DIETARY AND HEALTH CHARACTERISTICS OF FOOD INSECURE OLDER ADULT

SENIOR CENTER PARTICIPANTS IN GEORGIA

by

CHRISTINA S. CATLETT

(Under the Direction of Mary Ann Johnson)

ABSTRACT

This study compared food insecure (FI) and food secure (FS) older adults from senior centers in all 12 Georgia Area Agencies on Aging (convenience sample, n = 572, mean age = 75.6, 81.8% female, 66.4% white, 18.2% to 19.8% FI). FI was measured with the Nutrition Screening Initiative and the USDA Six-Item Short Form of the US Household Food Security Survey Module. In bivariate analyses, both FI measures were associated significantly (P < 0.05) with younger age, being black vs. white, using food assistance, diabetes, arthritis, joint pain, and diet (lower vegetable intake and fewer days of the week consumed five or more fruits and vegetables). There is an urgent need to address FI in Georgia senior centers. FI was about three times higher than the national average in older adults (6.5%, Nord et al., 2008), despite food stamp, food bank and pantry usage and congregate meal participation.

INDEX WORDS: Older adults, food insecurity, aging, Older Americans Act Nutrition Program, congregate meals

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CHAPTER 1

INTRODUCTION

Older adults are vulnerable to chronic disease and malnutrition. FI further threatens an older adult's well-being and independence by decreasing food and nutrient intake. Risk factors for FI include age, race, education, community, disease, self-reported health, nutrient intake and tobacco use (Lee & Frongillo, 2001; Nord, 2002; Vozoris & Tarasuk, 2003; Seligman et al., 2007; Armour et al., 2007; Nord et al., 2008; Ziliak et al., 2008). Prevention of FI through the provision of congregate or home-delivered meals is one of the intended purposes of the Older Americans Act Nutrition Program (OAANP) (Public Law 109–330, 2006). FI is associated with decreased intakes of fruits and vegetables and nutrients such as protein, carbohydrate, saturated fat, niacin, riboflavin, vitamins B-6, B-12, C and E, magnesium, iron, zinc, and several carotenoids (Cristofar & Basiotis, 1992; Dixon et al., 2001; Kendall et al. 1995 and 1996; Rose & Oliveira 1997; Tarasuk & Beaton 1999; Sahyoun & Basiotis, 2000; Lee & Frongillo, 2001; Ziliak et al., 2008). The 2005 Dietary Guidelines for Americans recommends seven to ten servings of fruits and vegetables, six to nine servings of grains, and three servings of low-fat dairy daily for those needing 1,600 to 2,200 calories daily, which is the general range of energy needs for older adult men and women (United States Department of Agriculture (USDHHS & USDA, 2005). Meals funded by state and federal funds under the OAANP must meet these 2005 Dietary Guidelines for Americans per state and federal regulations (Georgia Department of Human Resources & Division of Aging Services, 2002). Surveys of older adults reflect a higher prevalence of FI in local studies (19.6%, Duerr, 2006) than national studies (5.9% to 6.5%, Nord, 2002, Nord et al., 2008). For example, Duerr (2006) reported a high prevalence of FI in

congregate meal participants in southern Indiana. Thus, we hypothesized that FI might also be prevalent in those receiving congregate meals and/or other services from senior centers in Georgia. The goal of the present study was to determine the prevalence and predictors of FI in older adults attending senior centers throughout Georgia. It was hypothesized that demographic factors, food intake, food assistance, and health-related factors would be associated with FI. The important contribution of this study is that it provides the first estimates of the prevalence of FI in older adults at Georgia senior centers using detailed measures and a variety of associated factors.

Chapter 2 is a review of the literature outlining the special needs of older adults, the prevalence of FI among them, the impact of food security status on older adult health and diet, and a review of the challenges and importance of accurately capturing food security status in older adults as acknowledged in current and past research.

Chapter 3 is a manuscript to be submitted to the *Journal of Nutrition for the Elderly*. This chapter includes the methods, results, and discussion of the important findings highlighted in the data tables.

Chapter 4 presents a summary of the major findings and conclusions for this study.

CHAPTER 2

LITERATURE REVIEW

The Older Adult Population

The US older adult population is becoming larger, more diverse, and is living longer. By 2030, nearly one in five US residents is expected to be 65 and older. This age group is estimated to increase to 88.5 million in 2050, more than doubling the 2008 populace of 38.7 million (Administration on Aging (AoA) & US Department of Health and Human Services (USDHHS), 2007). Georgia's older adult population is anticipated to exceed the national growth rate of 48% and grow by 62% by the year 2020 (Houser et al., 2006). The health status of racial and ethnic minorities falls far behind that of non-minority populations and minority populations often are at greater risk for social isolation, poverty, and poor food security (Centers for Disease Control & Prevention (CDC) & The Merck Company Foundation, 2007; Nord et al., 2008). Currently, minority older adults 65 years of age and older account for 19% of all older adults living in the US. Minority older adults are projected to represent 23.6% of the older adults living in the US by 2020 (AoA & USDHHS, 2007). Georgia has a large minority population. In 2005, Georgia ranked 11th nationally for older minorities age 65 and older. During the same year, Georgia had the sixth highest population of African Americans age 65 and older comprising 20.2% of the state population of older adults, compared to approximately 9% nationally (Houser et al., 2006). Technological and pharmaceutical advances prolong life. In 2004, adults aged 65 years had an average life expectancy of an additional 18.7 years (20 years for females and 17.1 years for

males) (AoA & USDHHS, 2007). An older adult population that is increasing in diversity and longevity increases demands on the health care system and social support services.

Older Adult Population and Health Care Costs

National health care costs will be affected by the increasing number of aging Americans. Currently, the cost of providing health care for one person aged 65 or older is three to five times greater than the cost for someone younger than 65 (CDC & The Merck Company Foundation, 2007). Health care costs for the US population are projected to increase by 25%, a change directly attributed to an aging population (CDC & The Merck Company Foundation, 2007). Chronic disease is prevalent in older adults and accounts for 95% of health care expenditures in older adults (CDC & The Merck Foundation, 2007). Chronic disease is the leading cause of death in US adults ages 65 and older: heart disease accounts for 30% of all deaths, cancer for 20%, and stroke for 7% (CDC & The Merck Foundation, 2007), and led to more than 53% of all deaths in Georgia in 2004 (CDC & The National Center for Health Statistics, 2007). Many older adults experience multiple chronic conditions, which can compound the financial, emotional, and physiological burden of disease. Eighty percent of older adults experience one chronic disease but 50% experience at least two (CDC & The Merck Foundation, 2007). Chronic disease is likely to cause disability, loss of function, loss of independence and potentially years of pain before resulting in death (CDC & The Merck Foundation, 2007). Chronic disease is not an inevitable consequence of aging. Proper nutrition is one way to fight chronic disease and circumvent rising health care costs. Malnourished patients experience more complications, longer hospital stays, and compile greater hospital costs compared to well-nourished patients. These longer, costlier hospitalizations, along with more frequent readmissions, riskier surgeries, delayed recovery times, and premature nursing home admissions, decrease quality of life and

escalate health care costs significantly (Gallagher-Allred et al., 1996). Poor nutritional status negatively impacts an older adult's ability to remain independent by encouraging premature nursing home placement and decreasing quality of life (Wellman, 1997). Energy requirements decrease with aging, however, the overall requirements for most essential nutrients in older adults are not lower than younger people (USDHHS & USDA, 2005). According to the American Dietetic Association, the presence of any of the following factors can increase the risk of nutritional problems in an older adult: hunger, poverty, inadequate food and nutrient intake, functional disability, social isolation, living alone, living in urban or rural areas, depression, dementia, dependency, poor dentition, overall poor oral health, diet-related acute or chronic conditions, polypharmacy, minority status, and advanced age (American Dietetic Association, 2005). These characteristics are prevalent among Georgia older adults. For example, Georgia ranks 11th nationally for individuals 65 and older living at or below the poverty level (12.4%) with 56% of these individuals living at or below 300% of the poverty level. In older adults with disabilities, Georgia ranks sixth, seventh, and tenth, respectively, for mobility, cognitive and mental and self-care disabilities (Houser et al., 2006). In 2004, Georgia had the eighth worst oral health with 28% of older adults experiencing complete tooth loss (CDC & The Merck Company Foundation, 2007).

Congregate Meals and the Older Americans Act Nutrition Program (OAANP)

The Administration on Aging (AoA) in the United States Department of Health and Human Services (USDHHS) serves as an advocate for older adults within the federal government (AoA & USDHHS, 2004). AoA helps develop state level service systems that are administered by 56 State and Territorial Units on Aging, 655 Area Agencies on Aging, 226 Native American and Hawaiian organizations, and more than 29,000 local service providers.

The OAANP is authorized under Title III of the Older Americans Act and provides grants to State Agencies on Aging to support congregate and home-delivered meals to individuals 60 years and older as well as nutrition screening, nutrition education, and other health services for older adults in the community (OAA, 2006). Section 330 of the OAA states that one intended purposes of congregate meal services is to "reduce hunger and food insecurity" (OAA, 2006). State agencies award funds to 655 Area Agencies on Aging that administer the OAANP in their respective planning and service areas. Meals funded by state and federal sources under the Older Americans Act Nutrition Program must meet the 2005 Dietary Guidelines for Americans per state and federal regulations (Georgia Department of Human Resources & Division of Aging Services, 2002). In Georgia, for example, older adults participating in congregate meals receive at least three servings of fruits and vegetables, two servings of bread or bread alternative, and one serving of milk or milk alternative with their lunch, because the 2005 Dietary Guidelines for Americans recommends seven to ten servings of fruits and vegetables, six to nine servings of grains, and three servings of low-fat dairy daily for those needing 1,600 to 2,200 calories daily, which is the general range of energy needs for older adult men and women (USDHHS & USDA, 2005). The OAANP targets individuals possessing the greatest social and economic needs with particular attention paid to low-income minorities and rural individuals (OAA, 2006; Ponza et al., 1996). OAA Title III participants are more likely to have low educational attainment, poor self-reported health, low incomes, and have poor physical function (Beauchamp & Trebino, 2007).

FS and Older Adults

FS is access at all times to enough food for an active and healthy life. Older adults in the US have a high prevalence of FS (Nord, 2002; Nord et al., 2008). A household can be

characterized as having high (HFS), marginal (MFS), low (LFS) or very low food security (VLFS). A household with high FS has no problems or anxiety about consistently accessing adequate food. A marginally FS household has problems or anxieties at times about accessing adequate food but the quality, variety, and quantity of food intake is not substantially reduced (Nord et al., 2008). Household with LFS or VLFS are categorized as being FI. FI is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Nord et al., 2008). Households with LFS experience reductions in quality, variety, and desirability of their diets, but the amount of food consumed and normal eating patterns are not substantially disrupted (Nord et al., 2008). Households characterized by VLFS experience disrupted eating patterns with reduced food intake during a specified time period that is directly related to a lack of money or other resources for food (Nord et al., 2008). Between 2006 and 2007, the prevalence of FI among US elderly living alone and VLFS among households including elderly increased significantly. Overall FI is above the national average in Georgia (11.0 vs. 13.0%) and the national incidence of VLFI increased from the period of 1996-98 to 2005-07 (Nord et al., 2008).

