the FS status. This module was used with adults because it has been determined to be less burdensome for respondents, and avoids asking about children's FS in adult-only households.

The items on the U.S. Adult FS Module are:

1. "We worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?

2. "The food that we bought just didn't last and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?

3. "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?

4. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food? (Yes/No)

5. (If yes to question 4) How often did this happen--almost every month, some months but not every month, or in only 1 or 2 months?

6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (Yes/No)

7. In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (Yes/No)

8. In the last 12 months, did you lose weight because there wasn't enough money for food? (Yes/No)

9. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

10. (If yes to question 9) How often did this happen--almost every month, some months but not every month, or in only 1 or 2 months?

In combination, the CPS/FSS will allow and support investigation of the sample so that inferences can be made about FS status and its predictors.

1.3.12 Description and Selection of Variables

1.3.12.1 Independent variables

Independent variables were determined from the survey responses categorized to reflect characteristics of the domains/environments of the EMHB: intrapersonal domain (e.g., biological, psychological), interpersonal (social, cultural, organizational), physical domain (e.g., geography, neighborhoods, city size and types), and policy domain (e.g., NGO and/or governmental policies, political groups including advocacy groups, e.g., AARP, food safety net programs such as community gardens, food pantries, food cooperatives). After face-to-face and

phone discussions with the director of ERS, Mark Nord (personal communication, June 6, 2009), 54 variables from the parent CPS/FSS (Appendix A) were noted to be compatible with the environments of the EMHB. Eight independent variables were selected for analysis in this study from the 54 variables. For clarity, the variables were renamed from the variable naming conventions of the parent data set (i.e., GTCBSAZ was changed to metsize). The selected CPS independent variables for this study are: intrapersonal variables: age, education, race, and sex; interpersonal variables: family income and marital status; physical variable: metropolitan size; and policy variable: FAPP, which includes Meals-on-Wheels, Supplemental Nutrition Assistance Program, congregate meals, emergency food programs, and soup kitchen/shelter programs. The independent variables will be dichotomized into dummy variables (Table 2).

1.3.12.2 Dependent variable

The possible range of the FS score is 0 to 10 points, with a score of 0 indicating high FS. The sum of affirmative responses to the 10 questions in the U.S. Adult FS Module is the household raw score.

The FS score, the basis for the dependent variable, FS status, will be recoded into a dichotomous variable (Figure 2). The FS score, garnered from 10 items on the U.S. Adult FS Module, produces the ordinal scale: 0 = high FS, 1-2 = marginal FS, 3-5 = low FS, 6-10 = very low FS. For some reporting purposes, the first two categories of the ordinal scale in combination are described as food secure and the latter two categories as food insecure (Economic Research Service, 2008). Dichotomization of the FS score into FS scores of 0-2 = food secure and FS scores of 3-10 = food insecure creates the variable, FS status (Food and Nutrition Technical Assistance Project, 2005). For this study, FS status will be recoded such that 0 = Food Insecure and 1 = Food Secure.

Table 2. Recoding Independent and Dependent Variables

Variable	Study Name	Categories	Response	Response Code for Analysis
<u>Independent Variables</u>				
Age	Age	Person's age in years as of the week of the survey	65 - 74 (reference group) 75 - 84 (dummy group) ≥ 85 (dummy group)	0/1
Education	Educat	Less than 1st grade 1st, 2nd, 3rd, or 4th grade 5th or 6th grade 7th or 8th grade 9th grade 10th grade 11th grade 12th grade, no diploma High school graduate-diploma or equivalent (GED) Some college but no degree Associate degree- occupational/vocational Associate degree- academic program Bachelor's degree Master's degree Professional school degree Doctorate degree	≤ High School / Post High School	0/1
Family Income	Faminco	Less than \$5,000 \$5,000 to \$7,499 \$7,500 to \$9,999 \$10,000 to \$12,499 \$12,500 to \$14,999 \$15,000 to \$19,999 \$20,000 to \$24,999 \$25,000 to \$29,999 \$30,000 to \$34,999 \$35,000 to \$39,999 \$40,000 to \$49,999 \$50,000 to \$59,999 \$60,000 to \$74,999 \$75,000 to \$99,999 \$100,000 to \$149,999 \$150,000 or more	≤ \$24,999 / ≥ \$25,000	0/1
Food Assistance Programs Participation	Policy2	Participates in: Meals-on-Wheels, Supplemental Nutrition Assistance Program, congregate meals, emergency food programs (food pantries, food banks), soup kitchen/shelter programs	Does Not Participate / Does Participate	0/1
Marital Status	Maritstat	Married - spouse present Married - spouse absent Widowed Divorced Separated Never married	Unmarried / Married	0/1
Metropolitan Size	Metsize	Not identified or nonmetropolitan 100,000 - 249,999 250,000 - 499,999 500,000 - 999,999 1,000,000 - 2,499,999 2,500,000 - 4,999,999 5,000,000+	< 1,000,000 / ≥ 1,000,000	0/1

Race	Race	White (W) Only Black (B) Only American Indian or Alaskan Native (AI) Only Asian (A) Only Hawaiian/Pacific Islander (HP) Only W-B W-AI W-A W-HP B-AI B-A B-HP AI-A A-HP W-B-AI W-B-A W-AI-A W-A-HP W-B-AI-A 2 or 3 Races 4 or 5 Races	White / Non-white	0/1
Sex	Gen	Male Female	Female / Male	0/1
<u>Dependent Variable</u>				
Food Security (FS) Status	FdsecstatR	U.S. Adult FS Module score	Food Insecure / Food Secure (see Figure 2)	0/1

1.3.13 Procedures for Data Analysis

1.3.13.1 Preliminary data screening

All data, which will be entered from ASCII format into IBM SPSS Statistical Software Version 20 and backed up on a portable hard drive due to the size of the parent data set, will be under the control of the investigator. A conceptual food policy variable (FAPP) was created as a composite of five food supplement programs commonly used by older adults (Meals-on-Wheels, Supplemental Nutrition Assistance Program (formerly called food stamps), congregate meals, emergency food programs, and soup kitchen/shelter programs), thus allowing ignorable (Keppel & Wickens, 2004) empty data points for this sample. If a respondent answered any one of the

five food supplement questions, they were entered into the study sample and their data were determined to be complete for this independent variable.

A careful examination of the parent study design and data collection will be done by referral to and application of the Technical Documentation papers provided as downloadable files from the USDA and U.S. Census Bureau, to verify that this study's sample exists within the data set, the inclusion/exclusion criteria can be achieved, characteristics of the sample are clearly defined in the data set, preparation of the data collectors is satisfactory, and procedures are specified to handle missing data (Jacobson et al., 1993). A general perusal of the data will be completed through discussion with the ERS and the study statistician to verify that the data are acceptable, and have been successfully entered prior to preliminary data analysis.

Descriptive statistics will be performed on the sample characteristics (age, education, employment status, family income, marital status, race, sex, and states of residence in the NE U.S.), the independent variables (age, education, family income, FAPP, marital status, metropolitan size, race, and sex), and the dependent variable (FS status) in order to summarize the sample profile. Distributions of the selected variables will be examined, especially frequency and range, which will glean summaries for the numbers and percentages of all variables of interest. Graphic examination of the distributions using histograms will be done for visual depiction of the selected variables as a way to generalize the details of data while at the same time illustrating the data's overall patterns before dichotomization. Additionally, descriptive statistics will be used to identify missing data, patterns of missingness, skewness to assess for normality, and outliers. Percentages, mean, standard deviation, and range will be reported for age. Percentages will also be reported for education, family income, FAPP, marital status, metropolitan size, race, and sex as well as state of residence.

1.3.13.2 Primary data analysis

Descriptive statistics will be performed to address Specific Aim 1. Specifically, frequencies and percentages will be reported for FS status. For Specific Aim 2, correlational analyses will be performed using Pearson's r to determine the strength of the relationships between the predictor variables (age, education, family income, FAPP, marital status, metropolitan size, race, and sex) and the dependent variable, FS status. The Chi square test of independence will be performed as cross tabs for the same independent variables on FS status. The Chi square test of independence is appropriate because it examines the independence of categorical variables (Glass & Hopkins, 1996).

Next, simple and multivariable binary logistic regression with predictor variables on FS status will be applied to address Specific Aim 2 and test the hypothesis. Logistic regression is the most popular regression technique available for modeling a dichotomous dependent variable in order to describe the relationship to several predictor variables. The quantification of the relationships between the dichotomous dependent variable and the set of predictors is produced via the odds ratio (Kleinbaum, Kupper, Muller, & Nizam, 1998, p. 656). The parameter estimates (β), p -values, and odds ratios as well as the confidence intervals will be reported to describe the relationships between the predictors and FS status. Two-tailed testing and level of significance of $p < .05$ will be employed. All data will be analyzed using IBM SPSS Statistical Software Version 20.

1.3.14 Data Interpretations

It is planned that the analysis of data will produce adequate and accurate information to describe both demographic characteristics and FS status of the sample and examine the hypothesized

relationships based on the preset level of statistical significance. It is planned that the presentation of results will flow in a logical and scholarly manner and with concise and clear graphical and tabular presentation of results. It is planned that valid conclusions can be drawn from the results. In addition, it is planned that the conclusions will enhance the body of knowledge about the status of FS in older adults that may be generalized to geographical areas similar to the NE U.S. region. If contradictions between the study findings and previous research are found, they will be adequately discussed. A discussion will be presented regarding the compatibility and efficiency of the choice of theoretical framework including introduction of other frameworks, such as theory of Social Networks and Social Support or the Health Belief Model, if needed and are found to be more applicable to the study.

1.3.15 Implications of the Study

It is anticipated that the findings of this study and the future plan of research will provide an evidenced-based footprint for nursing practice protocols related to FS status of older adults. It is the intention of this investigator that this study will be a catalyst for future studies addressing predictors of FS that provide evidence supporting and guiding the selection of interventions to prevent inadequate FS status, which nurses and other health care professionals might consider both nationally and globally.

It is anticipated that several independent variables will support the proposed hypothesis. If the hypothesis is partially or fully supported, then the research plan is to proceed to a series of studies that will identify intervention strategies that are appropriate for groups found to be at risk for inadequate FS status in this study. Additionally, if FAPP, a modifiable factor, is found to be a significant predictor in this study, then future studies will be designed to improve participation

rates in these programs. This future research program is appropriate because of demographic changes indicated in the 2010 Census (Lopez, 2005) as well as current acknowledgement that the world has become increasingly global in its economies and health care concerns (Katz, Kornblat, Arnold, Lief, & Fischer, 2011).

1.3.16 Study Limitations

Clinically it has been observed in home visits by the investigator that, even in households where income is not an issue, other factors such as frailty, decreased or impaired mentation, and multi-family household configurations may contribute to impaired FS status. Older adult reticence to discuss certain sociodemographic and clinical information may result in self-reported misclassification of the FS status of their households. These factors affecting data collection for the parent survey may skew the data resulting in faulty conclusions about the results of this study. Secondary analysis of existing data limits the investigator to data collected in the original study. For example, the proposed study does not have clinical data available, such as biomarkers of nutritional status, to confirm biomedical consequences of inadequate FS. Additionally, the investigator is unable to examine culturally and ethnically appropriate food preparations in this study, which are often an issue for older adults. Finally, the FSS is administered in late fall when certain food stuffs are less likely to be available and more expensive prepared food products are needed, thereby reducing the buying power of those surveyed.