Measuring FS

The FS status of the nation's households is monitored through annual, nationally representative surveys conducted for the USDA by the US Census Bureau's monthly Current Population Survey (CPS). The Household Food Security Survey Module (FSSM) assesses household FS status by a series of 18 questions about behaviors and experiences known to characterize households that are having difficulty meeting their food needs. A "short form" of the 18-item FSSM that includes 6 of the 18 items has been shown to have high specificity and sensitivity and minimal bias when compared with the 18-item FSSM (Blumberg et al., 1999).

 The Six-item Short Form and the associated Six-Item FS Scale were developed by researchers at the National Center for Health Statistics in collaboration with Abt Associates, Inc. The Six-Item FSSM is limited in that it does not assess the FS status of children and therefore does not measure the most severe range of adult FI when children's food intake is likely to be reduced (Nord et al., 2008).

The 18-item FSSM was designed to assess household FS during the 12-month period prior to survey administration (Bickel et al., 2000; Nord et al., 2008). Beginning with the 2005 CPS survey, information was collected using the reference period of 30 days and 12 months prior to the survey. Relationships across the 12-month and 30-day reference periods are closely associated and the 30-day reference period produces a more temporally precise analysis of the relationship between households' FI and their use of federal and community food and nutrition assistance programs (Nord et al., 2008).

Measuring FS in Older Adults

Older adult FI is a complex experience influenced by a variety of physiological, social, and environmental components and dependable measurements are essential both for monitoring and research purposes (Sahyoun & Basiotis, 2000; Guthrie & Lin, 2002). The FSSM specifically measures FI that is caused by insufficient money or other resources for food, but does not ask questions about other risk factors for FI such as depression, reductions in taste and smell, poor health status, poor dentition, the ability to prepare, gain access to, and eat the food available all of which are factors affecting older adult FS (Kim & Frongillo, 2007; Wolfe et al., 2003; Wolfe et al., 1996; Vozoris & Tarasuk, 2002; Seligman et al., 2007). For example, limitations in physical mobility interfere with the ability of seniors to shop and prepare food (Lee & Frongillo, 2001). Other concerns about the FSSM are that the questions may be understood differently by

 older adults versus young adults and older adults may experience and respond to FI in different ways than individuals from younger generations. For instance, some research suggests that the least severe question in the 18-item FSSM, which asks whether respondents worried that their food would run out before they received money to buy more, may be less sensitive in older adults. Some older adults report that they just do not worry about such things. Thus, it can be argued that the FSSM may not be sensitive to the many obstacles to adequate intake that are unique to the older adult population. According to Nord (2003), the FSSM 18-item module fairly represents the FS of older adults, compared with that of the young adults. An augmented FSSM has been suggested as a way to make the module more applicable to the FI experience of older adults and that with augmentation, certain aspects of the measure become more sensitive (Wolfe et al., 2003).

Nutrition Risk Screening

The Nutrition Screening Initiative (NSI) and the NSI checklist were developed by the American Academy of Family Physicians, in partnership with the American Dietetic Association and the National Council on Aging, to assess nutritional risk in older adult OAANP participants (NSI, 1991). This ten-item checklist includes a question assessing FI, "Do you have enough money to buy the food you need most of the time?" This question has been used as an indicator of FI in previous research (Lee & Frongillo, 2001).

Characteristics of FI Individuals

Socioedemographic Characteristics of FI Individuals

Sociodemographic factors such as age (Duerr, 2006; Duerr, 2006; Lee & Frongillo, 2001; Ziliak et al., 2008), gender (Duerr, 2006; Duerr, 2006), race-ethnicity (Lee & Frongillo, 2001; Nord, 2002; Seligman et al., 2007; Ziliak et al., 2008), low education (Lee & Frongillo, 2001;

Lee & Frongillo, 2001; Rose & Oliveria, 1997; Duerr, 2006; Seligman et al., 2007; Ziliak et al., 2008), community, (Rose & Oliveria, 1997; Lee & Frongillo, 2001; Lee & Frongillo, 2001; Nord, 2002; Ziliak et al., 2008) and living in the south (Rose & Oliveria, 1997; Nord, 2002; Ziliak et al., 2008) have been associated with FI in cross-sectional and longitudinal studies in all age groups. Among older adults, FI prevalence is higher among younger older adults than the oldest older adults (Duerr, 2006; Lee & Frongillo, 2001; Ziliak et al., 2008). Younger older adults who are black have a higher nutritional risk than older, white older adults (Sharkey & Schoenburg, 2002). National and regional research reflects a higher prevalence of FI among older minority compared to older non-minority adults (Nord, 2002; Sharkey & Schoenburg, 2002; Nord et al., 2008). Having less than or equal to a high school education is associated with FI. Regionally, the prevalence of FI is higher in the South (11.8%) than in the Northeast (10.3%) and Midwest (10.7%). Within regions, FI older adults are more likely to reside in the central cities of metropolitan areas (Nord, 2002). Metropolitan areas have large numbers of minorities many of whom are poorly educated and live at or below the poverty level (Bachtel, 2007). Briefly, Georgia counties can be classified into five areas based on analysis of various population statistics: urban, urbanizing, suburban, rural growth, and rural decline (Bachtel, 2007, Appendix C). Georgia has 15 metropolitan areas (Bachtel, 2007).

Health Characteristics of FI Individuals

Tobacco use is associated with a higher risk of FI (Armour et al., 2007). FI older adults are 2.33 times (95% CI: 1.73-3.24) more likely to report fair to poor health status compared to FS older adults (Lee & Frongillo, 2001). Diabetes is associated with FI independent of age, gender, race, parity, income, family history of diabetes, education and physical activity and BMI and diabetes prevalence increases as FI status worsens (Seligman et al., 2007). FI households are

significantly more likely to report having heart disease, diabetes, high blood pressure and food allergies than FS households (Vozoris & Tarasuk, 2003). Total number of chronic diseases (e.g., arthritis, hypertension, heart disease, cancer, diabetes and emphysema) is associated with an increased prevalence of FI (Lee & Frongillo, 2001). FI households are more likely to have poor functional health, major depression and distress, as well as poor social support compared with FS households (Vozoris & Tarasuk, 2003; Ziliak et al., 2008). Lack of social and emotional support is associated with FI and the relationship appears to be attenuated with increased use of food assistance programs (Lee & Frongillo, 2001).

Dietary Patterns of FI Individuals

FS is a cornerstone of nutritional status in older adults (Wellman, 1997). FI has been shown to negatively impact nutrient intake in older adults (Lee & Frongillo, 2001; Ziliak et al., 2008). Lee & Frongillo (2001) found that compared to FS older adults, those who were FI consumed significantly lower amounts of total energy, protein, carbohydrate, saturated fat, niacin, riboflavin, vitamins B-6 and B-12, magnesium, iron and zinc. Additionally, FI older adults have higher nutritional risk showing that FI in older adults is associated with poorer dietary intake, nutritional status and health status. These results are consistent with previous studies (Cristofar & Basiotis, 1992; Dixon et al., 2001; Kendall et al. 1995 and 1996; Rose & Oliveira 1997; Tarasuk & Beaton 1999; Sahyoun & Basiotis, 2000; Ziliak et al., 2008). FI older adults have lower serum concentrations of folate, vitamin C, vitamin E, and several carotenoids (β-carotene, cryptoxanthine and lutein/zeaxanthin, Sahyoun & Basiotis, 2000). Fruit and vegetable intake, as well as household food supplies of dairy, meat, grains, and fruits and vegetables, decline significantly as FI status worsens (Kendall et al., 1996). FI increases the likelihood of older adult malnutrition; therefore, FI older adults are at even greater risk for

chronic disease (Sahyoun & Basiotis, 2000). FI individuals are more likely than FS individuals to participate in federal or community food assistance programs however, participation rates, particularly among older adults are low (Nord, 2002).

Rationale, Specific Aims, and Hypothesis

This study builds on other studies describing important characteristics of older adults participating in programs at senior centers (Ellis et al., 2005; Hendrix et al., 2008, McCamey et al., 2003; Fitzpatrick et al., 2008; Bell, 2008) by utilizing a more detailed measure of FS and assessing the relationship of different characteristics with FI. The first specific aim of this study is to determine the prevalence and severity of FI of senior center participants in Georgia. The first hypothesis is that senior center participants will be more FI compared to the national average in older adults. The second specific aim is to assess characteristics of FI senior center participants. The second hypothesis is that FI senior center participants will be more likely to be younger, minority, have lower education, have poorer dietary intakes, use tobacco, have poorer overall health, and use food banks or pantries and food stamps compared to FS senior center participants. Research has been done to assess the determinants and consequences of FI in subgroups of older adults. Research describing characteristics of FI senior center participants is lacking. By assessing characteristics of FI senior center participants, this study may be used to advocate for funding of congregate meal and other federal food assistance programs for older adults. This study also provides valuable insights that may assist in the development of accurate measurements of FI in older adults.

CHAPTER 3

DIETARY AND HEALTH CHARACTERISTICS OF FOOD INSECURE OLDER ADULT

SENIOR CENTER PARTICIPANTS IN GEORGIA[1]

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Abstract

This study compared food insecure (FI) and food secure (FS) older adults from senior centers in all 12 Georgia Area Agencies on Aging. Participants completed a questionnaire assessing food security, food assistance, health, and dietary characteristics (convenience sample, n = 572, mean age = 75.6, 81.8% female, 66.4% white). FI was assessed with a question from the Nutrition Screening Initiative checklist ("Do you always have enough money to buy the food you need?" NSI-2, FI = no, FS = yes) and the USDA Six-Item Short Form of the US Household Food Security Survey Module that was scored as two categories (USDA-2, FI or FS) or four categories (USDA-4, high food security, HFS; marginal food security, MFS; low food security, LFS; or very low food security, VLFS). NSI-2 and USDA-2 assign individuals as FS or FI, while USDA-4 determines the extent of FI. The prevalence of FI was 18.2% (NSI-2) and 19.8% (USDA-2), while MFS, LFS, and VLFS were 9.6%, 15.7%, and 4.0%, respectively. Thus, FI in this sample is nearly three times higher than the national prevalence in older adults (6.5% FI, Nord et al., 2008). In multivariate regression models controlled for demographics, health, and food assistance, all measures of FI were significantly associated with being black vs. white, living in areas other than rural growth, receiving food assistance or food stamps, and having four or more health conditions ($P < 0.05$ to 0.001), while only FI assessed as NSI-2 was significantly associated with tobacco use, low social and emotional support, and a history of depression ($P < 0.05$). In summary, there is an urgent need to address FI in Georgia senior centers, because the prevalence of FI was very high even though many of these older adults used food stamps, food banks, and food pantries and received congregate meals.

INDEX WORDS: Older adults, food insecurity, aging, Older Americans Act Nutrition Program, congregate meals

Introduction

Older adults are vulnerable to chronic disease and malnutrition. FI further threatens an older adult's well-being and independence by decreasing food and nutrient intake. FI is associated with many demographic and health-related factors including age, race, education, community, disease, self-reported health, nutrient intake, and tobacco use (Lee & Frongillo, 2001; Nord, 2002; Vozoris & Tarasuk, 2003; Seligman et al., 2007; Armour et al., 2007; Nord et al., 2008; Ziliak et al., 2008). Prevention of FI through the provision of congregate or home-delivered meals is one of the intended purposes of the Older Americans Act Nutrition Program (OAANP) (Public Law 109–330, 2006). FI is associated with decreased intakes of fruits and vegetables and nutrients such as protein, carbohydrate, saturated fat, niacin, riboflavin, vitamins B-6, B-12, C and E, magnesium, iron, zinc, and several carotenoids (Cristofar & Basiotis, 1992; Dixon et al., 2001; Kendall et al. 1995, 1996; Rose & Oliveira 1997; Tarasuk & Beaton 1999; Sahyoun & Basiotis, 2000; Lee & Frongillo, 2001; Ziliak et al., 2008). The 2005 Dietary Guidelines for Americans recommends seven to ten servings of fruits and vegetables, six to nine servings of grains, and three servings of low-fat dairy daily for those needing 1,600 to 2,200 calories daily, which is the general range of energy needs for older adult men and women (USDHHS & USDA, 2005). Meals funded by state and federal funds under the OAANP must meet these 2005 Dietary Guidelines for Americans per state and federal regulations (Georgia Department of Human Resources & Division of Aging Services, 2002).

Surveys of older adults reflect a higher prevalence of FI in OAANP congregate meal participants (19.6%, Duerr, 2006) than in national studies (5.9% to 6.5%, Nord, 2002, Nord et al., 2008). Thus, it was hypothesized that FI might also be prevalent in those receiving congregate meals and/or other services from senior centers in Georgia. The goal of the present

study was to determine the prevalence, extent and predictors of FI in older adults attending senior centers throughout Georgia. Two FS measures were used to understand the existence of FI in this population: a single-item question from the NSI, "Do you always have enough money to buy the food you need?" (NSI-2, FI = no, FS = yes) and a modified version of the Six-Item Short Form Food Security Survey Module that was scored as two categories (FI or FS, USDA-2), and as four categories (high food security, HFS; marginal food security, MFS; low food security, LFS; or very low food security, VLFS; USDA-4). The NSI-2 and the USDA-2 measure determine if an individual is FS vs. FI and the USDA-4 measure is used to determine the extent of FS. It was hypothesized that demographic factors, food intake, food assistance, and health related factors would be associated with FI. The important contribution of this study is that it provides the first estimates of the prevalence of FI in older adults at Georgia senior centers, as well as factors associated with FI.

Methods

Sample

Questionnaires and procedures were approved by the Institutional Review Boards on Human Subjects of the University of Georgia and the Georgia Department of Human Resources. Participants were a convenience sample of people aged 50 and older recruited from 40 senior centers in the fall of 2007, similar to previous studies (Fitzpatrick et al., 2008; Hendrix et al., 2008; Bell et al., 2009). Briefly, each of the 12 Area Agencies on Aging in Georgia was asked to recruit about 70 people from senior centers in their area. Senior centers were selected based on the support of the senior center director and interest of the participants. Most participants received congregate meals. Procedures were explained and the consent forms were read to participants, and written informed consent was obtained from participants. Potential participants

were excluded if they were homebound or when the interviewer determined that the individual

was unable to understand the informed consent and/or answer questions. These recruitment

procedures yielded 815 participants of whom 572 were included in this study. Two-hundred and

forty-three participants were excluded from the analytic sample because they had incomplete

information for at least one variable of interest: NSI-2, n = 19; USDA-2, USDA-4, USDA-6, n =

19; tobacco, n = 7; diabetes, n = 4; high blood pressure, n = 2; heart disease, n = 5; arthritis, n =

2; joint pain, n = 1; osteoporosis, n = 12; social and emotional support, n = 23; depression, n = 4;

experiencing a fall in the past year, n = 7; prescription medication, n = 18; over-the-counter

medication, n = 27; food bank/pantry usage, n = 13; food stamp participation, n = 12; daily fruit

intake, n = 16; daily vegetable intake, n = 9; daily combined fruit and vegetable consumption, n =

25; days of the week five or more fruits and vegetables consumed, n = 27; knowledge of fruit and

vegetable recommendations, n = 29; daily whole grain bread intake, n = 29; daily whole grain

cereal intake, n = 25; daily combined whole grain bread and cereal consumption, n = 54;

knowledge of whole grain recommendations, n = 9; daily milk consumed as a beverage, n = 23;

daily milk consumed with cereal, n = 27; combined beverage and cereal milk, n = 50; knowledge

of milk product recommendations, n = 6; presence of stomachache, gas, or diarrhea after drinking

milk, n = 13; younger than 60 years; n = 17; or race other than black or white, n = 9. Individuals

representing other races were excluded because they represented a small portion of the sample

population. Table 3.5 compares the characteristics of included and excluded participants.

Compared to included participants, those excluded were significantly more likely to be white,

live in an urban community, and always or usually receive the social and emotional support they

needed.

Questionnaires

Participants were interviewed as previously described (Bell et al., 2009; Ellis et al., 2005; Fitzpatrick et al., 2008; Hendrix et al., 2008). Participant FS was assessed by a modified version of the US Household Food Security Survey Module: Six-Item Short Form (USDA, 2008). Participants were asked to respond to statements and answer FS questions based on the past 30 days: 1) "The food that you bought just didn't last, and you didn't have money to buy more" (sometimes or never = 0, often = 1), 2) "You couldn't choose the right food and meals for your health because you couldn't afford them" (sometimes or never = 0, often = 1), 3) "Did you ever cut the size of your meals or skip meals because there wasn't enough money for food?" (no = 0, yes = 1), 4) "If yes, in the last 30 days, how many days did this happen?" (<3 days = 0, ≥3 days = 1), 5) "Did you ever eat less than you felt you should because there wasn't enough money to buy food?" (no = 0, yes = 1), and 6) "Were you ever hungry but didn't eat because you couldn't afford food?" (no = 0, yes = 1). Question #2 was modified from the USDA Food Security Survey Module question, "You couldn't afford to eat balanced meals." The use of "health" in the question wording rather than "balanced meals" was found to be more sensitive and indicative of food security in older adults (Wolfe et al., 2003). The 30-day reference period, rather than 12-months, facilitates a more temporally precise analysis of the relationship between households' food insecurity and their use of federal and community food and nutrition assistance programs (Nord et al., 2008). Missing items (n = 6) were assigned values only if the response pattern followed the recommended imputation criteria (Bickel et al., 2000). Imputed values did not change the FS status of participants in the study. Responses were summed to create a six-item food security scale that ranged from 0 to 6 (high score indicating high FI), and was categorized into two subscales: USDA-2 category measure that assessed food security status (FS = 0 to 1,

and FI = 2 to 6) and USDA-4 category measure that assessed degree of food security (HFS = 0, MFS = 1, LFS = 2 to 4, VLFS = 5 to 6, USDA, 2008). Participants were asked, "Do you always have enough money to buy the food you need?" (FS is yes = 0, FI is no = 1), which is referred to as NSI-2 category measure in this study (NSI, 1991). The NSI-2 and the USDA-2 measures categorize individuals as FS or FI and the USDA-4 measure is used to determine the extent of FI.

Age was divided into four categories: 60 to 64, 65 to 74, 75 to 84, and ≥ 85 years (Duerr, 2007). Based on mean age, age was dichotomized for regression analyses (< 75 = 0 and ≥ 75 = 1). Gender (male = 0 and female = 1), race/ethnicity (white = 0, black =1), and education (≤ 12 years = 0, more than high school graduate was > 12 years = 1, Lee and Frongillo, 2001) were self-reported. Counties in which senior centers were located were classified based on analysis of various population statistics into five types of communities (Bachtel, 2007); based on the bivariate analysis that showed the rural growth areas generally had the lowest FI, in the regression analyses these communities were dichotomized (urban, urbanizing, suburban and rural decline = 0, rural growth = 1). Tobacco use was assessed with, "Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?" (no = 0, yes = 1).

Self-reported overall health was assessed with, "How would you rate your overall health?" (poor = 0, fair = 1, good = 2, very good = 3, and excellent = 4, dichotomized to poor and fair = 0, good, very good or excellent = 1, adapted from the Behavioral Risk Factor Surveillance System, BRFSS, 2006). Total number of health conditions was assessed by combining affirmative responses (no = 0, yes = 1) to having diabetes, high blood pressure, arthritis, heart disease ("Do you have heart disease such as angina, congestive heart failure, heart attack or other heart problems?" BRFSS, 2005), joint pain ("During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?" BRFSS, 2005), and osteoporosis ("Have you ever been told by a doctor or other health professional that you have

osteoporosis?" BRFSS, 2005). Participants were also asked, "How many prescription medications, including insulin, do you take?" and "How many over-the-counter medications do you take" (such as a daily multivitamin, supplements, aspirin, etc.). Responses of 20 or greater for prescription or for non-prescription medications were recoded to 20.

Frequency of social and emotional support was assessed with, "How often do you get the social and emotional support that you need?" (always = 1, usually = 2, sometimes = 3, rarely = 4, never = 5; dichotomized to never, rarely, or sometimes = 0, usually or always = 1, BRFSS, 2006) and history of depression with, "Has a doctor or other health care provider ever told you that you have a depressive disorder?" (no = 0, yes = 1, BRFSS, 2007).

Use of food assistance programs was assessed with, "In the past month, have you received food from a food pantry or food bank?" and "Do you currently receive food stamps?" (no = 0, yes = 1). Dietary intakes of fruits and vegetables (Toobert et al., 2000; Hendrix et al., 2008), whole grains (Ellis et al., 2005), and milk (Cheong et al., 2003) were assessed as follows: "How many days of the last week did you eat 5 or more servings of fruits and vegetables?" (range = 0 to 7), "How many servings of fruits and 100% fruit juices do you usually have each day?" (range = 0 to 7), "How many servings of vegetables do you usually eat each day?" (range = 0 to 7), "How often do you eat whole wheat or whole grain bread, such as 100% whole wheat bread?" (range = 1 time per week to 3 times per day), "How often to you eat whole grain cereals, such as oatmeal, Cheerios®, bran flakes or bran cereal?" (range = 1 time per week to 3 times per day), "How often do you drink milk as a beverage including soy milk?" (range = 1 time per week to 3 times per day), and "How often do you eat milk on cereal including soy milk?" (range = 1 time per week to 3 times per day). It was felt that the frequency of intake of each of the foods was more important than the serving size to gauge exposure of this population to the target foods (Thompson & Subar, 2001). Summary scores were created for total fruit and vegetable intake, total

whole grain intake, and total milk intake by summing the relevant questions related to each food category. Knowledge of dietary recommendations was based on the 2005 Dietary Guidelines for Americans (USDHHS & USDA, 2005) and assessed with these questions, "How many fruits and vegetables should older people eat each day? (incorrect responses including don't know (= 0), correct responses were 7, 8, 9, 10, 5 a day, 5 or more a day, 7 to 10 a day (= 1), Hendrix et al., 2008); "How many whole grain servings should people eat each day?" (incorrect responses including don't know (= 0), correct response was 3 or more (= 1), Ellis et al., 2005); and "How many servings of milk products should older people eat daily?" (incorrect responses including don't know (= 0), correct response was 3 servings daily (= 1), Ellis et al., 2005). Milk intolerance was assessed with, "Do you get a stomachache, gas, or diarrhea after drinking milk?" (no = 0, yes = 1, Elbon et al., 1998).