This situation may alter survey responses and lead to incorrect conclusions about the implications of the study results. The parent surveys do not investigate the presence of food deserts relating to the paucity of reasonable food supply facilities, and the overabundance of inappropriate or non-nutritious fast food places (Freeman, 2007). These situations have an

impact on accessibility to adequate and nutritious foods. Finally, Schwartz (1994) explains that it has been demonstrated that individual-level variables do not readily correlate with aggregate-level variables. This lack of correlation can be a problem in interpreting results from community survey data (e.g., FSS) to individual behaviors that may potentially influence proposed community-based nutrition education or interventions.

1.3.17 Potential Problems with Proposed Procedures

Selecting variables from the 523 variables in the parent data set is subjective. Other researchers may select alternative variables to fit the EMHB. Reproducing the same procedures on different variables may or may not result in similar conclusions. A preliminary examination of the variables in the final data set for this study found in cross-tabulation that some of the cells, e.g., race (Other Races, n = 27) * FS, were considerably small in spite of the large and adequate sample size of 1,246, which causes some concern regarding Chi square test for independence and correlational analyses, i.e., the near empty cells can cause false or incorrect rejection.

1.3.18 Alternate Approaches to Achieve Specific Aims

Throughout the course of data analysis, it is planned to closely check statistical outputs to determine accuracy and appropriateness of procedures and results whether planned, anticipated, or unexpected. To address the discrepancies that may occur in variable selection related to this study's theoretical framework, a panel of experts who are familiar with the FSS or who have used the EMHB in similar research and are cited in this proposal, e.g., Frongillo, Sharkey, Nord, as well as faculty and researchers from the schools of social work and public health, where this

survey and theoretical framework have been more often taught, discussed, and employed in research, will be consulted on the appropriateness and accuracy of variable selection, much like the theme selection in qualitative research studies. It will not be possible to change data collection procedures, but there may be some possibility to adapt the inclusion criteria, e.g., expand the geographical area from which the sample will be taken or lower the age limit from 65 years. Principal Component Analysis could be employed as an initial step to determine if other variables in the parent data set might be appropriately used as indicators of the EMHB concepts to answer the research questions (Osborne & Costello, 2004). If persistent, inadequate analytical statistical outcomes occur, Fisher's exact test, likelihood ratio test, or a combination (Baglivo, Olivier, & Pagano, 1998) may be considered for analysis of fit of the variables. Analyses could be conducted in SAS/STAT® software as an alternative software package for better adaption of the planned analytical procedures.

1.4 RESEARCH PARTICIPANT RISK AND PROTECTION

Approval from the University of Pittsburgh Institutional Review Board has been obtained for an exempt status IRB protocol to conduct this study using an existing public-use data set (see Appendix B). Informed consent was obtained from respondents in the parent study per Department of Health and Human Services Protection of Human Subjects (U.S. Department Health and Human Services (45 CFR 46), 2009). The investigator has certificates documenting completion of University of Pittsburgh Required Research Training (see Appendix C).

1.4.1 Involvement of Human Subjects

Study respondents are 65 years and older living independently in the NE U.S. In addition, respondents must have answered at least one of the FAPP variable questions. Women and members of all minority groups, as previously defined, are included in the study sample. Children have been excluded from this study because they do not meet the specific aims of this dissertation project, which are to describe the level of FS status of older adults and identify variables that correlate with and are predictors of FS status; however, it is possible that children may reside within the household of an older adult respondent. The study sample does not include any vulnerable populations (e.g., pregnant women or institutionalized individuals).

1.4.2 Sources of Data

This study will use public-use household-level Current Population Survey/Food Security Supplement (CPS/FSS) data files from December, 2008.

1.4.3 Recruitment and Retention

The investigator had no input into the recruitment and retention of respondents since the data were gathered by the USDA and the U.S. Census Bureau.

1.4.4 Potential Risks

Perusal of the literature by internet search and search of the primary sites of the parent surveys did not find statements reflecting potential risks to respondents. De-identification of data occurred via the National Agricultural Statistics Service (NASS) processes (U.S. Department of Agriculture, 2012). However, since this study is a secondary analysis, there are no potential risks to the sample selected.

1.4.5 Procedures to Minimize Potential Risks

Because there are no potential risks to subjects, plans to reduce risks are not needed.

1.4.6 Cost-To-Benefit

The potential benefit of the proposed research to the discipline of nursing in particular and to society in general and the cost to the respondents is noted to be favorable because increasing the body of knowledge by research about FS status is hoped to be achieved. Both the discipline of nursing and society will have additional evidence about predictors of FS status for aging adults, while enlisting no infringement on subjects' rights. The cost-to-benefit ratio is favorable for this study.

2.0 RESPONSE TO DISSERTATION COMMITTEE FEEDBACK ON THE PROPOSAL

2.1 MANUSCRIPT REORGANIZATION AND EXPANSION

2.1.1 Grammatical and stylistic changes

Grammatical and stylistic changes were applied throughout the revised manuscript including:

- Content was reorganized within the main sections
- Flow and conciseness was improved in the Introduction
- Variables were defined and consistently ordered
- Parent study and this study were differentiated
- Limitations were clarified, expanded, and discussed
- Implications for practice were more clearly explained and referenced
- Future studies were recommended

2.1.2 Justification for selection of Northeast U.S. region as an inclusion criterion

Justification for selection of the Northeast U.S. region was expanded in the Introduction.

2.1.3 Justification of food security (FS) status as a behavioral variable to fit the theoretical framework

The parent study collected responses to behavioral questions, e.g., “the food I bought didn’t last”, “skip or cut the size of a meal”, “eat less” etc., which were self-reported and used to compute the FS status index score.

2.2 ADDED OR CHANGED VARIABLES

2.2.1 Ethnicity

Ethnicity was added because it was a weighted variable and a standard demographic characteristic used to describe the U.S. population in the parent study. Ethnicity is a variable found in other studies of FS status in the U.S.

2.2.2 Family income changed to income range

The former Family Income variable had multiple levels making it difficult to classify respondents into the poverty income range. The parent data set contained another variable that classified respondents as 185% above or below the poverty line. This new variable, Income Range, was used since this is the income definition used by the U.S. Department of Health and Human Services to set eligibility requirement for all federal level food assistance programs.

2.2.3 Metropolitan size changed to metropolitan status

Since 2000 and until 2010, population cluster descriptions used the terms metropolitan (a large population nucleus and adjacent communities that have a high degree of integration with that nucleus) and micropolitan (non-metropolitan; a smaller population cluster) statistical areas as centers of population and activities, but did not produce an urban-rural classification. Therefore, it was decided to replace the former variable, Metropolitan Size, which had multiple levels, with the new variable Metropolitan Status, which was already dichotomized (metropolitan vs. non-metropolitan) to reduce confusion and more adequately operationalize the physical domain in the theoretical framework.

2.3 SUGGESTED VARIABLES NOT INCLUDED

2.3.1 States of residence and employment status

Although these variables may be of interest for future studies, they were not included as predictors because they added little additional information about the sample and did not address the specific aims, research question, or hypothesis.

2.4 REVISED DATA ANALYSIS

2.4.1 Study sample

A subsample of 3,923 respondents met inclusion criteria; however, 716 respondents did not complete the questions about food assistance programs participation. Therefore, the final study sample consisted of 3,207 respondents.

2.4.2 Table 3 was developed comparing the analytical and non-analytical samples; response bias related to answering items about food assistance programs participation was acknowledged

Table 3 reports the demographic characteristics of sample respondents who did not respond (n = 716, non-analytic sample) and those who did respond (N = 3,207, analytic sample) to items about food assistance programs participation. There were no substantial differences between the two groups.

2.4.3 Redefined food assistance programs participation (FAPP) variable

The former FAPP variable was revised for the 3,207 respondents in the final study sample. There were 149 missing cases on the revised FAPP variable. Upon further inspection, we discovered that the Church item (Is there a church where you can get emergency food if you needed it?) was the cause of most of the missing data. Furthermore, the Church item was not considered an active food assistance program so it was removed from FAPP. Upon further

review, the FAPP variable was redefined as participation in the following programs: Meals on Wheels, congregate meals, emergency food sources, soup kitchens, and SNAP, formerly known as food stamps, which was left out of the former FAPP variable. It was observed in clinical/community settings that some older adults did not effectively use the SNAP option; however, the literature indicated that older adults did use this resource so it was incorporated into the revised FAPP variable.

Once the FAPP variable was redefined, there were only 33 (1%) missing cases. As shown in Table 4, FAPP was described for 3,174 subjects. As shown in Tables 5 and 6, the analyses with FAPP were conducted on 3,174 subjects. These 33 cases were dropped from the final multivariable logistic regression model as noted in Table 7.

2.4.4 Weighting of variables

Phone consultation with Dr. Mark Nord of the Economic Research Service (ERS) at the U.S. Department of Agriculture (USDA) clarified the weighted variables in the parent study (age, sex, race, and ethnicity). A review of the literature provided justification to not use weighted variables in this study because standard errors derived from a logistic regression model using weighted data are generally unstable (Gelman, 2007). As an alternative to using weighted variables in the analysis, we included all variables used to create weights in the parent sample as predictors in the multivariable logistic regression model (Korn & Graubard, 1991; Lohr & Liu, 1994).

2.4.5 Distribution of data in the predictors

The distribution of data in the predictors was provided in Table 4. A separate table reporting relationships between age and the other predictors was prepared for one committee member, but was not included in the manuscript.

2.4.6 Redefined dependent variable, FS status

In the parent study, four levels of FS were created:

- 1 = High FS
- 2 = Marginal FS
- 3 = Low FS
- 4 = Very low FS

Similar to the ERS, we dichotomized FS status as follows:

- 1 and 2 = Food secure (1)
- 3 and 4 = Food insecure (0)

In the Introduction, data on FS status in the U.S. for adults 65 year or older in 2008 and 2012 were reported. In the Discussion, FS status in the study sample was compared to FS status for adults 65 year or older in 2008 in the U.S. and FS status across all age groups in 2008 in the Northeast U.S.

It was explained to one of the committee members that marginal FS is an acceptable descriptor of FS by the USDA because households that had problems at times or anxiety about accessing adequate food, did not experience lesser quality, variety, and quantity of their food, and food

intake was not substantially reduced (U.S. Department of Agriculture Economic Research Service, 2012a).

2.4.7 Missing cases on the dependent variable, FS status

12 cases were missing on FS status. As shown in Table 4, FS status was described for 3,195 subjects. As shown in Tables 5 through 7, the analyses with FS status were conducted on 3,195 subjects. As noted above, an additional 33 cases were dropped from the final multivariable logistic regression model owing to missing data on FAPP.

3.0 MANUSCRIPT: PREDICTORS OF FOOD SECURITY STATUS IN OLDER ADULTS LIVING IN THE NORTHEAST UNITED STATES

3.1 ABSTRACT

The current study describes and identifies predictors of food security status among 3,207 older adults living in the northeast U.S. The study used a descriptive correlational design for a secondary analysis of data from the 2008 Current Population Survey/Food Security Survey. Simple and multivariable binary logistic regression modeling examined nine predictors of food security status, based on environments of the Ecological Model of Health Behavior. Nearly 6% of the sample lacked adequate food security status. Respondents who were young old, non-white, Hispanic, less educated, below the poverty income range, lived in non-metropolitan areas, and participated in food assistance programs were at risk for inadequate FS status after controlling for all other variables in the model. Sex and marital status were significant predictors individually, but non-significant in the multivariable model. These findings suggest characteristics of older adults at risk for inadequate FS status, which can be used during routine health assessments.