Statistical Analyses

Questionnaires and consent forms were sent to The University of Georgia for analyses (SAS, Version 9.1, SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means, standard deviations, medians, and 95% confidence intervals were calculated. Bivariate associations of FI (NSI-2, the USDA-2, and the USDA-4) with demographic, health- and food-related measures were assessed with t-tests, GLM and chi-square analyses, as well as non-parametric tests for non-normally distributed data (Mann-Whitney U and Kruskal-Wallis tests). Regression analyses were used to identify the independent variables associated with each of the four measures of FI, as well as how these same independent variables and FI were associated with measures of food intake. Variables included in these models were demographics, community, tobacco use, self-reported health, social and emotional support, depression, health conditions, prescription medications, and over-the-counter medications. $P \leq 0.05$ was considered statistically significant.

Results

The demographic, health, and food-related characteristics of the overall sample are shown in Table 1. Participants had a mean age of 75.6, were primarily female (81.8%) and white (66.4%), had a mean education level of 10.5 years, and were most likely to live in suburban areas rather than other areas (urban, urbanizing, rural growth areas, or rural decline). Depending on the measure, about 70.6% to 81.8% of the participants were FS. The prevalence of FI was 18.2% with the NSI-2 measure and 19.8% with the USDA-2 measure. According to the USDA-4 measure, 9.6% were MFS, 15.7% were LFS, and 4.0% were VLFI. Tobacco was used by 7.3% and poor or fair health was reported by 40.2%. About 29% to 39% of participants reported having diabetes, heart disease, osteoporosis, or a fall in the past year, while 70% to 71% reported having arthritis or joint pain. About 77.1% of participants reported "always" or "usually" getting the emotional support they need and 24.1% reported a history of depression. Mean number of prescription and over-the-counter medications were 4.9 and 2.0, respectively. About 26.4% of participants received food from a food pantry or food bank and 14.5% used food stamps. Mean daily servings of fruit, vegetables, and fruit plus vegetables were 2.2, 2.8, and 5.0, respectively; participants reported eating 5 or more servings of fruits and vegetables an average of 3.9 days per week; and 11.9% knew that 7 or more servings of fruits and vegetables are recommended daily. Mean daily servings of whole wheat or whole grain bread, cereals, and total whole grains were 0.9, 0.7, and 1.6, respectively; and 31.8% of participants knew that 3 or more servings of whole grains are recommended daily. Mean daily servings of milk to drink, milk with cereal, and total milk were 0.8, 0.6, and 1.4 servings daily; 33.6% knew that three servings are milk products are recommended daily; and 25.4% reported milk intolerance.

The bivariate relationships of FI with demographic, health, and food-related variables are shown in Table 2. Although gender was not associated significantly with FI, being younger vs. older and being black compared to white were significantly associated with being FI (all measures). Lower education was significantly associated with only one measure of FI (USDA-2), while participants in rural growth areas had the lowest prevalence of FI (significant associations for USDA-2 and USDA-4). Using tobacco and lower self-reported health were significantly associated with only one measure of FI (NSI-2). All measures of FI were significantly associated with having diabetes, arthritis, or joint pain, but not any of the other health conditions (heart disease, high blood pressure, or osteoporosis). Lower emotional support was significantly associated with FI for all FI measures (NSI-2, USDA-2, and USDA-4), while history of depression was significantly associated with two measures of FI (NSI-2 and USDA-4). The mean number of medications was associated significantly with two measures of FI (USDA-2 and USDA-4), such that higher FI was associated with a higher number of prescription medications and a lower number of over-the-counter medications. The use of food banks or pantries and food stamps was significantly higher among the FI for all three measures (NSI-2, USDA-2, and USDA-4). Daily fruit and vegetable consumption was significantly associated with the NSI-2 measure, while daily vegetable consumption was associated with the USDA-2 measure only. The significant associations of the USDA-4 measure of FI with fruit, vegetable and total fruit and vegetable intakes were not linear. The number of days in the last week that participant consumed 5 or more servings of fruits and vegetables was significantly lower in the FI participants for all measures (NSI-2, USDA-2, and USDA-4). The only association of whole grain-related measures with FI was that FI was significantly associated with lower mean intake of whole grain cereals (NSI-2 only). Milk intake was not consistently associated with FI, except

that some measures of milk with cereal and overall milk intake were significantly lower in those with FI (NSI-2 only). Milk intolerance was significantly associated with all measures of FI (NSI-2, USDA-2, and USDA-4).

Multivariate regression analyses were conducted to identify predictors of NSI-2, USDA-2, and USDA-4 categories (logistic regression), as well as the USDA-6 item summary score (General Linear Models, Table 3). In the four demographic models, FI was more prevalent among the younger participants and in those participants who were black compared to white, but gender was not associated with FI. In the fully adjusted models, being black continued to be a strong and consistent predictor of FI for all four measures of FI; age was only associated with FI in the models using the USDA measures, but not the NSI measure; all measures of FI were significantly associated with living in areas other than rural growth, using food stamps or food banks and pantries, and having four or more of the six health conditions; and lower education, tobacco use, and history of depression were significantly associated with FI in the NSI-2 model, but not in any of the USDA models. Forward step wise regression models yielded similar results as the fully adjusted models (data not shown.)

A series of regression models were also tested to determine the relationship of FI with the number of days five or more fruits and vegetables were consumed, total fruit and vegetable intake, total whole grain intake, and total milk intake. The independent predictors examined were the same as those used in the models predicting FI. Generally, the four measures of FI were not related to the intakes of these foods in the fully adjusted models or in the forward stepwise regression models, except that number of days five or more fruits and vegetables were consumed was significantly associated with all four measures of FI in the forward step-wise regression models (Table 4).

Discussion

The most important finding of this study was that FI was up to nearly three times more prevalent in this sample than in other samples of older adults (Nord et al., 2008). Being black compared to white remained a very strong and consistent predictor of FI when controlled for other demographic and health-related factors. FI was associated to a lesser extent with younger age, tobacco use, and certain health conditions, but was not strongly associated with dietary patterns, suggesting that participation in nutrition education and/or congregate meal programs at senior centers may have moderated the negative effects of FI on food intake. Somewhat different demographic and health factors were associated with the NSI-2 and the USDA-2 measures, so perhaps these measures are assessing different aspects of FI. According to the USDA-2 measure, the prevalence of FI among our population was nearly three times that of the nationally representative sample of older adults in 2007, 19.8% vs. 6.5%. Similarly, the prevalence of VLFS was more than three times more likely to occur among our sample compared to the national sample, 4.0% vs. 1.2%, when using a 30-day time frame.

This high prevalence of FI occurred despite most participants attending senior centers with congregate meal programs. Moreover, among the FI (USDA-2 measure) 39.8% received food stamps and 52.2% used food banks or food pantries in the past 30 days. Although we did not determine household characteristics, income or eligibility for food stamps within this sample, senior center programs usually target low-income individuals (OAA, 2006). Nationally, among low-income FI older adults, 26.2% used food stamps and 15.0% used food pantries in the previous 12 months (Nord, 2002). Thus, it appears that the use of food stamps and food banks or pantries is particularly high in this Georgia sample, but these community resources apparently were not sufficient to eliminate FI in these vulnerable elders.

Race was a very strong and consistent predictor of FI and when adjusted for gender and age, blacks were 2.8 to 3.5 times more likely than whites to be FI (NSI-2 and USDA-2 measures, respectively, Table 3). Nationally, FI was about five times more prevalent in black compared to white households with elderly in 1999-2000 (18.9% and 3.7%, respectively, Nord, 2002). When controlled for additional demographic and health-related conditions, the relationship of race with FI was attenuated, but was still strong and blacks were about 1.7 to 2.1 times more likely than whites to be FI (Table 3). Thus, there may be factors that were not measured that contributed to FI in blacks in this sample. The high prevalence of FI among older minority groups compared to whites may be related to several factors such as the higher prevalence of low incomes, high poverty rates, single living, and mixed-aged households (Nord, 2002). In addition to race, other risk factors for FI included being < 75 years of age, tobacco use, and certain health conditions (Table 3) as reported by others (Lee & Frongillo, 2001; Duerr, 2006; Armour et al., 2007; Seligman et al., 2007, Vozoris & Tarasuk, 2003; Ziliak et al., 2008). It has been suggested that among the elderly the more vulnerable individuals may not survive to the older age groups, some food assistance programs are targeted to the oldest adults who have or are perceived to have the highest nutritional risk, and the oldest adults may perceive their FI as less severe because they have lived through the Great Depression and other hard times (Sharkey & Schoenberg, 2002, Duerr, 2006). The association of tobacco use with FI is attributed to limited incomes being spent on tobacco instead of food (Armour et al., 2007) and to multiple health conditions with the impact on daily function, special dietary needs, and costs associated with disease management (Vozoris & Tarasuk, 2003). Community is often associated with FI because different types of communities have different food availability. The effects of community may have been attenuated in this study because many participants are often driven to the senior center and

 therefore are brought to a food source. Senior centers may also provide participants with transportation to food stores. The community designations assigned by Bachtel (2007) in The Five Georgias (appendix C) describe the communities, but not necessarily the individuals residing in those communities.

In the regression models, the NSI-2 measure and the USDA measures had a somewhat different set of predictors related to demographic and health-related factors. For example, for the NSI-2, but not the USDA-2 measure, FI was significantly ($P < 0.05$) associated with tobacco use, poor social support, and history of depression. Thus, for reasons that are not clear, these measures may be assessing different aspects of FI. Multiple measures were utilized in this study to identify the prevalence (NSI-2 and USDA-2), extent (USDA-4), and associated characteristics of FI across all measures. FI individuals may have high rates of poor social support, major depression, and distress associated with their limited financial resources (Kim & Frongillo, 2006; Vozoris & Tarasuk, 2003). Social resources such as participation in food assistance programs may moderate some of these effects (Kim & Frongillo, 2006).

In contrast to previous literature (Dixon et al., 2000; Rose & Oliveira, 1997; Kendall et al., 1996; Lee & Frongillo, 2001; Ziliak et al., 2008), dietary patterns were not strongly related to FI, except daily servings of vegetables, total daily servings of fruits and vegetables, and the number of days per week participants ate five or more fruits and vegetables (Tables 2 and 4). Perhaps the congregate meal program moderates the effects of FI on dietary patterns, because state and federal regulations require that nutrition education be provided for participants and require and/or encourage that meals include fruits, vegetables, whole grains, and milk products (Georgia Department of Human Resources & Division of Aging Services, 2002). In Georgia, the nutrition education programs during the past several years have focused on cost-effective ways

to include whole grains, fruits, vegetables and milk products as part of a healthy diet (Ellis et al., 2005; Hendrix et al., 2008; McCamey et al., 2003; Cheong et al., 2003).

There are some limitations to this study. This convenience sample may not be representative of all older adults attending senior centers in Georgia, so additional population-based studies are needed to document the magnitude and severity of FI. Although participants were attending senior centers that provide congregate meals, we did not collect information on their frequency of receiving congregate meals. Potential variability in how the questionnaires were administered was minimized by holding a statewide training and providing technical assistance by phone, e-mail and site visits. Possible concerns about functional impairments of participants, such as impaired vision and/or hearing, were addressed by requiring that all questionnaires be interviewer administered. Another limitation is that information was self-reported and may be subject to biases related to social acceptability; however this methodology has provided meaningful information in other surveys of the older adult population (Dixon et al., 2001; Lee & Frongillo, 2001; Nord et al., 2008; Rose & Oliveira, 1997; Vozoris & Tarasuk, 2003).