3.2 INTRODUCTION

Food security (FS) status is an economic and social indicator of household health and well-being (Karpilow, Reed, Chamberlain, & Shimada, 2011) achieved when all members of a household have access at all times to enough nutritionally adequate food for an active, healthy lifestyle (Nord, Coleman-Jensen, Andrews, & Carlson, 2010; U.S. Department of Health and Human Services, 2000). FS status is the linchpin of healthful living and must be achieved in the United States to improve the health of its citizens and residents (Holben, 2010). Inadequate FS status is a high priority for public health action (Holben, 2010). Most U.S. households have enough access to food to sustain food needs (Coleman-Jensen, Nord, & Singh, 2013).

However, when inadequate FS status occurs in the U.S., it tends to be recurrent but not chronic (Coleman-Jensen et al., 2013). Inadequate FS status is rare in this country, but some groups experience episodic and prolonged shortfalls in food consumption (Rose & Oliveira, 1997), resulting in inadequate FS status. The estimated annual burden to the U.S. is more than \$90 billion for direct and indirect costs to government agencies and hunger-related charities for illnesses, psychosocial dysfunction, impaired educational function, poor health-related quality of life, and lowered productivity related to inadequate FS status (National Anti-Hunger Organizations, 2008; Rasheed & Woods, 2013).

In 2009, there were 39.6 million adults 65 years of age or older living independently in the U.S. (Administration on Aging, 2010). Nearly 9% (8.8%), or 980 of 11,148 households with adults 65 years or older living alone, had inadequate FS status in 2008 (Nord, Andrews, & Carlson, 2009). The percentage increased in 2012 when 9.1%, or 1,063 of 11,706 households with older adults living alone, had inadequate FS status (Coleman-Jensen et al., 2013). Nutrition-related issues for older adults include exacerbation of chronic disease, depression,

dementia, dysphagia, obesity, cachexia, and nutritional frailty (Borden, Conner, & Hark, 2012). Clinical presentation of impaired nutrition in older adults includes unintentional weight loss of 5% in one month or 10% weight loss over six months, muscle wasting, in particular temporal muscle wasting (sunken temples), ill-fitting dentures, and mouth sores or abscesses (Borden et al., 2012). Additionally, patients with impaired nutrition present with a body mass index < 18.5kg/m², low albumin levels, elevated C-reactive protein tests, abnormal complete blood counts, and low blood glucose tests resulting from interruptions in feeding behaviors and patterns (White, Guenter, Jensen, Malone, Schofield, 2012).

Several studies have examined sociodemographic predictors of FS status. Duerr (2006a, 2006b) found age to be a significant inverse predictor of FS status in which FS status decreased as age increased. In contrast, others reported that the older the respondent, the more adequate was FS status (Feeding America & National Foundation to End Senior Hunger, 2013). Female sex was a significant predictor of inadequate FS status in three studies (Alley et al., 2009; Duerr, 2006a; Sullivan, Clark, Pallin, & Campargo, 2010), but adequate FS status in another study (Duerr, 2006b). No association between FS status and sex was found by Bowman (2009). Race was not a significant predictor of FS status in two studies (Alaimo, Briefel, Frongillo, & Olson, 1998; Duerr, 2006a); however, five studies found that non-whites were more likely to have inadequate FS status than whites (Alley et al., 2009; Bowman, 2009; Kaiser, Baumrind, & Dumbauld, 2007; Lee & Frongillo, 2001; Sharkey & Schoenberg, 2005). Ethnicity was found to predict FS status in two studies in which Hispanics had inadequate FS status compared to non-Hispanics (Alkon & Agyeman, 2011; Martin, Cook, Rogers, & Joseph, 2003).

Education was a significant predictor of FS status in five studies (Alley et al., 2009; Duerr, 2006b; Kaiser et al., 2007; Laraia, Borja, & Bentley, 2009; Lee & Frongillo, 2001). In

two of the five studies, respondents with less than a high school education were two times more likely than those with a high school education or greater to have inadequate FS status (Alley et al., 2009; Kaiser et al., 2007). Similarly, others reported that those with a high school education or greater had adequate FS status compared to those with less than a high school education (Duerr, 2006b; Laraia et al., 2009; Lee & Frongillo, 2001). In contrast, Duerr (2006a) found education to be a non-significant predictor of FS status. Two studies showed that those who were not married were significantly less likely to have adequate FS status than married respondents (Hanson, Sobal, & Frongillo, 2007; Kaiser et al., 2007); in contrast, marital status was not significant in three studies (Bowman, 2009; Duerr, 2006a; Duerr, 2006b).

Lower income was consistently found to be a significant predictor of inadequate FS status (Alaimo et al., 1998; Bowman, 2009; Lee & Frongillo, 2001). One study showed that those at 50% and 50%-100% of the income poverty rate were 3 and nearly 4 times more likely to have inadequate FS status, respectively, compared to households above the poverty line (Lee & Frongillo, 2001). Another study found that in low income households, 40.4% of African Americans and 21.3% of Caucasians had inadequate FS status (Bowman, 2009). In two studies, income was not a significant predictor of FS status (Duerr, 2006a; Duerr, 2006b). Metropolitan status was found to be predictive of FS status in several studies (Gerlach & Loring, 2013; Holben, 2010; LaVeist, Gaskin, & Trujillo, 2011; Ziliak & Gundersen, 2011). In particular, Gerlach and Loring (2013) reported that people living in metropolitan areas with 1,000,000 or more residents as well as those living in non-urban areas were at risk for inadequate FS status.

Two studies found that respondents who did not participate in food assistance programs (e.g., Meals on Wheels; Supplemental Nutrition Assistance Program (SNAP), formerly known as Food Stamps; and Senior Farmers' Market Nutrition Program) had less risk for inadequate FS

status compared to participants in these programs (Gollub & Weddle, 2004; Lee & Frongillo, 2001), whereas two studies found participation in food assistance programs to be a non-significant predictor (Gundersen & Oliveira, 2009; Vailas et al., 1998).

Most FS status studies have focused on the rural Southeast, the Southwest, and non-urban areas (Bengle et al., 2010; Brewer et al., 2010; Duerr, 2006b; Quandt, McDonald, Arcury, Bell, & Vitolins, 2000; Vailas, Nitzke, Becker, & Gast, 1998). The Northeast U.S. (i.e., CT, ME, MA, NH, RI, VT, NJ, NY, and PA) is the most food secure region in the country. People in urban areas are at higher risk of inadequate FS status, with FS status in central cities averaging 28.7% and metropolitan areas not designated central cities averaging 28.3% (Malbi, Cohen, Potter, & Zhao, 2010; Nord & Andrews, 2003). Three of the largest U.S. cities are located in this region (Boston, New York, and Philadelphia). The Northeast region has the largest percentage of people ≥ 65 years (14.1%) and the largest percentage of people ≥ 85 years (2.2%) (U.S. Census Bureau, 2011). Yet, little is known and no studies have been conducted about the FS status of older adults living in the Northeast U.S., where 19.5% and 17.2% of households have low and very low FS status, respectively (Nord, Coleman-Jensen, Andrews, & Carlson, 2010).

The Ecological Model of Health Behavior (EMHB) posits that multiple environments contribute to health behaviors (Sallis, Owen, & Fisher, 2008). The EMHB explains that transactions occur between individuals and environments that provide useful and appropriate orientations for understanding contemporary health promotion issues and for developing interventions in subsequent research (Sallis et al., 2008). The EMHB includes the intrapersonal environment comprising individual characteristics such as age, sex, race, ethnicity, and education (LaVeist et al., 2011; Sullivan et al., 2010); the interpersonal or social environment, which includes marital status and household income (Bowman, 2009; Frongillo, Valois, & Wolfe,

2003); the physical environment consisting of living space and geopolitical entity, e.g., metropolitan status (Duerr, 2006a; LaVeist et al., 2011); and the policy environment encompassing legislation, regulation, and program delivery, e.g., food and nutrition assistance programs (Gorton, Bullen, & Mhurchu, 2010; Hinrichsen et al., 2010; LaVeist et al., 2011; McQueen, 2011).

In the EMHB, FS status is a construct reflecting an array of behaviors because efforts to achieve FS status occur by the individual or members of the household acting to acquire and utilize adequate, safe, and culturally appropriate foods (Sallis et al., 2008). Further, FS status is involves the act of making choices about the amount and kinds of food present in the household, which subsequently leads to sustained nutritional health.

The purpose of this report, which is guided by the EMHB, is to describe the profile of older adults at greatest risk for inadequate FS status in the Northeast region of the U. S. The research questions were: 1) What is the level of FS status of older adults living in the Northeast U.S. according to the Current Population Survey (CPS)/Food Security Survey (FSS), and 2) Which CPS/FSS characteristics significantly correlate with and predict FS status of older adults living in the Northeast U.S.? It was hypothesized that variables (age, sex, race, ethnicity, education, marital status, income range, metropolitan status, and participation in food assistance programs) based on environments of the EMHB would significantly correlate with and predict FS status of older adults in the Northeast U.S.

3.3 METHODS

3.3.1 Study Design

This study used a descriptive correlational design for a secondary analysis of data from responses to the CPS and FSS found in the micro-data on CD-ROM of the Economic Research Service, U.S. Department of Agriculture (USDA), December, 2008.

3.3.2 Sample

3.3.2.1 Parent Study Sample

The CPS is sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics and produces the country's primary source of demographics and labor force statistics for the entire population. In 2008, it was conducted monthly by professionally trained survey staff and data were collected from 149,687 respondents. CPS respondents were expected to participate in the FSS for four consecutive months.

In December, 2008, the FSS was administered to approximately 53,000 households comprising a representative sample from the U.S. civilian, non-institutionalized population of 118 million households. The FSS was conducted by trained interviewers in home settings in 278 core-based selected areas. The FSS interviewers asked one adult respondent in each of 44,000 surveyed households a series of questions on four interview encounters each one month apart about experiences and behaviors in the last 12 months that indicated FS or the lack thereof. The individuals in the remaining 9,000 households were unable (e.g., due to respondent relocation,

dwelling was vacant, no eligible respondent due to age restrictions, or no one was home during allocated time of interview) or unwilling to complete the FSS (Nord et al., 2009).

3.3.2.2 Current Study Sample

For the current investigation, the CPS and FSS data sets were merged and a subsample was extracted. Inclusion criteria were: 1) households from the Northeast U.S., and 2) adults greater than or equal to 65 years of age. Initial examination of the CPS and FSS data identified a subsample of 3,923 respondents who lived in the Northeast U.S. and were ≥ 65 years of age. Of the sub-sample of 3,923 respondents, 716 non-analytic respondents did not answer questions about participation in food assistance programs, leaving 3,207 respondents in the final analytical sample. Table 4 reports the demographic characteristics of sample respondents who did not respond ($n = 716$, non-analytic sample) and those who did respond ($N = 3,207$, analytic sample) to items about participation in food assistance programs. The non-analytic and analytic respondents to the items about participation in food assistance programs did not differ significantly on the demographic characteristics. The sample of 3,207 was adequate for performing logistic regression using a two-tailed significance test and alpha of .05 to achieve 80% power to detect an odds ratio as low as 1.13 (Faul, Erdfelder, Buchner, & Lang, 2009).

3.3.3 Measures

3.3.3.1 Current Population Survey

The CPS is a 50- to 60-item survey that was used to collect demographic information from respondents within households. In the current study, the variables of age, sex, race,

ethnicity, education, marital status, income range, and metropolitan status were extracted from the CPS database.