In summary, this sample had a very high prevalence of FI. Future studies are needed to more thoroughly assess FI, food assistance and measures of household income, living alone or with others, and other factors that might impair an older adults' ability to secure adequate food resources, such as impairments in physical function, transportation problems, and community food availability. Special attention must be given to minority older adults who represent a considerable proportion of the growing older adult population and have a very high prevalence of FI in this sample and nationally.

Acknowledgements

Table 3.1: Characteristics of Participants, Georgia Senior Centers, 2007

	n	Participants Mean (SD) Median (95% CI) or % n = 572
Age (years)		75.6 (7.8) 75.0 (63.0-89.0)
60-64	44	7.7
65-74	223	39.0
75-84	223	39.0
≥85	82	14.3
Gender		
Men	104	18.2
Women	468	81.8
Race		
White	380	66.4
Black	192	33.6
Education (years)		10.5 (3.2) 11.0 (4.0-15.0)
≤12	491	85.8
>12	81	14.2
Community		
Urban	110	19.2
Suburban	207	36.2
Urbanizing	108	18.9
Rural Growth	104	18.2
Rural Decline	43	7.5
Do you always have enough money to buy the food you need?		
Yes	468	81.8
No	104	18.2
Food Security Status		
Food secure (0)	459	80.2
Food insecure (1)	113	19.8
Degree of Food Security		
High security (0)	404	70.6
Marginal security (1)	55	9.6

	n	**Participants Mean (SD) Median (95% CI) or %** **n = 572**
Low security (2 – 4)	90	15.7
Very low security (5 – 6)	23	4.0
Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?		
Yes	42	7.3
No	530	92.7
Self-reported health		
Poor	33	5.8
Fair	197	34.4
Good	241	42.1
Very good	79	13.8
Excellent	22	3.9
Diabetes	175	30.6
Yes	397	69.4
No		
High blood pressure		
Yes	417	72.9
No	155	27.1
Heart disease		
Yes	177	30.9
No	395	69.1
Arthritis		
Yes	404	70.6
No	168	29.4

	n	Participants Mean (SD) Median (95% CI) or % n = 572
During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?		
Yes	406	71.0
No	166	29.0
Have you ever been told by a doctor or other health professional that you have osteoporosis?		
Yes	166	29.0
No	406	71.0
How often do you get the social and emotional support that you need?		
Always	328	57.3
Usually	113	19.8
Sometimes	76	13.3
Rarely	26	4.6
Never	29	5.1
Has a doctor or other health care provider ever told you that you have a depressive disorder?		
Yes	138	24.1
No	434	75.9
Have you fallen in the past year?		
Yes	224	39.2
No	348	60.8
How many prescription medications, including insulin do you take?		4.9 (4.1) 4.0 (0.0-12.0)
<3	146	25.5
≥3	572	74.5
<5	301	52.6
≥5	572	47.4
<20	565	98.8
≥20	7	1.2

	n	Participants Mean (SD) Median (95% CI) or % n = 572
How many over-the-counter medications do you take?		1.98 (1.95) 2.0 (0.0-5.0)
<1	102	17.8
≥1	470	82.2
<3	412	72.0
≥3	160	28.0
<4	482	84.3
≥4	90	15.7
<5	525	91.8
≥5	47	8.2
In the past month, have you received food from a food pantry or food bank?		
Yes	151	26.4
No	421	73.6
Do you currently receive food stamps?		
Yes	83	14.5
No	489	85.5
Fruit (servings/day)		2.2 (1.3) 2.0 (0.0-4.0)
< 1	40	7.0
≥ 1	532	93.0
< 2	181	31.6
≥ 2	391	68.4
< 3	364	63.6
≥ 3	208	36.4
Vegetables (servings/day)		2.8 (1.2) 3.0 (1.0-5.0)
< 1	4	.7
≥ 1	568	99.3
< 2	57	10.0
≥ 2	515	90.0

	n	Participants Mean (SD) Median (95% CI) or % n = 572
< 3	252	44.1
≥ 3	320	55.9
Fruits and vegetables (servings/day)		5.0 (2.0) 5.0 (2.0-8.0)
< 1	1	.2
≥ 1	571	99.8
< 2	10	1.8
≥ 2	562	98.3
< 3	43	7.5
≥ 3	529	92.5
< 4	127	22.2
≥ 4	445	77.8
< 5	249	43.5
≥ 5	323	56.5
< 7	462	80.8
≥ 7	110	19.2
How many days of the last week did you eat 5 or more servings of fruits and vegetables? (days/week)		3.9 (2.7) 5.0 (0.0-7.0)
How many servings of fruits and vegetables should older people eat each day?		
Don't know	92	16.1
Incorrect (6 or less)	412	72.0
Correct (7 or more)	68	11.9
How often do you eat whole wheat or whole grain bread such as 100% whole wheat bread? (servings/day)		0.9 (0.7) 1.0 (0.0-2.0)
< 1	255	44.6
≥ 1	317	55.4
< 2	493	86.2
≥ 2	79	13.8
< 3	560	97.9
≥ 3	12	2.1

	n	Participants Mean (SD) Median (95% CI) or % n = 572
How often do you eat whole wheat or whole grain cereals such as oatmeal, Cheerios®, bran flakes or bran cereal? (servings/day)		0.7 (0.5) 0.9 (0.0-1.4)
< 1	303	53.0
≥ 1	269	47.0
< 2	554	96.9
≥ 2	18	3.2
< 3	566	99.0
≥ 3	6	1.1
Total whole wheat or whole grain bread and cereals. (servings/day)		1.6 (1.0) 1.4 (0.1-3.3)
< 1	134	23.4
≥ 1	438	76.6
< 2	343	60.0
≥ 2	229	40.0
< 3	511	89.3
≥ 3	61	10.7
How many whole grain servings should people eat each day?		
Don't know	177	30.9
Incorrect (2 or less)	213	37.2
Correct (3 or more)	182	31.8
Milk to drink (servings/day)		0.8 (.7) 0.7 (0.0-2.0)
< 1	308	53.9
≥ 1	264	46.2
< 2	505	88.3
≥ 2	67	11.7
< 3	563	98.4
≥ 3	9	1.6

	n	Participants Mean (SD) Median (95% CI) or % n = 572
Milk with cereal (servings/day)		0.6 (1.0) 0.6 (0.0-1.0)
< 1	332	58.0
≥ 1	240	42.0
< 2	561	98.1
≥ 2	11	1.9
< 3	569	99.5
≥ 3	3	0.5
Drinking milk and cereal milk (servings/daily)		1.4 (1.0) 1.1 (0.0-3.0)
< 1	177	30.9
≥ 1	395	69.1
< 2	395	69.1
≥ 2	177	30.9
< 3	522	91.3
≥ 3	50	8.7
How many servings of milk products should older people eat daily?		
Don't know	162	28.3
Incorrect (2 or less)	218	38.1
Correct (3 or more)	192	33.6
Do you get stomachache, gas, or diarrhea after drinking milk?		
Yes	145	25.4
No	427	74.7

Table 3.2: Food Insecurity, Demographics, Health, and Fruit, Vegetable, and Whole Grain Food Intake, Georgia Senior Centers, 2007

	n	Do you always have enough money to buy the food you need? NSI-2 Mean (SD) Median (95% CI) or % n = 572			Food Security Status, USDA-2 Mean (SD) Median (95% CI) or % n = 572			Degree of Food Security, USDA-4 Mean (SD) Median (95% CI) or % n = 572				
	n	FS (n=468)	FI (n=104)	P-value	FS (n=459)	FI (n=113)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
Age (years)		76.1 (7.8) 76.0 (64.0-90.0)	73.2 (7.4) 72.5 (62.0-86.0)	0.01[a] .001[b]	76.3 (7.7) 76.0 (64.0-90.0)	72.5 (7.51) 71.1 (62.0-87.0)	0.001[a] .0001[b]	76.6 (7.8) 76.0 (64.0-90.0)	73.9 (6.7) 73.0 (63.0-86.0)	73.0 (7.7) 71.0 (62.0-87.0)	70.9 (6.4) 72.0 (62.0-79.0)	0.001[c] .0001[d]
60-64	44	65.9	34.1		61.4	38.6		52.3	9.1	25.0	13.6	
65-74	223	79.4	20.6		76.2	23.8		64.1	12.1	20.2	3.6	
75-84	223	83.9	16.1		84.3	15.7		76.2	80.1	11.7	4.0	
≥85	82	91.5	8.5		90.2	9.8		82.9	7.3	9.8	0.0	
Gender				0.10			0.13					0.39
Men	104	87.5	12.5		85.6	14.4		76.9	8.6	10.6	3.8	
Women	468	80.6	19.4		79.1	20.9		69.2	9.8	16.9	40.1	
Race				0.0001			0.0001					0.0001
White	380	87.6	12.4		87.6	12.4		79.0	8.7	10.5	1.8	
Black	192	70.3	29.7		65.6	34.4		54.2	11.5	26.0	8.3	
Education (years)		10.6 (3.2) 11.0 (4.0-16.0)	10.3 (3.0) 11.5 (4.0-14.0)	0.08[a] .58[b]	10.7 (3.2) 12.0 (5.0-16.0)	9.9 (3.3) 11.0 (3.0-14.0)	0.05[a] .03[b]	10.8 (3.2) 12.0 (5.0-16.0)	10.2 (3.1) 11.0 (5.0-16.0)	9.9 (3.2) 11.0 (3.0-13.0)	9.9 (3.3) 10.0 (4.0-16.0)	0.08[c] .06[d]
≤12	491	80.6	19.4		78.6	21.4		69.3	9.4	17.3	4.1	
>12	81	88.9	11.1		90.1	9.9		79.0	11.1	6.2	3.7	
Community				0.12			0.05					0.05
Urban	110	81.8	18.2		74.6	25.4		60.9	13.6	20.9	4.6	
Suburban	207	80.7	19.3		78.7	21.3		70.0	8.7	16.9	4.4	
Urbanizing	108	76.8	23.2		82.4	17.6		69.4	13.0	14.8	2.8	
Rural Growth	104	90.4	9.6		90.4	9.6		85.6	4.8	7.7	1.9	
Rural Decline	43	79.1	20.9		72.1	27.9		65.1	7.0	18.6	9.3	