3.3.3.2 Food Security Survey

The FSS explores the full range of FS in U.S. households by obtaining responses about food-access conditions and coping behaviors including spending, access, adequacy, and sources of food assistance for the U.S. population (Nord et al., 2009). The USDA sponsors the FSS as a supplement to the CPS in late fall (U.S. Census Bureau, 2009). The FSS reflects information about FS status over the course of the previous twelve months prior to administration of the FSS. The FSS has helped inform U.S. national nutrition policy (Nord, Andrews, & Carlson, 2008) and has become a benchmark tool used as a template for valid and reliable assessments of FS status throughout the nation and the globe (Frongillo et al., 2003; Radimer et al., 2005). The FSS queries concerns about ways of coping with not having enough food. The FS status of the household is assessed based on the number of food-insecure conditions reported (e.g., being unable to afford balanced meals, cutting the size of meals because of too little money for food, or being hungry because of inadequate finances for food). Survey respondents also report the amount of money their household had spent on food and whether they had used public or private food and nutrition assistance programs (Nord et al., 2009). An overall FS status level was derived using a scale of 0-10, with 0 representing the highest level of FS and 10 representing the lowest level of FS among adult household members. From this scale, a categorical variable with 4 levels of FS was created: 1 = high FS, 2 = marginal FS, 3 = low FS, and 4 = very low FS.

3.3.3.3 Current Study Variables

Predictor variables used in the current investigation include demographic variables from the CPS that represent elements of the four environments from the study theoretical framework: intrapersonal, interpersonal, physical, and policy. The intrapersonal environment was operationalized by age (young old, 65 - 74 years; old, 75 - 84 years; and old old, \geq 85 years (Hiramatsu et al., 2012; Transgenerational Design Matters, 2009), sex (male, female), race (non-white, white), ethnicity (Hispanic, non-Hispanic), and education (high school or less, more than high school). The interpersonal environment was operationalized by marital status (not married, married) and income range (below 185% poverty level, above 185% poverty level). The physical environment was operationalized by metropolitan status, i.e., metropolitan areas with 1,000,000 or more residents vs. less than 1,000,000 (Ziliak & Gundersen, 2011). The policy environment was operationalized by a variable entitled food assistance programs participation (FAPP) representing use of one or more sources of food assistance available to older adults, specifically Meals on Wheels, Congregate Meals, Emergency Sources, Soup Kitchens, and/or Supplemental Nutrition Assistance Program (SNAP), formerly known as Food Stamps (U.S. Department of Health and Human Services, Administration on Aging, 2014) Respondents were asked if they participated in each of these food assistance programs in the previous year. The FAPP variable was created and scored “1” for participation in any of the five feeding programs, and “0” for non-participation. The outcome variable, FS status, was created using the categorical variable with four levels of FS, which were dichotomized into adequate FS status (1 = “high FS among adults” and “marginal FS among adults) and inadequate FS status (0 = “low FS among adults” and “very low FS among adults”).

3.3.4 Statistical Analysis

Data analyses were conducted in three phases. First, all data were examined via descriptive statistics to determine frequencies and percentages (for categorical variables) and to assess measures of central tendency and variability (for continuous variables). Second, the bivariate relationships between the dependent variable, FS status, and predictor variables (age, sex, race, ethnicity, education, marital status, income range, metropolitan status, and FAPP) were examined using chi-square tests of independence, Spearman's rho correlation (age), and simple binary logistic regression analyses. Finally, predictor variables associated with the dependent variable at a statistically significant level ($p < .05$) were entered in a multivariable binary logistic regression model.

The parameter estimates employed in the multivariable logistic analysis included standardized betas to determine the strength of the predictors, p-values, odds ratios as well as the 95% confidence intervals. The Hosmer-Lemeshow (H-L) goodness-of-fit test was also examined; a non-significant statistic provides evidence of good model fit (Hosmer, Lemeshow, & Sturdivant, 2013). The Cox and Snell and Nagelkerke R² statistics were examined for goodness-of-fit in conjunction with the H-L test as part of model assessment (Cox & Snell, 1989). Additionally, the classification rate of the model was evaluated; values closer to one indicated an adequate classification rate.

By convention, the U.S. Census Bureau and U.S. Bureau of Labor and Statistics created weights to be used to analyze data collected for the parent CPS. Weights were not used in the current analyses because standard errors derived from a logistic regression model using weighted data are generally unstable (Gelman, 2007). As an alternative to using weights in the analysis, all variables used to create weights in the parent sample were included as predictors in the

multivariable logistic regression model (Korn & Graubard, 1991; Lohr & Liu, 1994). The variables used to create weights in the parent CPS were age, sex, race, and ethnicity.

Two-tailed testing was used and the level of significance was set at $\alpha = .05$. All analyses were performed using Statistical Packages for the Social Sciences (SPSS) version 20. This study was approved by the University of Pittsburgh Institution Review Board.

3.4 RESULTS

Table 4 reports frequencies of the sociodemographic characteristics of the study sample (N = 3,207). The age groups of the sample were satisfactorily distributed between the young old (the reference group) at 52% and the old and old old age categories with a combined frequency of 48%. The sample was 57% female, 93% white, 97% non-Hispanic, and 55% married. Forty percent of the sample had greater than a high school education, 68% had an income range above 185% of poverty, and 77% lived in metropolitan communities. In this study, only 8.5% participated in food assistance programs, and 5.5% reported inadequate FS status.

Table 5 shows relationships between FS status and the predictors. The chi-square test of independence results indicated that FS status was significantly associated with eight variables: sex, race, ethnicity, education, marital status, income range, metropolitan status, and FAPP (N = 3,174). There was also a statistically significant positive relationship between age and FS status ($r = .055$, $p = .002$).

Through simple and multivariable binary logistic regression models, a profile of characteristics was created that identified older adults at greatest risk for inadequate FS status in the Northeast U.S. region. The results of the simple binary logistic regression modeling are

reported in Table 6. The nine predictors associated with FS in the bivariate analyses were significantly predictive of FS status, supporting the results of the tests of association.

The multivariable binary logistic regression model contained nine predictors (age, sex, race, ethnicity, education, marital status, income range, metropolitan status, and FAPP). The Hosmer and Lemeshow goodness-of-fit test was not significant ($p = .932$), indicating that the model fit was appropriate for the data (Hosmer et al., 2013). The Cox and Snell and Nagelkerke R² statistics were .060 and .177, respectively, also indicating a good fit of the model for the data. Furthermore, 94.7% of cases were categorized correctly.

Table 7 reports the standardized betas, p values, and odds ratios with 95% confidence intervals (CI) from the multivariable binary logistic regression model. Two of nine original variables, sex and marital status, were found to be non-significant. Respondents who were young old, non-white, Hispanic, less educated, below the poverty income range, lived in non-metropolitan areas, and participated in FAPP were at risk for inadequate FS status after controlling for all other variables in the model. Compared to the young old respondents (65 - 74 years), those classified as old (75 - 84 years; OR = 1.646, 95% CI = 1.147 - 2.362), and old old (\geq 85 years; OR = 3.271, 95% CI = 1.692 - 6.326) had higher odds of reporting adequate FS status. Whites had higher odds of reporting adequate FS status than non-whites (OR = 1.815, 95% CI = 1.107 - 2.975), and non-Hispanic respondents had higher odds of adequate FS status than Hispanics (OR = 2.084, 95% CI = 1.107 - 3.923). Having greater than a high school education increased the odds for adequate FS status over having a high school education or less (OR = 2.599, 95% CI = 1.653 - 4.085). Households with income range greater than 185% of the poverty level had higher odds to report adequate FS status than those below the income range for poverty level (OR = 2.726, 95% CI = 1.865 - 3.983). Respondents who lived in metropolitan

areas had higher odds of adequate FS status than those in non-metropolitan areas (OR = 2.054, CI = 1.282 - 3.292). Although significant, FAPP was negatively related to FS status, i.e., respondents who participated in food assistance programs had 65% lower odds of reporting adequate FS status than those who did not participate (OR = .354, 95% CI = 0.236 - 0.530).

3.5 DISCUSSION

This study is the first to consider the EMHB for its applicability to the issues of FS status for this older, regional subset of the U.S. population. Our findings identify characteristics of those at risk for inadequate FS status and partially support the hypothesis that variables based on the four environments of the EMHB theoretical framework (age, sex, race, ethnicity, education, marital status, income range, metropolitan status, and FAPP) would predict FS status. Further, this was the first study examining data from the Northeast region of the U.S. to create a profile of risk factors for inadequate FS status among older adults particularly in relation to the age classification of young old, old, and old old (Hiramatsu et al., 2012; Transgenerational Design Matters, 2009).

The prevalence rate of 5.5% of inadequate FS status found in adults 65 years and older in this study was lower than the 2008 national prevalence rates of 8.1% for households with older adults and 8.8% for households with older adults living alone, and lower than the 12.8% prevalence rate across all age groups in the Northeast region in 2008 (Nord, et al., 2009). In previous studies (Duerr, 2006a; Duerr, 2006b), advancing age diminished FS status, whereas Feeding America and National Foundation to End Senior Hunger (2013) and this study found that the older the respondent, the more adequate was FS status. Perhaps the finding that the old

and old old age groups are more food secure than the young old can be explained by accepted clinical understanding that as one ages, lower caloric intake is usually needed (Borden et al., 2012), thereby requiring less food stuffs in the living environment. Consequently, respondents may report that they feel they have adequate food supplies irrespective of their nutritional health.

Another possible reason for the finding that older age survey respondents have adequate FS status is that older age is thought to be more protective against inadequate FS status. Unmet food needs of older adults may be masked and go undetected because of loss of or diminished appetite, problems with dentition, effects of late life depressive disorders, reduced social interaction, and decline in sensory perceptions about food leading to lack of appreciation for and enjoyment of food (Ziliak & Gundersen, 2011; Ziliak, Gundersen, & Haist, 2008). Older adults are more reticent to admit to inadequate FS status because of shame and lack of understanding of the concept of FS status (Doswell & Kregg-Byers, 2009). The young old may be more susceptible to inadequate FS status because this is the period when predictable and expected life course changes occur, e.g., changing relationships with adult children, loss of job or reduction of income, and retirement, which may disrupt the food acquisition, utilization, and consumption processes and thereby threaten FS status of the young old adult (Hoyer & Roodin, 2003).

Our study findings for race were similar to previous studies (Alley et al., 2009; Bowman, 2009; Feeding America & National Foundation to End Senior Hunger, 2013; Kaiser et al., 2007; Lee & Frongillo, 2001; Sharkey & Schoenberg, 2005), which have found that being a member of a racial group other than white, especially black, was a predictor of inadequate FS status, whereas others found race was not a significant predictor of FS status (Alaimo et al., 1998; Duerr, 2006a). Similar to this study, previous research has revealed that ethnicity, based on the U.S. Census classification of Hispanic as Mexican, Puerto Rican, Cuban, Central/South

American, and other Spanish, was a significant predictor of inadequate FS status (Alkon & Agyeman, 2011; Martin et al., 2003). Since the federal designation defines ethnicity as Hispanic or not Hispanic, it is difficult to delineate the influence of beliefs and traditions of other ethnic groups in regard to FS status because most people of color do not identify homogeneously, e.g., blacks self-identify as African American, African Cuban, African Caribbean, or African immigrant of various continental locations, as do Asian Americans (National Research Council, 2004).

Although Duerr (2006a) found no significant relationship between education and FS status, our finding that education was a predictor of FS status is similar to other studies (Alley et al., 2009; Laraia et al., 2009). The current study was based on 2008 data, which is the year that marked the beginning of the economic downturn in the U.S. (Sattler & Lee, 2013; U.S. Bureau of Labor Statistics, 2012). It was expected that income range would predict inadequate FS status, especially for older adults who very often live on fixed incomes. Our finding regarding the relationship between FS status and income range was supported in previous reports in which respondents were at risk for inadequate FS status if their household income was below the poverty level (Algert, Reibel, & Renvall, 2006). An additional element regarding low income range and inadequate FS status examined by Sattler and Lee (2013) revealed a connection between inadequate FS status and medication non-adherence related to limited or fixed income. They found that older adults with persistent inadequate FS status showed increased odds of reporting higher levels of non-adherence to medication and treatment regimens than those with persistent adequate FS status.

In this study, non-metropolitan areas had inadequate FS status compared to metropolitan areas. With respect to Alaskan natives, Gerlach and Loring (2013) identified aspects of non-

metropolitan areas that impact inadequate FS, such as paucity of local food stuffs, transition of food sources to cash-crop productivity, less availability of quality food in scarce small rural food stores, the high price of fuel to travel to grocery markets, lack of public transportation to travel to grocery markets, and food delivery systems that are not sensitive to climate change, weather, and seasonal fluctuations. These effects are magnified if a person or household is part of a racial or ethnic group. Metropolitan status influenced FS status according to LaVeist et al., (2011) and Ziliak & Gundersen (2011). LaVeist et al. (2011) reported that locality matters when considering health disparities, such as FS status. They found that race plus physical and geographical location impart a doubly negative impact on FS status.

A large proportion of the current sample did not participate in food assistance programs, which is consistent with the fact that if a household has adequate FS status, the household will exhibit little need for supplemental food assistance. Since their inception, programs such as Meals on Wheels, especially for seniors, have been especially effective for those who participate. On the other hand, Gollub and Weddle (2004) found that FAPP stabilized FS status for community-dwelling, frail, and homebound older adults, which is contrary to what this study found.

This study had several strengths. It answers the call from the position paper of the American Dietetic Association to investigate the causes of inadequate FS status and its effects on health, nutritional status, and well-being of special, at-risk population groups (Holben, 2010). The study used existing data from a large government sponsored and approved national data set, which provided some assurance that the sample was representative of the general population. The data set had a geographic configuration clearly defined by the U.S. Census Bureau, which allowed for the examination of FS and its predictors in the little researched region of the

Northeast U.S. The data set provided a satisfactory number of variables from which to operationalize the various environments specified by the EMHB that guided this study. Further, there was little missing data on the selected variables, and the study was adequately powered.

This study had a few limitations. The descriptive correlational design does not permit causal inference to be made between the predictors and FS status. Possible confounding variables could not be controlled. For example, factors such as frailty, impaired cognition, and multi-family household configurations may contribute to inadequate FS status. Secondary analysis of existing data limited the investigator's input into data collection so that no clinical data were available, such as biomarkers of nutritional status, to confirm biomedical consequences of inadequate FS status. Because data from these other factors were not available to include in our analytical model, there may be omitted variable bias (Clark, 2005), causing over-or underestimation of the effects included in the model.

The FSS is administered in late fall when certain food stuffs are less likely to be available and more expensive prepared food products are needed, thereby reducing perceptions or reality of the buying power of those surveyed. Further, recall bias may occur as respondents are asked to report on FS status over the past 12 months. Other limitations include bias due to lack of heterogeneity in the sample because the sample predominantly was white and non-Hispanic, had an income above poverty level, lived in metropolitan communities, and did not participate in food assistance programs. Ethnicity, as defined in U.S. census data, is either Hispanic or non-Hispanic and does not delineate the ethnicities of other non-white groups, e.g., African American, African Caribbean, and African native (National Research Council, 2004). Older adult reticence to discuss certain sociodemographic and personal information may result in self-reported misclassification of FS status. Additionally, not being able to address culturally and

ethnically appropriate foods and food preparations, which are often an issue with older adults, could have limited respondents' adequate understanding of FS status.

3.6 IMPLICATIONS AND CONCLUSIONS

This study has several implications for practice. The findings can inform health care professionals and other stake holders of the importance of FS status assessment of older adults to identify those at risk. Health care professionals do not routinely assess nutrition status as part of their health promotion/health maintenance plans of care for their older adult patients (Chernoff, 2001). The American Dietetic Association and other professional groups have agreed that screening and referral systems are not a routine in the care of older adults but should be (Kamp, Wellman, & Russell, 2010). Routine assessment by health care professionals can identify potential and actual inadequate FS status that negatively affects successful aging in place for older adults. Successful aging in place incorporates a high degree of all facets of life inclusive of social and environmental situations other than simply biomedical parameters (McCarthy, Ling, & Carini, 2013). The results of this study are from data that require recall of FS status over the preceding year so it is not possible to determine what older adults face on a daily basis in regard to FS status. Thus, health care professional may want to inquire about FS status at each patient encounter to confirm that FS status is not threatened.

Screening is important at the secondary level of prevention for addressing FS status issues; however, at the tertiary level of prevention, FAPP is essential by raising awareness and educating people that these services and programs exist, increasing the numbers of older adults who participate in them, and making the programs more culturally, racially, ethnically as well as

financially appropriate based on characteristics identified in this study. Keller (2007) discussed FS status in terms of primary, secondary, and tertiary prevention in Canada, but much of what the author writes is applicable to FS status in U.S. older adults. Primary prevention includes activities or measures that prevent the onset of negative nutrition-related circumstances; secondary prevention includes prompt treatment of risk factors for inadequate FS status that negatively impact health-related quality of life for older adults; and tertiary prevention includes all aspects of attention to nutrition that prevent further deterioration of the nutritional condition. Most public health and health care programs focus on primary prevention similar to initiatives to prevent chronic diseases in Canada (Keller, 2007).

LaVeist et al. (2011) have shown that place and race matter in regard to health disparities. Health care professionals can be aware that nutrition as a basis of good health is at risk for young old patients in non-metropolitan areas who are members of racially and ethnically identifiable groups. Further, health care professionals can make themselves aware of the safety-net programs for which their patients may be eligible, the localities from which they come, and the racial and ethnic group with which they identify. Health care professionals may take note of the understanding and comprehension, or lack thereof, exhibited and verbalized by their patients about the elements of food and nutrition that impact health. Patient education may be needed at every health care encounter across various health care settings (practitioner offices, clinics, acute care, and home care) to help older adults become aware of threats to their FS status.

Because FAPP is a modifiable factor predictive of FS status, further research needs to be done on the kinds and effectiveness of these feeding programs. The percentage of households participating in food assistance programs has been increasing since 2008 (Economic Research Service, U.S. Department of Agriculture, 2013), and the need remains high. In the private sector,

community gardens, urban gardens, and shopper assist programs are intermittently and sporadically in effect. The integration of government and NGO feeding programs needs to be evaluated for value and effectiveness then instituted in appropriate areas (e.g., non-metropolitan, underserved areas). Further research needs be done regarding older adults' knowledge about food acquisition, utilization, and consumption. Age appropriate educational interventions aimed at increasing knowledge in these areas for at risk older adults may be a first step to correcting the FS status deficiencies threatening the health of older adults in the U.S.

In conclusion, this study identified seven independent predictors of FS status, based on the EMHB, which can provide useful information for health care professionals who manage geriatric patients that may be at risk for inadequate FS status. Being young old (65 - 74 years), being of non-white and Hispanic origins, having a high school education or less, having low income range, living in non-metropolitan areas of less than one million people, and participating in food assistance programs predicted inadequate FS status. While six of the seven predictors are not modifiable, future interventions designed around food assistance programs may provide a promising direction to address inadequate FS status.

3.7 TAKE AWAY POINTS

- Prior to this study, little was known about the FS status of older adults living in the Northeast region of the U.S. and the characteristics of at risk older adults in this region.
- Independent predictors of inadequate FS status include being young old (65 - 74 years), being of non-white and Hispanic origins, having a high school education or less, being

below the poverty income range, living in a non-metropolitan area of less than one million people, and participating in food assistance programs.

- Routine assessment by health care professionals can identify potential and actual inadequate FS status that negatively affects successful aging in place for older adults.

Table 3. Comparison Table For Response Bias: Adult Food Security Responses

<i>N</i> = 3,923, <i>n</i> = 716 (Non-analytic)			<i>N</i> = 3,923, <i>n</i> = 3,207 (Analytic)	
Variable	%	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)
Age		75.1 (6.46)		74.3 (6.35)
65 - 74 = Young Old	46.5		52.2	
75 - 84 = Old	37.6		34.7	
≥ 85 = Old Old	15.9		13.1	
Sex				
Male	41.3		42.8	
Female	58.7		57.2	
Race				
White	86.7		93.3	
Non-White	13.3		6.7	
Ethnicity				
Hispanic	4.6		2.6	
Non-Hispanic	95.4		97.4	
Education				
≤ High School	64.4		59.9	
> High School	35.6		40.1	
Marital Status				
Non-married	54.6		45.1	
Married	45.4		54.9	
Income Range				
Below 185% Poverty			31.9	
Above 185% Poverty			68.1	
Metropolitan Status				
Metropolitan	82.4		77.1	
Non-Metropolitan	17.6		22.9	

Table 4. Sample Characteristics as Percentages (*N* = 3,207)

Characteristic	<i>M</i> (<i>SD</i>)	<i>n</i> (%)
Age (Years)	74.3 (6.354)	
65 - 74 = Young Old (Reference Group)		1,675 (52.2)
75 - 84 = Old		1,113 (34.7)
≥ 85 = Old Old		419 (13.1)
Sex (Female)		1,836 (57.2)
Race (White)		2,993 (93.3)
Ethnicity (Non-Hispanic)		3,124 (97.4)
Education (> High School)		1,286 (40.1)
Marital Status (Married)		1,762 (54.9)
Income Range (>185% Poverty)		2,183 (68.1)
Metropolitan Status (Metropolitan)		2,473 (77.1)
FAPP ^a (Participating)		270 (8.5)
Food Security Status ^b (Food Secure)		3,019 (94.5)

^aFood Assistance Program Participation (Meals on Wheels, Congregate Meals, Emergency Sources, Soup Kitchens, and Supplemental Nutrition Assistance Program [SNAP], formerly known as Food Stamps), *n* = 3,174. ^bFood Security Status, *n* = 3,195.

Table 5. Relationships Between Predictors and Food Security Status ($N = 3,195^b$)

Predictor	r	χ^2	p
Age (Years)	.055		.002
Sex (Female)		5.712	.017
Race (White)		25.571	<.001
Ethnicity (Non-Hispanic)		36.704	<.001
Education (> High School)		47.731	<.001
Marital Status (Married)		20.211	<.001
Income Range (> 185% Poverty)		99.686	<.001
Metropolitan Status (Metropolitan)		8.966	.003
FAPP ^a (Participating)		136.734	<.001

^aFood Assistance Program Participation (Meals on Wheels, Congregate Meals, Emergency Sources, Soup Kitchens, and Supplemental Nutrition Assistance Program [SNAP], formerly known as Food Stamps), $n = 3,174$. ^b12 missing cases on Food Security Status score.

Table 6. Simple Binary Logistic Regression for Predictors of Food Security Status ($N = 3,195^b$)

Predictor	β	p	OR	95% CI
Age (Years)				
65 - 74 = Young Old (Reference Group)				
75 - 84 = Old	0.337	.050	1.400	1.0 - 1.962
≥ 85 = Old Old	0.781	.009	2.183	1.216 - 3.919
Sex (Female)	-0.388	.017	0.678	0.493 - 0.934
Race (White)	1.064	<.001	2.898	1.884 - 4.457
Ethnicity (Non-Hispanic)	1.565	<.001	4.784	2.742 - 8.345
Education(> High School)	1.369	<.001	3.932	2.593 - 5.961
Marital Status (Married)	0.703	<.001	2.020	1.479 - 2.759
Income Range(> 185% Poverty)	1.514	<.001	4.545	3.296 - 6.267
Metropolitan Status (Metropolitan)	0.659	.003	1.933	1.247 - 2.998
FAPP ^a (Participating)	-1.862	<.001	0.155	0.109 - 0.221

^aFood Assistance Program Participation (Meals on Wheels, Congregate Meals, Emergency Sources, Soup Kitchens, and Supplemental Nutrition Assistance Program [SNAP], formerly known as Food Stamps), $n = 3,174$. ^b12 missing cases on Food Security Status score.