		Do you always have enough money to buy the food you need? NSI-2 Mean (SD) Median (95% CI) or % n = 572			Food Security Status, USDA-2 Mean (SD) Median (95% CI) or % n = 572			Degree of Food Security, USDA-4 Mean (SD) Median (95% CI) or % n = 572				
	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?				0.01			0.28					0.64
Yes	42	64.3	35.7		73.8	26.2		64.3	9.5	19.0	7.1	
No	530	83.2	16.8		80.8	19.3		71.1	9.6	15.5	3.8	
Self-reported health				0.001			0.10					0.36
Poor	33	60.6	39.4		63.6	36.4		54.6	9.1	24.2	12.1	
Fair	197	78.2	21.8		79.2	20.8		71.1	8.1	16.2	4.6	
Good	241	85.5	14.5		82.2	17.8		71.4	10.8	14.1	3.7	
Very good	79	83.5	16.5		81.0	19.0		71.0	10.1	17.7	1.3	
Excellent	22	100.0	0		90.9	9.1		81.8	9.1	9.1	0.0	
Diabetes				0.05			0.05					0.001
Yes	175	76.6	23.4		74.3	25.7		61.1	13.1	17.7	8.0	
No	397	84.1	15.9		82.9	17.1		74.8	8.1	14.9	2.3	
High blood pressure				0.08			0.07					0.25
Yes	417	80.1	19.9		78.4	21.6		75.5	9.7	12.9	1.9	
No	155	86.5	13.6		85.2	14.8		68.8	9.6	16.8	4.8	
Heart disease				0.17			0.11					0.12
Yes	177	78.5	21.5		76.3	23.7		69.5	6.8	17.5	6.2	
No	395	83.3	16.7		82.0	18.0		71.1	10.9	14.9	3.0	
Arthritis				0.01			0.01					0.01
Yes	404	79.2	20.8		77.2	22.8		66.3	10.9	17.8	5.0	
No	168	88.1	11.9		87.5	12.5		81.0	6.6	10.7	1.8	
During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?				0.01			0.05					0.01
Yes	406	79.1	20.9		77.8	22.2		66.8	11.1	17.0	5.2	
No	166	88.6	11.5		86.1	13.9		80.1	6.0	12.6	1.2	

	n	Do you always have enough money to buy the food you need? NSI-2 Mean (SD) Median (95% CI) or % n = 572			Food Security Status, USDA-2 Mean (SD) Median (95% CI) or % n = 572			Degree of Food Security, USDA-4 Mean (SD) Median (95% CI) or % n = 572				
	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
Have you ever been told by a doctor or other health professional that you have osteoporosis?				0.10			0.96					0.90
Yes	166	77.7	22.3		80.1	19.9		69.3	10.8	16.3	3.6	
No	406	83.5	16.5		80.3	19.7		71.2	9.1	15.5	4.2	
How often do you get the social and emotional support that you need?				0.01			0.05					0.01
Always	328	85.7	14.3		82.6	17.4		73.2	9.5	15.2	2.1	
Usually	113	81.4	18.6		82.3	17.7		70.8	11.5	11.5	6.2	
Sometimes	76	75.0	25.0		68.4	31.6		61.8	6.6	26.3	5.3	
Rarely	26	61.5	38.5		69.2	30.8		57.7	11.5	11.5	19.2	
Never	29	75.9	24.1		86.2	13.8		75.9	10.3	13.8	0.0	
Has a doctor or other health care provider ever told you that you have a depressive disorder?				0.001			0.24					0.01
Yes	138	72.5	27.5		76.8	23.2		62.3	14.5	15.9	7.3	
No	434	84.8	15.2		81.3	18.7		73.3	8.1	15.7	3.0	
Have you fallen in the past year?				0.78			0.15					0.38
Yes	224	81.2	18.8		77.2	22.8		66.5	10.7	18.3	4.5	
No	348	82.2	17.8		82.2	17.8		73.3	8.9	14.1	3.7	

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		FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
How many prescription medications, including insulin do you take?		4.9 (4.3)	5.2 (3.5)	0.51[a]	4.8 (4.1)	5.7 (4.1)	0.05[a]	4.7 (4.1)	5.4 (4.5)	5.3 (3.0)	7.3 (6.7)	0.01[c]
		4.0 (0.0-12.0)	5.0 (1.0-11.0)	0.06[b]	4.0 (0.0-11.0)	5.0 (1.0-12.0)	0.01[b]	4.0 (0.0-10.0)	4.0 (0.0-14.0)	5.0 (1.0-10.0)	5.0 (1.0-12.0)	0.05[d]
<3	146	85.6	14.4		86.3	13.7		76.0	10.3	10.3	3.4	
≥3	572	80.5	19.5	0.17	78.2	21.8	0.05	68.8	9.4	17.6	4.2	0.19
<5	301	83.4	16.6		83.1	16.9		73.8	9.3	13.3	3.7	
≥5	572	80.1	19.9	0.31	77.1	22.9	0.08	67.2	10.0	18.5	4.4	0.31
<20	565	81.8	18.2		80.4	19.7		70.6	9.6	15.9	3.7	
≥20	7	85.7	14.3	0.79	75.0	25.0	0.56	57.1	14.3	0.00	28.6	0.01
How many over-the-counter medications do you take?		2.0 (2.0)	1.7 (1.7)	0.14[a]	2.1 (2.0)	1.5 (1.4)	0.01[a]	2.1 (2.1)	1.9 (1.6)	1.5 (1.4)	1.5 (1.3)	0.05[c]
		2.0 (0.0-5.0)	1.0 (0.0-5.0)	0.06[b]	2.0 (0.0-5.0)	1.0 (0.0-4.0)	0.01[b]	2.0 (0.0-6.0)	1.0 (0.0-5.0)	1.0 (0.0-4.0)	1.0 (0.0-3.0)	0.05[d]
<1	102	79.4	20.6		86.3	24.5		67.7	7.8	19.6	4.9	
≥1	470	82.3	17.7	0.49	78.2	18.7	0.18	71.3	10.0	14.9	3.8	0.58
<3	412	80.1	19.9		83.1	22.1		68.5	9.5	17.2	4.9	
≥3	160	86.3	13.8	0.09	77.1	13.8	0.05	76.3	10.0	11.9	1.9	0.13
<4	482	80.9	10.1		78.4	21.6		68.7	9.8	17.0	4.6	
≥4	90	86.7	13.3	0.19	90.0	10.0	0.01	81.1	8.9	8.9	1.1	0.07
<5	525	81.5	18.5		79.2	21.8		69.3	9.9	16.6	4.2	
≥5	47	85.1	14.9	0.54	91.5	8.5	0.05	85.1	6.4	6.4	2.1	0.15

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		FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
In the past month, have you received food from a food pantry or food bank?				0.0001			0.0001					0.0001
Yes	151	66.2	33.8		60.9	39.1		50.1	9.9	32.4	6.6	
No	421	87.4	12.6		87.2	12.8		77.7	9.5	9.7	3.1	
Do you currently receive food stamps?				0.0001			0.0001					0.0001
Yes	83	56.6	43.4		45.8	54.2		33.7	12.0	43.4	10.8	
No	489	86.1	13.9		86.1	13.9		76.9	9.2	11.0	2.9	
Fruit (servings/day)		2.2 (1.3)	2.1 (1.2)	0.62[a]	2.2 (1.3)	2.2 (1.2)	0.97[a]	2.2 (1.3)	1.7 (1.1)	2.3 (1.2)	1.9 (1.3)	0.05[c]
		2.0 (0.0-4.0)	2.0 (0.0-4.0)	0.66[b]	2.0 (0.0-5.0)	2.0 (1.0-4.0)	0.46[b]	2.0 (0.0-5.0)	2.0 (0.0-4.0)	2.0 (1.0-4.0)	2.0 (0.0-4.0)	0.01[d]
< 1	40	80.0	20.0		87.5	12.5		75.0	12.5	7.5	5.0	
≥ 1	532	82.0	18.0	0.76	79.7	20.3	0.23	70.3	9.4	16.4	4.0	0.48
< 2	181	83.4	16.6		81.8	18.2		67.4	14.4	12.1	6.1	
≥ 2	391	81.1	18.9	0.50	79.5	20.5	0.53	72.1	7.4	17.4	3.1	0.01
< 3	364	80.2	19.8		79.4	20.6		67.3	12.1	15.9	4.7	
≥ 3	208	84.6	15.4	0.19	81.7	18.3	0.50	76.4	5.3	15.4	2.9	0.05

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	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
Vegetables (servings/day)		2.9 (1.2)	2.6 (1.0)	0.01 [a]	2.9 (1.2)	2.7 (1.1)	0.09 [a]	2.9 (1.2)	2.6 (1.0)	2.7 (1.1)	2.4 (1.1)	0.05 [c]
		3.0 (1.0-5.0)	2.0 (1.0-4.0)	0.01 [b]	3.0 (1.0-5.0)	2.0 (1.0-5.0)	0.05 [b]	3.0 (1.0-5.0)	2.0 (1.0-4.0)	3.0 (1.0-5.0)	2.0 (1.0-4.0)	0.05 [d]
< 1	4	75.0	25.0		75.0	25.0		75.0	0.0	0.0	25.0	
≥ 1	568	81.9	18.1	0.72	80.3	19.7	0.79	70.6	9.7	15.9	3.9	0.14
< 2	57	77.2	22.8		73.7	26.3		57.9	15.8	12.1	5.3	
≥ 2	515	82.3	17.7	0.34	81.0	19.0	0.19	72.0	8.9	15.2	3.9	0.15
< 3	252	79.0	21.0		77.4	22.6		66.3	11.1	17.5	5.2	
≥ 3	320	84.1	15.9	0.12	82.5	17.5	0.13	74.1	8.4	14.4	3.1	0.21
Fruits and vegetables (servings/day)		5.0 (2.0)	4.7 (1.7)	0.08 [a]	5.0 (2.0)	4.8 (1.8)	0.34 [a]	5.1 (2.0)	4.3 (1.7)	5.0 (1.7)	4.3 (1.9)	0.01 [c]
		5.0 (2.0-9.0)	4.0 (2.0-7.0)	0.05 [b]	5.0 (2.0-9.0)	5.0 (2.0-8.0)	0.17 [b]	5.0 (2.0-9.0)	4.0 (2.0-7.0)	5.0 (3.0-8.0)	4.0 (2.0-8.0)	0.01 [d]
< 1	1	100.0	0		100.0	0.0		100.0	0	0	0	
≥ 1	571	81.8	18.2	0.64	80.2	19.8	0.62	70.6	9.6	15.8	4.0	0.94
< 2	10	80.0	20.0		90.0	10.0		70.0	20.0	10.0	0.0	
≥ 2	562	81.8	18.2	0.88	80.1	19.9	0.43	70.6	9.4	15.8	40.1	0.62
< 3	43	86.0	14.0		83.7	16.3		65.1	18.6	9.3	7.0	
≥ 3	529	81.5	18.5	0.45	80.0	20.0	0.55	71.1	8.9	16.3	3.8	0.09
< 4	127	78.0	22.0		78.7	21.3		63.0	15.8	13.4	7.9	
≥ 4	445	82.9	17.1	0.20	80.7	19.3	0.63	72.8	7.9	16.4	2.9	0.01
< 5	249	78.7	21.3		77.5	22.5		65.5	12.0	16.5	6.0	
≥ 5	323	84.2	15.8	0.09	82.4	17.7	0.15	74.6	7.7	15.2	2.5	0.05
< 7	462	80.5	19.5		80.1	19.9		69.7	10.4	15.8	4.1	
≥ 7	110	87.3	12.7	0.10	80.9	19.1	0.85	74.6	6.4	15.5	3.6	0.60