Table 7. Multivariable Binary Logistic Regression for Predictors of Food Security Status (N = 3,195^b)

Predictor	β	p	OR	95% CI
Age (Years)				
65 - 74 = Young Old (Reference Group)				
75 - 84 = Old	0.498	.007	1.646	1.147 - 2.362
≥ 85 = Old Old	1.185	<.001	3.271	1.692 - 6.326
Sex (Female)	-0.153	.409	0.858	0.596 - 1.234
Race (White)	0.596	.018	1.815	1.107 - 2.975
Ethnicity (Non-Hispanic)	0.734	.023	2.084	1.107 - 3.923
Education (> High School)	0.955	<.001	2.599	1.653 - 4.085
Marital Status (Married)	0.265	.157	1.303	0.903 - 1.882
Income Range (> 185% Poverty)	1.003	<.001	2.726	1.865 - 3.983
Metropolitan Status (Metropolitan)	0.720	.003	2.054	1.282 - 3.292
FAPP ^a (Participating)	-1.040	<.001	0.354	0.236 - 0.530

^aFood Assistance Program Participation (Meals on Wheels, Congregate Meals, Emergency Sources, Soup Kitchens, and Supplemental Nutrition Assistance Program [SNAP], formerly known as Food Stamps), $n = 3,174$. ^b12 missing cases on Food Security Status score.

APPENDIX A

CPS/FSS VARIABLES CONSIDERED FOR INCLUSION

CPS Variables

(Bolded variables are study variables)

1. Living Quarters
2. Type of Housing Unit
3. Number of Persons Living in Household
4. Status of Each Person in the Household
5. Household Type
6. Family Type
7. Family Relationship
- 8. Family Income**
9. Is There a Telephone in This Household
10. Region
11. State
12. County Code Identification
13. Principal City
14. Metropolitan Status
- 15. Metropolitan Size**
- 16. Age**
- 17. Marital Status**
18. Relation to Reference Person
- 19. Sex**
- 20. Education**
- 21. Race**

22. Immigration Status
23. Citizen Status
24. Employment Status
25. Retirement Status
26. Fulltime Work Status
27. Disability Status
28. Type of Non-interview Reason

FSS Variables

(Bolded variables are study variables)

29. Usual Amount Money Spent on Food
30. Where You Bought Food: supermarket, grocery
31. Where You Bought Food Other: meat market, warehouse club, convenience store
32. Other Sources of food: restaurant, fast food, cafeterias, vending machines
33. Supplemental Nutrition Assistance Program (Food Stamps)
34. Food in Household
35. To Meet Your Needs, Did You Buy Just Enough or More Food
36. Worry Food Run Out Before Bet Money to Buy More
37. Food Would Not Last
38. Balanced Meal
39. Cut Size of Meal or Skip Meal
40. Skip Meals Because There Was Not Enough Money
41. Frequency of Cutting Meals
42. Eat Less Than You Felt You Should
43. Hungry
44. Lose Weight
45. Not Eat for Whole Day
46. Frequency of Not Eating
47. Relied on Only Low Cost Food
- 48. Receive Meals on Wheels**
- 49. Participated in Congregate Meals Community of Senior Centers**

- 50. Received Emergency Food from Church, Pantry, Food Bank**
- 51. Available Emergency Meals in My Community**
- 52. Ate at Soup Kitchens or Shelters**
- 53. 185% Poverty Level
- 54. Adult Food Security Status**

APPENDIX B

IRB APPROVAL LETTER



University of Pittsburgh
Institutional Review Board

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
<http://www.irb.pitt.edu>

Memorandum

To: Claudia Gregg-Byers
From: Christopher Ryan, PhD , Vice Chair
Date: 10/1/2012
IRB#: [PRO12060030](#)
Subject: Predictors of Food Security in Older Adults Living in the Northeast United States

The above-referenced protocol has been reviewed by the University of Pittsburgh Institutional Review Board. Based on the information provided to the IRB, this project includes no involvement of human subjects, according to the federal regulations [§45 CFR 46.102(f)]. That is, the investigator conducting research will not obtain information about research subjects via an interaction with them, nor will the investigator obtain identifiable private information. Should that situation change, the investigator must notify the IRB immediately.

Given this determination, you may now begin your project.

Please note the following information:

- If any modifications are made to this project, use the "**Send Comments to IRB Staff**" process from the project workspace to request a review to ensure it continues to meet the determination.
- Upon completion of your project, be sure to finalize the project by submitting a "**Study Completed**" report from the project workspace.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

APPENDIX C

CERTIFICATES OF RESEARCH TRAINING

CITI Collaborative Institutional Training Initiative

**Biomedical Human Subjects Research Curriculum
Completion Report
Printed on 4/16/2013**

Learner: Claudia Kregg-Byers (username: Kregg-ByersClaudia)

Institution: University of Pittsburgh

Contact Information Email: clk30@pitt.edu

Biomedical Researchers (includes fellows, residents, and medical students) - Basic/Refresher: Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in biomedical research with human subjects.

Stage 1. Basic Course Passed on 12/05/12 (Ref # 9283257)

Required Modules	Date Completed	Score
University of Pittsburgh	12/05/12	no quiz
Belmont Report and CITI Course Introduction	12/05/12	3/3 (100%)
History and Ethical Principles	12/05/12	6/6 (100%)
Basic Institutional Review Board (IRB) Regulations and Review Process	12/05/12	5/5 (100%)
Informed Consent	12/05/12	4/4 (100%)
Genetic Research in Human Populations	12/05/12	2/2 (100%)
Research With Protected Populations - Vulnerable Subjects: An Overview	12/05/12	4/4 (100%)
Vulnerable Subjects - Research Involving Children	12/05/12	1/3 (33%)
Conflicts of Interest in Research Involving Human Subjects	12/05/12	4/5 (80%)
Elective Modules	Date Completed	Score
Cultural Competence in Research	12/05/12	5/5 (100%)
Avoiding Group Harms: U.S. Research	12/05/12	1/3 (33%)

Perspectives		
--------------	--	--

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

CITI Collaborative Institutional Training Initiative (CITI)

Biomedical Responsible Conduct of Research Curriculum Completion Report Printed on 4/16/2013

Learner: Claudia Kregg-Byers (username: Kregg-ByersClaudia)

Institution: University of Pittsburgh

Contact Information Email: clk30@pitt.edu

Biomedical Responsible Conduct of Research: This course is for investigators, staff and students with an interest or focus in **Biomedical Research**. This course contains text, embedded case studies AND quizzes.

Stage 1. RCR Passed on 12/06/12 (Ref # 9283258)

Required Modules	Date Completed	Score
Introduction to the Responsible Conduct of Research	12/05/12	no quiz
Research Misconduct <small>1-1215</small>	12/05/12	5/5 (100%)
Data Acquisition, Management, Sharing and Ownership <small>1-1308</small>	12/05/12	5/5 (100%)
Publication Practices and Responsible Authorship <small>1-1380</small>	12/06/12	5/5 (100%)
Mentor and Trainee Responsibilities <small>01234-1250</small>	12/06/12	5/5 (100%)
Collaborative Research <small>1-1450</small>	12/06/12	5/5 (100%)
The CITI RCR Course Completion Page	12/06/12	no quiz
Elective Modules	Date Completed	Score
Peer Review <small>1-1368</small>	12/06/12	8/8 (100%)

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific

misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

BIBLIOGRAPHY

- Administration on Aging. (2010). A profile of older Americans: 2010. U.S. Department of Health and Human Services. Retrieved from http://www.aoa.gov/Aging_Statistics/Profile/2010/3.aspx
- Alaimo, K., Briefel, R. R., Frongillo, E. A., Jr., & Olson, C. M. (1998). Food insufficiency exists in the U.S.: Results from the third National Health and Nutrition Examination Survey (NHANES III). *Journal of Nutrition*, 88(3), 419-426.
- Algert, S. J., Reibel, M., & Renvall, M. J. (2006). Barriers to participation in the food stamp program among food pantry clients in Los Angeles. *American Journal of Public Health* 96(5), 807-809.
- Alkon, A. H., & Agyeman, A. (Eds.). (2011). *Cultivating food justice: Race, class, and sustainability*. Cambridge MA: MIT Press.
- Alley, D. E., Soldo, B. J., Pagan, J. A., McCabe, J., deBlois, M., Field, S. H., Asch, D. A., & Cannuscio, C. (2009). Material resources and population health: Disadvantages in health care, housing, and food among adults over 50 years of age. *American Journal of Public Health*, 99(S3), S693-S701.
- Baglivo, J., Olivier, D., & Pagano, M. (1998). Methods for the analysis of contingency tables with large and small cell counts. *Journal of the American Statistical Association*, 83(404), 1006-1013.
- Bengle, R., Sinnott, S., Johnson, T., Johnson, M. A., Brown, A., & Lee, J. S. (2010). Food insecurity is associated with cost-related medication non-adherence in community-dwelling, low-income older adults in Georgia. *Journal of Nutrition for the Elderly*, 29(2), 170-191.
- Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). Measuring food security in the United States: Guide to measuring household food security. Retrieved from <http://www.fns.usda.gov/sites/default/files/FSGuide.pdf>
- Block, D., & Kouba, J. (2006). A comparison of the availability and affordability of a market basket in two communities in the Chicago area. *Public Health Nutrition*, 9, 837-845.

- Borden, C., Conner, C., & Hark, L. (2012). Nutrition for older adults. In L. Hark, K. Ashton, & D. Deen (Eds.), *The nurse practitioner's guide to nutrition* (pp. 113-133). Ames, Iowa: Wiley-Blackwell.
- Bowman, S. A. (2009). Socioeconomic characteristics, dietary and lifestyle patterns, and health and weight status of older adults in NHANES, 1999-2002: A comparison of Caucasians and African Americans. *Journal of Nutrition for the Elderly*, 28, 30-46.
- Brewer, D. P., Catlett, C. S., Porter, K. N., Lee, J. S., Hausman, D. B., Reddy, S., & Johnson, M. A. (2010). Physical limitations contribute to food insecurity and the food insecurity-obesity paradox in older adults at senior centers in Georgia. *Journal of Nutrition for the Elderly*, 29(2), 150-169.
- Brown, J. L., Shepard, D., Martin, T., & Orwat, J. (2007). The economic cost of domestic hunger: Estimated annual burden to the United States. Gaithersburg, MD: The Sodexo Foundation, in partnership with The Public Welfare Foundation and Spunk Fund, Inc. Retrieved from http://www.sodexofoundation.org/hunger_us/Images/Cost%20of%20Domestic%20Hunger%20Report%20_tcm150-155150.pdf
- Chernoff, R. (2001). Nutrition and health promotion in older adults. *Journal of Gerontology: Series A*, 56A(Special Issue II), 47-53.
- Clark, K. A. (2005). The phantom menace: Omitted variable bias in econometric research. *Conflict Management and Peace Science*, 22(4), 341-352.
- Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2011). Household food security in the U.S. in 2010. Retrieved from http://www.ers.usda.gov/media/121076/err125_2_.pdf
- Coleman-Jensen, A., Nord, M., & Singh, A. (2013). Household food security in the United States in 2012. Economic Research Report No. (ERR-155). Washington, DC: U.S. Department of Agriculture. Retrieved from www.ers.usda.gov/publications/err-economic-research-report/err155.aspx
- Cook, T. (2002). Clinical implications of household food security: Definition, monitoring, and policy. *Nutrition in Clinical Care*, 5(4), 152-167.
- Cox, D. R., & Snell, E. J. (1989). *The analysis of binary data* (2nd ed.). London: Chapman and Hall.
- Cox, W. (2008). America is more small town than we think. *New Geography*. Retrieved from <http://www.newgeography.com/content/00242-america-more-small-town-we-think>

- DiMaria-Ghalili, R. A., & Amella, E. (2005). Nutrition in older adults: Intervention and assessment can help curb the growing threat of malnutrition. *American Journal of Nursing*, 105(3), 30-50.
- Doswell, W., & Kregg-Byers, C. (2009, October). *My bibi: Grandmothers raising teen granddaughters*. Paper presented at the Greater Pittsburgh 21st Annual Nursing Research Conference, Pittsburgh, PA.
- Duerr, L. (2006a). Food security status of older adult home-delivered meals program participants and components of its measurement. *Journal of Nutrition for the Elderly*, 26(1-2), 1-26.
- Duerr, L. (2006b). Prevalence of food insecurity and comprehensiveness of its management for older adult congregate meals program participants. *Journal of Nutrition for the Elderly*, 25(3-4), 121-146.
- Eberhardie, C. (2002). Nutrition and the older adult. *Nursing Older People*, 14(2), 22-27.
- Economic Research Service. (2008). U.S. Adult Food Security Module: Three-stage design with screeners. Retrieved from http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/ad2012.pdf
- Economic Research Service, U.S. Department of Agriculture. (2013). Trends in prevalence rates. Washington, DC: Author. Retrieved from <http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics.aspx#trends>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149-1160.
- Feeding America. (2011). Map the meal gap 2011: Highlights of findings. Retrieved from <http://www.feedingamerica.org/hunger-in-america/our-research/map-the-meal-gap/2009/2009-mapthemealgap-exec-summary.pdf>
- Retrieved from http://feedingamerica.org/our-network/the-studies/map-the-gap/~media/Files/research/ExecutiveSummary_Final.ashx?.pdf
- Feeding America & National Foundation to End Senior Hunger. (2013). Spotlight on senior hunger: Executive summary. Retrieved from <http://www.nfesh.org/wp-content/uploads/2013/05/Senior-Hunger-Research.pdf>
- Food and Nutrition Technical Assistance Project. (2005). Measuring household food insecurity workshop II report October 19, 2005. Washington, DC: Academy for Educational Development. Retrieved from http://portals.wi.wur.nl/files/docs/ppme/MHFI_Workshop_Oct05.pdf

- Ford, A. F., Thomas, S. B., Carr Copeland, V., & South-Paul, J. (2004). CRAB: Helping investigators think 'outside the box'. Paper presented at the American Public Health Association Annual Meeting, Washington DC. Retrieved from https://apha.confex.com/apha/132am/techprogram/paper_90335.htm
- Freeman, A. (2007). Fast food: Oppression through poor nutrition. *California Law Review*, 95(2221). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1639302
- Frongillo, E. A., Jr. (1999). Validation of measures of food insecurity and hunger. *Journal of Nutrition*, 129, 506S-509S.
- Frongillo, E. A. (2003). Commentary: Assessing food insecurity in Trinidad and Tobago. *International Journal of Epidemiology*, 32, 516-517.
- Frongillo, E. A., & Horan, C. M. (2004). Hunger and aging. *Generations*, 28(3), 28-33.
- Frongillo, E. A., Valois, P., & Wolfe, W. S. (2003). Using a concurrent events approach to understand social support and food insecurity among elders. *Family Economics and Nutrition Review*, 15(1), 25-32.
- Gary, R., & Fleury, J. (2002). Nutritional status: Key to preventing functional decline in hospitalized older adults. *Topics in Geriatric Rehabilitation*, 17(3), 40-71.
- Gelman, A. (2007). Struggles with survey weighting and regression modeling. *Statistical Science*, 22(2), 153-164.
- Gerlach, S. C., & Loring P. A. (2013). Rebuilding northern foodsheds, sustainable food systems, community well-being, and food security. *International Journal of Circumpolar Health*, 72, 21560. Retrieved from <http://dx.doi.org/10.3402/ijch.v72i0.21560>
- Glass, G. V., & Hopkins, K. D. (Eds.). (1996). *Statistical methods in education and psychology* (3rd ed., pp.130-133). Needham Heights, MA: Allyn & Bacon.
- Gollub, E. A., & Weddle, D. O. (2004). Improvements in nutritional intake and quality of life among frail homebound older adults receiving home-delivered breakfast and lunch. *Journal of the American Dietetic Association*, 104(8), 1227-1235.
- Gorton, D., Bullen, C. R., & Mhurchu, C. N. (2010). Environmental influences on food security in high-income countries. *Nutrition Reviews*, 68(1), 1-29.
- Gregson, J., Foerster, S. B., Orr, R., Jones, L., Benedict, J., Clarke, B., Hersey, J., Lewis, J., & Zotz, K. (2001). System, environmental, and policy changes: Using the sociological model as a framework for evaluating nutrition education and social marketing programs with low-income audiences. *Journal of Nutrition Education*, 33(1), S4-S15.

- Gundersen, C., & Oliveira, V. (2009). The food stamp program and food insufficiency. *American Journal of Agricultural Economics*, 83(4), 875-887.
- Hamilton, L. W., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo, E. A., Jr., Olson, C. M., & Wehler, C. A. (1997). Household food security in the United States in 1995: Technical report of the Food Security Measurement Project. Retrieved from <http://libcdm1.uncg.edu/cdm/ref/collection/HENP/id/159>
- Hanson, K. L., Sobal, J., & Frongillo, E. A. (2007). Gender and marital status clarify associations between food insecurity and body weight. *Journal of Nutrition*, 137, 1460-1465.
- Herbert, C. (1996). Assessing nutrition in elderly patients. *Nursing Standard*, 10(17), 35-37.
- Hinrichsen, G. A., Kietzman, K. G., Alkema, G. E., Bragg, E. J., Hensel, B. K., Miles, T. P., Segev, D. L., & Zerzan, J. (2010). Influencing public policy to improve the lives of older Americans. *The Gerontologist*, 50(6), 735-743.
- Hiramatsu, M., Ishida, M., Tonozuka, Y., Mikami, H., Yamanari, T., Momoki, N., Onishi, A. & Maruyama, K. (2012). Application of peritoneal dialysis in elderly patients by classifying the age into young-old, old, and oldest-old. *Nephrology*. 177, 48-56.
- Holben, D. H. (2010). Position of the American Dietetic Association: Food insecurity in the United States. *Journal of the American Dietetic Association*, 110, 1368-1377.
- Horwath, C. C. (1991). Nutrition goals for older adults: A review. *The Gerontologist*, 31, 811-821.
- Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). New Jersey: Wiley and Sons.
- Hoyer, W. J., & Roodin, P. A. (2003). *Adult development and aging* (5th ed.). New York: McGraw-Hill.
- Institute for Experimental Psychology. (2007). G*Power 3. Retrieved from <http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>
- Jacobson, A. F., Hamilton, P., & Galloway, J. (1993). Obtaining and evaluating data sets for secondary analysis in nursing research. *Western Journal of Nursing Research*, 15, 483-494.
- Kaiser, L., Baumrind, N., & Dumbauld, S. (2007). Who is food-insecure in California? Findings from the California women's health survey, 2004. *Public Health Nutrition*, 10(6), 574-581.
- Kamp, B. J., Wellman, N. S., & Russell, C. (2010). Position of the American Dietetic Association American society for nutrition, and society for nutrition education: Food and

- nutrition programs for community-residing older adults. *Journal of Nutrition Education and Behavior*, 42(2), 72-82.
- Kantor, L. S. (2001). Community food security programs improve food access. *Food Review*, 24(1), 20-26.
- Karpilow, K. A., Reed, D. F., Chamberlain, P. T., & Shimada, T. (2011). Understanding nutrition: A primer on programs and policies in California (2nd ed.). Sacramento, CA: California Center for Research on Women and Children, Public Health Institute. Retrieved from <http://ccrwf.org/wp-content/uploads/2011/10/Understanding-Nutrition-CCRWF-Primer-2011FINAL.pdf>
- Katz, R., Kornblat, S., Arnold, G., Lief, E., & Fischer, J. E. (2011). Defining health diplomacy: Changing demands in the era of globalization. *Milbank Quarterly*, 89(3), 503-523.
- Keller, H. H. (2007). Promoting food intake in older adults living in the community: A review. *Applied Physiology, Nutrition, and Metabolism*, 32(6), 991-1000.
- Kempson, K., Keenan, D., Sadani, P., Ridlen, S., & Rosato, N. (2002). Food management practices used by people with limited resources to maintain food sufficiency as reported by nutrition educators. *Journal of the American Dietetic Association*, 102, 1795-1799.
- Keppel, G., & Wickens, T. D. (2004). *Design and analysis: A researcher's handbook* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Kleinbaum, D. G., Kupper, L. L., Muller, K. E., & Nizam, A. (1998). *Applied regression analysis and other multivariable methods*. Pacific Grove, CA: Duxbury Press.
- Korn, E. I., & Graubard, B. I. (1991). Epidemiologic studies utilizing surveys: Accounting for the sampling design. *American Journal of Public Health*, 81(9), 1166-1173.
- Kregg-Byers, C. M., Terhorst, L., & Schlenk, E. A. (2012, September). *Predictors of food security: Literature review and synthesis*. Poster presented at the 2nd Annual Scholarly Poster Presentations Symposium, University of Pittsburgh School of Nursing, Pittsburgh, PA.
- Laraia, B. A., Borja, J. B., & Bentley, M. E. (2009). Grandmothers, fathers, and depressive symptoms are associated with food insecurity among low-income first-time African American mothers in North Carolina. *Journal of the American Dietetic Association*, 109, 1042-1047.
- LaVeist, T. A., Gaskin, D., & Trujillo, A. J. (2011). Segregated spaces, risky places: The effects of racial segregation on health inequalities. Washington, DC: Joint Center for Political and Economic Studies. Retrieved from <http://www.cfgnh.org/Portals/0/Uploads/Documents/Segregated%20Spaces-web.pdf>

- Lawton, M. P. (1999). *Environmental taxonomy: Generalizations from research with older adults*. Washington, DC: American Psychological Association.
- Lee, J. S., & Frongillo, E. A., Jr. (2001). Factors associated with food insecurity among U.S. elderly persons: Importance of functional impairments. *Journal of Gerontology*, *56B*(2), S94-S99.
- Lohr, S. L., & Liu, J. (1994). A comparison of weighted and unweighted analyses in the national crime victimization survey. *Journal of Quantitative Criminology* *10*(4), 343-360.
- Lopez, I. H. (2005). Race on the 2010 census: Hispanics and the shrinking white majority. *Daedalus*, *134*(1), 42-52.
- Malbi, J., Cohen, R., Potter, F., & Zhao, Z. (2010). *Hunger in America 2010: National report prepared for Feeding America*. Princeton, NJ: Mathematica Policy Research. Retrieved from http://www.mathematica-mpr.net/publications/PDFs/Nutrition/Hunger_in_America_2010.pdf
- Martin, K. S., Cook, J. T., Rogers, B. L., & Joseph, H. M. (2003). Public versus private food assistance: Barriers to participation differ by age and ethnicity. *Journal of Nutrition Education & Behavior*, *35*(5), 249-254.
- McCarthy, V. L., Ling, J., & Carini, R. M. (2013). The role of self-transcendence: A missing variable in the pursuit of successful aging? *Research in Gerontological Nursing*, *6*(3), 178-186.
- McQueen, S. (2011). Predictors of food bank usage among those with low food security: Analysis of the current population survey food supplement data. Retrieved from http://www.martin.uky.edu/centers_research/Capstones_2011/McQueen.pdf
- National Anti-Hunger Organizations. (2008). A blueprint to end hunger 2008. Retrieved from <http://www.virtualcap.org/downloads/WCEH/Blueprint2008.pdf>
- National Research Council. (2004). *Critical perspectives on racial and ethnic differences in health in late life*. Washington, DC: The National Academies Press. Retrieved from <http://www.nap.edu/catalog/11086.html>
- National Research Council. (2006). *Food insecurity and hunger in the U.S.: An assessment of the measure*. Panel to review U.S. Department of Agriculture's measurement of food insecurity and hunger. In Wunderlich, G. S., Norwood, J. L. (Eds.), *Committee on National Statistics, Division of Behavioral and & Social Sciences and Education*. Washington, DC: National Academies Press.
- Neff, R., Palmer, A., McKenzie, S., & Lawrence, R. (2009). Food systems and public health disparities. *Journal of Hunger and Environmental Nutrition*, *4*, 282-314.