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	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
How many days of the last week did you eat 5 or more servings of fruits and vegetables? (days/week)		4.0 (2.7)	3.2 (2.7)	0.01[a]	4.0 (2.7)	3.3 (2.7)	0.01[a]	4.1 (2.7)	3.3 (2.7)	3.4 (2.7)	2.6 (2.6)	0.01[c]
		5.0 (0.0-7.0)	3.0 (0.0-7.0)	0.01[b]	5.0 (0.0-7.0)	3.0 (0.0-7.0)	0.01[b]	5.0 (0.0-7.0)	4.0 (0.0-7.0)	3.0 (0.0-7.0)	2.0 (0.0-7.0)	0.01[d]
How many servings of fruits and vegetables should older people eat each day?				0.26			0.42					0.34
Don't know	92	83.7	16.3		83.7	16.3		79.4	4.4	12.0	4.4	
Incorrect (6 or less)	412	80.3	19.7		78.9	21.1		68.0	11.0	17.0	4.1	
Correct (7 or more)	68	88.2	11.8		83.8	16.2		75.0	8.8	13.2	2.9	
How often do you eat whole wheat or whole grain bread such as 100% whole wheat bread? (servings/day)		0.9 (0.7)	0.9 (0.7)	0.99[a]	0.9 (0.7)	0.9 (0.7)	0.58[a]	0.9 (0.7)	0.8 (0.6)	0.9 (0.7)	0.7 (0.6)	0.39[c]
		1.0 (0.0-2.4)	1.0 (0.0-2.0)	0.42[b]	1.0 (0.0-2.4)	1.0 (0.0-2.0)	0.32[b]	1.0 (0.0-2.4)	.9 (0.0-2.0)	1.0 (0.0-2.0)	0.6 (0.0-2.0)	0.42[d]
< 1	255	82.4	17.7		79.2	20.8		68.2	11.0	16.1	4.7	
≥ 1	317	81.4	18.6	0.77	81.1	18.9	0.58	72.6	8.5	15.5	3.5	0.61
< 2	493	82.0	18.0		80.5	19.5		70.8	9.7	15.2	4.3	
≥ 2	79	81.0	19.0	0.84	78.5	21.5	0.67	69.6	8.9	19.0	2.5	0.76
< 3	560	82.0	18.2		80.0	20.0		70.2	9.8	15.9	4.1	
≥ 3	12	83.3	16.7	0.89	91.7	8.3	0.32	91.7	0.0	8.3	0.0	0.41

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		FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
How often do you eat whole wheat or whole grain cereals such as oatmeal, Cheerios®, bran flakes or bran cereal? (servings/day)		0.71 (0.52)	0.57 (0.50).	0.01[a]	0.69 (0.52)	0.64 (0.54)	0.36[a]	0.68 (0.51)	0.75 (0.55)	0.64 (0.55)	0.63 (0.54)	0.66[c]
		0.8 (0.0-1.4)	0.4 (0.0-1.0)	0.01[b]	0.8 (0.0-1.4)	0.6 (0.0-1.4)	0.14[b]	0.8 (0.0-1.0)	0.8 (0.0-2.0)	0.6 (0.0-1.4)	1.0 (0.0-1.0)	0.69[d]
< 1	303	79.5	20.5		79.2	20.8		69.0	10.2	17.2	3.6	
≥ 1	269	84.4	15.6	0.13	81.4	18.6	0.51	72.5	8.9	14.1	4.5	0.66
< 2	554	81.8	18.2		80.5	19.5		71.1	9.4	15.5	4.0	
≥ 2	18	83.3	16.7	0.87	72.2	27.8	0.38	55.6	16.7	22.2	5.6	0.54
< 3	566	81.6	18.4		80.0	20.0		70.5	9.5	15.9	4.1	
≥ 3	6	100.0	0.0	0.25	100.0	0.0	0.22	83.3	16.7	0.0	0.0	0.65
Total whole wheat or whole grain bread and cereals. (servings/day)		1.6 (1.0)	1.5 (0.9)	0.17[a]	1.6 (1.0)	1.5 (1.0)	0.37[a]	1.6 (1.0)	1.6 (1.0)	1.6 (1.0)	1.3 (1.0)	0.61[c]
		1.4 (0.1-3.4)	1.3 (0.0-3.0)	0.07[b]	1.4 (0.1-3.4)	1.4 (0.0-3.0)	0.18[b]	1.4 (0.1-3.4)	1.4 (0.3-3.1)	1.4 (0.0-3.0)	1.0 (0.1-3.0)	0.60[d]
< 1	134	79.9	20.2		76.9	23.1		67.9	9.0	17.9	5.2	
≥ 1	438	82.4	17.6	0.50	81.3	18.7	.26	71.5	9.8	15.1	3.7	0.70
< 2	343	80.2	19.8		79.6	20.4		69.1	10.5	16.3	4.1	
≥ 2	229	84.3	15.7	0.21	81.2	18.8	.63	72.9	8.3	14.9	3.9	0.76
< 3	511	82.2	17.8		80.4	19.6		70.8	9.6	15.5	4.1	
≥ 3	61	78.7	21.3	0.50	78.7	21.3	.75	68.9	9.8	18.0	3.3	0.95

		Do you always have enough money to buy the food you need? NSI-2 Mean (SD) Median (95% CI) or % n = 572			Food Security Status, USDA-2 Mean (SD) Median (95% CI) or % n = 572			Degree of Food Security, USDA-4 Mean (SD) Median (95% CI) or % n = 572				
	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
How many whole grain servings should people eat each day?				0.90			0.78					0.38
Don't know	177	80.8	19.2		81.9	18.1		71.2	10.7	14.1	4.0	
Incorrect (2 or less)	213	82.6	17.4		79.8	20.2		68.1	11.7	17.4	2.8	
Correct (3 or more)	182	81.9	18.1		79.1	20.9		73.1	6.0	15.4	5.5	
Milk to drink (servings/day)		0.8 (07)	0.7 (0.7)	0.62[a]	0.8 (0.7)	0.7 (0.7)	0.80[a]	0.8 (0.7)	0.7 (0.6)	0.8 (0.7)	0.6 (0.6)	0.63[c]
		0.7 (0.0-2.0)	0.8 (0.0-2.0)	0.38[b]	0.7 (0.0-2.0)	0.7 (0.0-2.0)	0.48[b]	0.7 (0.0-2.0)	0.6 (0.0-2.0)	0.7 (0.0-2.0)	0.6 (0.0-1.4)	0.76[d]
< 1	308	82.1	17.9		79.6	20.5		68.8	10.7	15.6	4.9	
≥ 1	264	81.4	18.6	0.83	81.1	18.9	0.65	72.7	8.3	15.9	3.0	0.50
< 2	505	81.2	18.8		79.8	20.2		69.9	9.9	15.8	4.4	
≥ 2	67	86.6	13.4	0.28	83.6	16.4	0.47	76.1	7.5	14.9	1.5	0.59
< 3	563	81.9	18.1		80.3	19.7		70.5	9.8	15.6	4.1	
≥ 3	9	77.8	22.2	0.75	77.8	22.2	0.85	77.8	0.0	22.2	0.0	0.67
Milk with cereal (servings/day)		06 (0.5)	0.5 (0.4)	0.01[a]	0.6 (0.5)	0.6 (0.6)	0.95[a]	0.6 (0.5)	0.6 (0.4)	0.6 (0.5)	0.6 (0.7)	0.90[c]
		0.6 (0.0-1.0)	0.4 (0.0-1.0)	0.01[b]	0.6 (0.0-1.0)	0.4 (0.0-1.0)	0.32[b]	0.6 (0.0-1.0)	0.6 (0.0-1.0)	0.6 (0.0-1.0)	0.4 (0.0-1.0)	0.71[d]
< 1	332	78.9	21.1	0.05	78.9	21.1	0.35	68.7	10.2	16.3	4.8	0.54
≥ 1	240	85.8	14.2		82.1	17.9		73.3	8.8	15.0	2.9	
< 2	561	81.6	18.4	0.43	80.6	19.4	0.16	70.8	9.8	15.5	3.9	0.42
≥ 2	11	90.9	9.1		63.6	36.4		63.6	0.0	27.3	9.1	
< 3	569	81.7	18.3	0.41	80.5	19.51	0.05	70.8	9.7	15.6	3.9	0.05
≥ 3	3	100.0	0		33.3	66.67		33.3	0.0	33.3	33.3	

		Do you always have enough money to buy the food you need? NSI-2 Mean (SD) Median (95% CI) or % n = 572			Food Security Status, USDA-2 Mean (SD) Median (95% CI) or % n = 572			Degree of Food Security, USDA-4 Mean (SD) Median (95% CI) or % n = 572				
	n	FS (n=468)	FI (n=104)	P-value	FS (n=468)	FI (n=104)	P-value	FS (n=404)	MFS (n=55)	LFS (n=90)	VLFS (n=23)	P-value
Drinking milk and cereal milk (servings/daily)		1.4 (1.0)	1.2 (1.0)	0.08[a]	1.4 (1.0)	1.3 (1.0)	0.87[a]	1.4 (1.0)	1.2 (0.8)	1.4 (1.0)	1.2 (1.0)	0.60[c]
		1.1 (0.0-3.0)	1.0 (0.0-3.0)	0.05[b]	1.1 (0.0-3.0)	1.1 (0.0-3.4)	0.40[b]	1.1 (0.0-3.0)	1.3 (0.0-3.0)	1.2 (0.0-3.4)	1.0 (0.0-3.0)	0.63[d]
< 1	177	79.1	20.9		78.5	21.5		67.8	10.7	15.8	5.7	
≥ 1	395	83.0	17.0	0.26	81.0	19.0	0.49	71.9	9.1	15.7	3.3	0.51
< 2	395	80.8	19.2		80.0	20.0		69.9	10.4	15.7	4.3	
≥ 2	177	84.2	15.8	0.33	80.8	19.2	0.83	72.9	7.9	15.8	3.4	0.75
< 3	522	81.2	18.8		80.5	19.5		70.5	10.0	15.5	4.0	
≥ 3	50	88.0	12.0	0.24	78.0	22.0	0.68	72.0	6.0	18.0	4.0	0.82
How many servings of milk products should older people eat daily?				0.55			0.97					0.78
Don't know	162	79.0	21.0		80.9	19.1		68.5	12.4	14.2	4.9	
Incorrect (2 or less)	218	83.3	17.0		79.8	20.2		70.6	9.2	16.1	4.1	
Correct (3 or more)	192	82.8	17.2		80.2	19.8		72.4	7.8	16.7	3.1	
Do you get stomachache, gas, or diarrhea after drinking milk?				0.02			0.01					0.01
Yes	145	75.2	24.8		71.7	28.3		61.4	10.3	20.0	8.3	
No	427	84.1	15.9		83.1	16.9		73.8	9.4	14.3	2.6	

[a]P-value for two sample comparisons is from Two-Sample *t* test

[b]P-value for two sample comparisons is from Mann-Whitney U test

[c]P-value for four sample comparisons is from GLM

[d]P-value for four sample comparisons is from Kruskal-Wallis test

Table 3.3: Predictors of Food Insecurity, Georgia Senior Center, 2007

Demographic Models	Predictors of not having enough money to buy the food you need, NSI-2 (0 = FS, 1 = FI)[a]			Predictors of Food Insecurity, USDA-2 (0 = FS, 1 = FI)[a]			Predictors of Degree of Food Insecurity, USDA-4 (0 = FS, 1 = MFS, 2 = LFS, 3 = VLFS)[a]			Predictors of Range of Food Insecurity, USDA-6 (range = 0 to 6)[b]	
	B	OR (95% CI)	P-values	B	OR (95% CI)	P-values	B	OR (95% CI)	P-values	Parameter Estimates (SEM)	P-values
Intercept	-2.01		0.0001	-1.84		0.0001				0.63	0.0001
Intercept 4							-3.63		0.0001		
Intercept 3							-1.77		0.0001		
Intercept 2							-1.20		0.0001		
Age (0 = < 75, 1 = ≥ 75)	-0.55	0.59 (0.38, 0.92)	0.05	-0.72	0.49 (0.32, 0.76)	0.001	-0.69	0.50 (0.35, 0.73)	0.05	-0.37	0.001
Gender (0 = male, 1 = female)	0.39	1.48 (0.78, 2.81)	0.23	0.29	1.34 (0.72, 2.47)	0.35	0.27	1.31 (0.79, 2.18)	0.29	0.08	0.59
Race (0 = white, 1 = black)	1.04	2.83 (1.82, 4.39)	0.0001	1.26	3.53 (2.29, 5.44)	0.0001	1.14	3.12 (2.15, 4.53)	0.0001	0.73	0.0001
Demographic and health models											
Intercept	-1.67		0.01	-1.83		0.001				0.71	0.01
Intercept 4							-3.96		0.0001		
Intercept 3							-1.83		0.0001		
Intercept 2							-1.15		.01		
Age (0 = < 75, 1 = ≥ 75)	-0.30	0.74 (0.45, 1.2)	0.23	-0.68	0.50 (0.31, 0.82)	0.01	-0.58	0.56 (0.38, 0.83)	0.05	-0.27	0.05
Gender (0 = male, 1 = female)	0.29	1.33 (0.66, 2.69)	0.42	0.08	1.08 (0.55, 2.12)	0.81	0.01	1.01 (0.59, 1.73)	0.96	-0.01	0.95
Race (0 = white, 1 = black)	0.58	1.79 (1.06, 3.02)	0.05	0.74	2.11 (1.26, 3.52)	0.01	0.75	2.11 (1.38, 3.23)	0.001	0.40	0.01
Education (0 = ≤ 12, 1 = > 12)	-0.60	0.55 (0.24, 1.25)	0.15	-0.85	0.43 (0.18, 1.01)	0.0539	-0.57	0.57 (0.30, 1.07)	0.08	-0.22	0.17