- Nord, M. (2003). Measuring the food security of elderly persons. *Family Economics and Nutrition Review*, 15(1), 33-46.
- Nord, M., & Andrews, M. (2003). Putting food on the table: Household food security in the United States. Retrieved from <http://webarchives.cdlib.org/sw1vh5dg3r/http://ers.usda.gov/AmberWaves/Feb03/Features/PuttingFood.htm>
- Nord, M., Andrews, M., & Carlson, S. (2008). Household food security in the United States, 2007. Economic Research Report No. (ERR-66). Washington, DC: U.S. Department of Agriculture. Retrieved from <http://www.ers.usda.gov/media/189485/err66.pdf>
- Nord, M., Andrews, M., & Carlson, S. (2009). Household food security in the United States, 2008. Economic Research Report No. (ERR-83). Washington, DC: U.S. Department of Agriculture. Retrieved from http://www.ers.usda.gov/media/184956/err83_1_.pdf
- Nord, M., Coleman-Jensen, A., Andrews, M., & Carlson, S. (2010). Household food security in the U.S., 2009. Economic Research Report No. (ERR 108). Washington, DC: U.S. Department of Agriculture. Retrieved from <http://www.ers.usda.gov/publications/err-economic-research-report/err108.aspx#.U9WUyPldWS0>
- Opsomer, J. D., Jensen, H. H., & Pan, S. (2003). An evaluation of the U.S. Department of Agriculture food security measure with generalized linear mixed models. *Journal of Nutrition*, 133, 421-427.
- Osborne, J. W., & Costello, A. B. (2004). Sample size and subject to item ratio in principal components analysis. *Practical Assessment, Research & Evaluation*, 9(11). Retrieved from <http://pareonline.net/getvn.asp?v=9&n=11>
- Owens, D. K., Lohr, K. N., Atkins, D., Treadwell, J. R., Reston, J., T., Bass, E. B., Chang, S., & Helfand, M. (2009). AHRQ Series Paper 5: Grading the strength of a body of evidence when comparing medical interventions—Agency for Healthcare Research and Quality and the Effective Health-Care Program. *Journal of Clinical Epidemiology*, 63(5), 513-523.
- Quandt, S. A., McDonald, J., Arcury, T. A., Bell, R. A., & Vitolins, M. Z. (2000). Nutritional self-management of elderly widows in rural communities. *The Gerontologist*, 40(1), 86-96.
- Radimer, K. L. (2002). Measurement of household food security in the USA and other industrialized countries. *Public Health Nutrition*, 5(6A), 859-864.
- Rasheed, S., & Woods, R. T. (2013). Malnutrition and quality of life in older people: A systematic review and meta-analysis. *Aging Research Reviews* 12(2), 561-566.

- Rebar, C. R., Gersch, C. J., Macnee, C. L., & McCabe, S. (2011). *Understanding nursing research: Using research in evidence-based practice* (3rd ed., pp. 189-190). Philadelphia, PA: Lippincott Williams & Wilkins.
- Renzaho, A. M. N., & Mellor, D. (2009). Food security measurement in cultural pluralism: Missing the point or conceptual misunderstanding? *Nutrition in Clinical Care, 26*, 1-9.
- Rose, D., & Oliveira, V. (1997). Nutrient intakes of individuals from food-insufficient households in the United States. *American Journal of Public Health, 87*(12), 1956-1961.
- Rotstein, G. (2011). Census finds Pittsburgh is growing younger. Pittsburgh, PA: Pittsburgh Gazette.com. Retrieved from <http://old.post-gazette.com/pg/11139/1147664-53-0.stm>
- Sallis, J. F., & Owen, N. (2002). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research, and practice* (3rd ed., pp. 545-558). San Francisco, CA: Jossey-Bass.
- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 465-485). San Francisco: Jossey-Bass.
- Sattler, E. L. P., & Lee, J. S. (2013). Persistent food insecurity is associated with higher levels of cost-related medication non-adherence in low-income older adults. *Journal of Nutrition in Gerontology and Geriatrics 32*(1), 41-58.
- Schwartz, S. (1994). The fallacy of the ecological fallacy: The potential misuse of a concept and the consequences. *American Journal of Public Health, 84*(5), 819-824.
- Sharkey, J. R., & Schoenberg, N. E. (2005). Prospective study of black-white differences in food insufficiency among homebound elders. *Journal of Aging Health, 17*(4), 507-527.
- Stewart, P., Brochetti, D., Cox, R., & Clarke, M. (1998). Low-income elderly adults' needs and preferences for nutrition education. *Journal of Nutrition for the Elderly, 18*(2), 1-20.
- Stokols, D. (1992). Establishing and maintaining healthy environments: Toward a social ecology of health promotion. *American Psychologist, 47*(1), 6-22.
- Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion, 10*(4), 282-298.
- Stuff, J. E., Casey, P. H., Szeto, K. L., Gossett, J. M., Robbins, J. M., Simpson, P. M., Connell, C., & Bogle, M. L. (2004). Household food insecurity is associated with adult health status. *Journal of Nutrition 134*, 2330-2335.

- Stuff, J. E., Horton, J. A., Bogle, M. L., Connell, C., Ryan, D., Zaghoul, S., Thornton, A., Simpson, P., Gossett, J., & Szeto, K. (2004). High prevalence of food insecurity and hunger in households in the rural lower Mississippi Delta. *Journal of Rural Health, 20*(2), 173-180.
- Sullivan, A. F., Clark, S., Pallin, D. J., & Campargo, C. A., Jr. (2010). Food security, health, and medication expenditures of emergency department patients. *Journal of Emergency Medicine, 38*(4), 524-528.
- Transgenerational Design Matters. (2009). Characteristics of our aging population. Retrieved from <http://transgenerational.org/aging/demographics.htm>
- Tscholl, E., & Holben, D. H. (2006). Knowledge and practices of Ohio nurse practitioners regarding food access of patients. *Journal of the American Academy of Nurse Practitioners, 18*(7), 335-342.
- U.S. Bureau of Labor Statistics. (2012). The recession of 2007-2009. Retrieved from http://www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf
- U.S. Census Bureau. (2009). Current population survey, December 2008: Food security supplement machine-readable data file conducted by the Bureau of the Census for the Bureau of Labor Statistics. In U.S. Bureau of Labor Statistics (Ed.). Washington, DC. Retrieved from <http://www.census.gov/prod/techdoc/cps/cpsdec08.pdf>
- U.S. Census Bureau. (2011). The older population: 2010. 2010 census briefs. (C2010BR-09). Retrieved from <http://www.census.gov/prod/cen2010/briefs/c2010br-09.pdf>
- U.S. Census Bureau. (2012). Survey rules, concepts, and definitions. Retrieved from http://www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology_ch06.pdf
- U.S. Congressional Research Service. (2011). The changing demographic profile of the United States. Retrieved from <http://www.fas.org/sgp/crs/misc/RL32701.pdf>
- U.S. Department of Agriculture. (2012). Census of agriculture. Retrieved from http://www.agcensus.usda.gov/About_the_Census/Confidentiality_Pledge/index.php
- U.S. Department of Agriculture Economic Research Service. (2012a). Measurement. Retrieved from <http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx#security>
- U.S. Department of Agriculture Economic Research Service (2012b). History and background. Retrieved from <http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/history-background.aspx>

- U.S. Department of Agriculture Food and Nutrition Service. (2012). Nutrition assistance programs. Retrieved from <http://www.fns.usda.gov/fns/>
- U.S. Department of Health and Human Services. (2000). Healthy people 2010: Understanding and improving health. Washington, DC: U.S. Government Printing Office. Retrieved from <http://www.healthypeople.gov/2010/Document/pdf/uih/2010uih.pdf>
- U.S. Department of Health and Human Services. (2009). Code of federal regulations title 45 public welfare Department of Health and Human Services part 46 protection of human subjects. Retrieved from <http://www.hhs.gov/ohrp/policy/ohrpreulations.pdf>
- U.S. Department of Health and Human Services. (2010). The 2008 HHS poverty guidelines: One version of the U.S. federal poverty measure. Retrieved from <http://aspe.hhs.gov/poverty/08poverty.shtml>
- U. S. Department of Health and Human Services, Administration on Aging. (2014). Nutrition Services (OAA Title IIIC) Authorizing Legislation: Sections 311, 330, 331, 336, and 339 of the Older Americans Act (OAA) of 1965, as amended. Retrieved from http://www.aoa.gov?AoA_programs/HCLTC?Nutrition_Services/index.aspx#nutritionservices
- Vailas, L. I., Nitzke, S. A., Becker, M., & Gast, J. (1998). Risk indicators for malnutrition are associated inversely with quality of life for participants in meal programs for older adults. *Journal of the American Dietetic Association*, 98, 548-553.
- Vozoris, N. T., & Tarasuk, V. S. (2003). Household food insecurity is associated with poorer health. *Journal of Nutrition*, 133, 120-126.
- Wellman, N. S. (1994). The Nutrition Screening Initiative. *Nutrition Reviews*, 52(8), 44-47. doi: 10.1111/j.1753-4887.1994.tb01448.x
- Wellman, N. S., & Kamp, B. (2004). Federal food and nutrition assistance programs for older people. *Generations*, 28(3), 78-85.
- White, J. V., Guenter, P., Jensen, G., Malone, A., & Schofield M. (2012). Consensus statement: Academy of nutrition and dietetics and American society for parenteral and enteral nutrition: Characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). *Journal of the Academy of Nutrition and Dietetics*, 112, 730-738.
- Wolfe, W. S., Frongillo, E. A., & Valois, P. (2003). Understanding the experience of food insecurity by elders suggests ways to improve its measurement. *Journal of Nutrition*, 133(9), 2762-2769.

- Ziliak, J. P., & Gundersen, C. (2009). Senior hunger in the U.S. Differences across states and rural and urban areas: A report submitted to Meals On Wheels Association of America, Inc. (Center for Poverty Research, Trans.). Lexington, Kentucky. Retrieved from <http://www.mowaa.org/document.doc?id=193>
- Ziliak, J. P., & Gundersen, C. (2011). Food insecurity among older adults: A report submitted to the AARP Foundation. Washington, DC: AARP Foundation. Retrieved from http://www.aarp.org/content/dam/aarp/aarp_foundation/pdf_2011/AARPFoundation_HungerReport_2011.pdf
- Ziliak, J. P., Gundersen, C., & Haist, M. (2008). The causes, consequences, and future of senior hunger in America. Special Report by the University of Kentucky Center for Poverty Research for the Meals on Wheels Association of America Foundation. Retrieved from <http://www.mowaa.org/document.doc?id=13>