	Predictors of not having enough money to buy the food you need, NSI-2 (0 = FS, 1 = FI)[a]			Predictors of Food Insecurity, USDA-2 (0 = FS, 1 = FI)[a]			Predictors of Degree of Food Insecurity, USDA-4 (0 = FS, 1 = MFS, 2 = LFS, 3 = VLFS)[a]			Predictors of Range of Food Insecurity, USDA-6 (range = 0 to 6)[b]	
	B	OR (95% CI)	P-values	B	OR (95% CI)	P-values	B	OR (95% CI)	P-values	Parameter Estimates (SEM)	P-values
Community (0 = other, 1 = rural growth)	-0.78	0.46 (0.22,0.98)	0.05	-0.81	0.45 (0.21,0.96)	0.04	-0.98	0.38 (0.20,0.70)	0.01	-0.38	0.001
Received food from food bank/pantry (0 = no, 1 = yes)	0.76	2.13 (1.29,3.52)	0.01	1.00	2.73 (1.66,4.49)	0.0001	0.74	2.09 (1.37,3.18)	0.001	0.31	0.05
Food stamp program participation (0 = no, 1 = yes)	1.09	2.98 (1.68,5.29)	0.001	1.56	4.74 (2.71,8.30)	0.0001	1.40	4.04 (2.48,6.57)	0.0001	1.02	0.0001
Tobacco use (0 = no, 1 = yes)	0.83	2.29 (1.03,5.13)	0.05	-0.04	.96 (0.40,2.34)	0.94	-0.13	0.88 (0.43,1.83)	0.73	0.03	0.90
Self-reported health (0 = poor/fair, 1 = good/very good/excellent)	-0.48	0.62 (.38,1.03)	0.06	0.02	1.02 (0.62,1.69)	0.92	0.12	1.13 (0.75,1.70)	0.57	-0.03	0.80
Disease (0 = < 4, 1 = ≥ 4)	0.76	2.15 (1.26,3.66)	0.01	0.57	1.76 (1.04,2.96)	0.03	0.77	2.15 (1.40,3.31)	0.01	0.44	0.01
Social/Emotional support (0 = sometimes, rarely, never, 1 = always, usually)	-0.66	0.52 (0.31,0.88)	0.05	-0.53	0.59 (0.35,1.01)	0.06	-0.41	0.66 (0.43,1.03)	0.07	-0.19	0.14
Depression (0 = no, 1 = yes)	0.67	1.95 (1.14,3.36)	0.05	0.03	1.03 (0.58,1.83)	0.92	0.36	1.44 (0.91,2.27)	0.12	0.19	0.15
Prescription medication (0 = < 5, 1 = ≥ 5)	-0.42	0.66 (0.34,1.26)	0.20	0.08	1.09 (0.57,2.06)	0.80	-0.16	0.85 (0.51,1.42)	0.53	-0.16	0.24
Over-the-counter medication (0 = < 5, 1 = ≥ 5)	-0.15	0.86 (0.48,1.55)	0.61	-0.26	0.77 (0.42,1.40)	0.39	-0.17	0.85 (0.53,1.36)	0.49	-0.11	0.38

[a]Logistic regression analysis, sample size n = 572

[b]Linear regression analysis, sample size n = 572

Table 3.4: Predictors of the Number of Days per Week Participants Consumed Five or More Fruits and Vegetables (Step-wise Regression Models), Georgia Senior Center, 2007

	Days of the week 5 or more fruits and vegetables consumed											
	NSI-2[a]			USDA-2[a]			USDA-4[a]			USDA-6[a]		
	B	SE	P-values	B	SE	P-values	B	SE	P-values	B	SE	P-values
Intercept	3.04	0.32	0.0001	3.43	0.20	0.0001	3.89	0.27	0.0001	3.50	0.20	0.0001
Race (0 = white, 1 = black)	-0.40	0.24	0.10									
Education (0 = ≤ 12, 1 = > 12)	0.81	0.32	0.01	0.78	0.32	0.05	0.78	0.32	0.05	0.78	0.32	0.01
Self-reported health (0 = poor/fair, 1 = good/very good/excellent)	0.60	0.23	0.01	0.65	0.23	0.01	0.64	0.23	0.01	0.62	0.23	0.01
Fruit and vegetable knowledge (0 = incorrect, 1 = correct)	0.61	0.34	0.08	0.66	0.34	0.06	0.65	0.34	0.06	0.64	0.34	0.06

[a]Linear regression analysis, sample size n = 572

Table 3.5: Characteristics of Participants Excluded From the Analytic Sample

	n	**Included** Mean (SD) Median (95% CI) or % n = 572	**Excluded** Mean (SD) Median (95% CI) or % n = 199-243	P-value
Age (years)		75.6 (7.8)	75.2 (9.1)	.53[a]
		75.0 (63.0-89.0)	76.0 (58.0-88.0)	.87[b]
<75	375	46.7	44.4	
≥75	440	53.3	55.6	.56
Gender				
Men	154	18.2	20.6	
Women	661	81.8	79.4	.42
Race				
White	504	66.4	53.0	
Black	302	33.6	47.0	.01
Education (years)		10.5 (3.2)	10.5 (3.5)	.79[a]
		11.0 (4.0-15.0)	11.0 (4.0-16.0)	.80[b]
≤12	679	85.8	82.5	
>12	121	14.2	17.5	.23
Community				
Urban	211	19.2	41.6	
Suburban	266	36.2	24.3	
Urbanizing	144	18.9	14.8	
Rural Growth	125	18.2	8.6	
Rural Decline	69	7.5	10.7	.01
Do you always have enough money to buy the food you need?				
Yes	647	81.8	79.9	
No	149	18.2	20.1	.54
Food Security Status				
Food secure (0)	656	80.2	81.1	
Food insecure (1)	159	19.8	18.9	.79
Degree of Food Security				
High security (0)	571	70.6	68.7	
Marginal security (1)	85	9.6	12.4	
Low security (2 – 4)	120	15.7	12.4	
Very low security (5 – 6)	39	4.0	6.6	.17
Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?				
Yes	740	92.7	89.0	
No	68	7.3	11.0	.09
Self-reported health				
Poor	51	5.8	7.4	
Fair	276	34.4	32.5	
Good	350	42.1	44.9	
Very good	109	13.8	12.4	
Excellent	29	3.9	2.9	.75
Diabetes				
Yes	264	30.6	37.2	
No	547	69.4	62.8	.06

	n	**Included** **Mean (SD)** **Median (95% CI)** **or %** **n = 572**	**Excluded** **Mean (SD)** **Median (95% CI)** **or %** **n = 199-243**	P-value
High blood pressure				
Yes	595	72.9	78.9	
No	218	27.1	26.1	.78
Heart disease				
Yes	253	30.9	31.9	
No	557	69.1	68.1	.78
Arthritis				
Yes	566	70.6	67.2	
No	247	29.4	32.8	.33
During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?				
Yes	562	71.0	64.5	
No	252	29.0	35.5	.07
Have you ever been told by a doctor or other health professional that you have osteoporosis?				
Yes	218	29.0	22.5	
No	585	71.0	77.5	.06
How often do you get the social and emotional support that you need?				
Always	432	57.3	47.3	
Usually	177	19.8	29.1	
Sometimes	98	13.3	10.0	
Rarely	34	4.6	3.6	
Never	51	5.1	10.0	.01
Has a doctor or other health care provider ever told you that you have a depressive disorder?				
Yes	184	24.1	19.3	
No	627	75.9	80.8	.13
Have you fallen in the past year?				
Yes	303	39.2	33.5	
No	505	60.8	66.5	.13
How many prescription medications, including insulin do you take?		4.9 (3.6) 4.0 (0.0-12.0)	5.1 (3.8) 4.0 (0.0-13.0)	.48[a] .63[b]
<5	414	52.6	50.2	
≥5	383	47.4	49.8	.54
How many over-the-counter medications do you take?		2.0 (2.0) 2.0 (0.0-5.0)	1.7 (1.6) 1.0 (0.0-5.0)	.05[a] .04[b]
<5	725	91.8	92.6	
≥5	63	8.2	7.4	.71
In the past month, have you received food from a food pantry or food bank?				
Yes	222	26.4	30.9	
No	580	73.6	69.1	.20

	n	Included Mean (SD) Median (95% CI) or % n = 572	Excluded Mean (SD) Median (95% CI) or % n = 199-243	P-value
Do you currently receive food stamps?				
Yes	129	14.5	19.9	
No	674	85.5	80.1	.06
Fruit (servings/day)		2.2 (1.3)	2.2 (1.3)	.91[a]
		2.0 (0.0-4.0)	2.0 (0.0-5.0)	.92[b]
< 2	268	31.6	35.8	
≥ 2	547	68.4	64.2	.25
Vegetables (servings/day)		2.8 (1.2)	2.7 (1.2)	.44[a]
		3.0 (1.0-5.0)	2.5 (1.0-5.0)	.21[b]
< 3	378	44.1	51.9	
≥ 3	437	55.9	48.2	.04
Fruits and vegetables (servings/day)		5.0 (2.0)	4.9 (1.9)	.64[a]
		5.0 (2.0-8.0)	5.0 (2.0-8.0)	.53[b]
< 5	374	43.5	51.4	
≥ 5	441	56.5	48.6	.04
How many days of the last week did you eat 5 or more servings of fruits and vegetables? (days/week)		3.9 (2.7) 50. (0.0-7.0)	3.7 (2.7) 4.0 (0.0-7.0)	.41[a] .39[b]
How many servings of fruits and vegetables should older people eat each day?				
Don't know	128	16.1	16.8	
Incorrect (6 or less)	565	72.0	71.5	
Correct (7 or more)	93	11.9	11.7	.97
How often do you eat whole wheat or whole grain bread such as 100% whole wheat bread? (servings/day)		0.9 (0.7) 1.0 (0.0-2.0)	1.0 (0.8) 1.0 (0.0-3.0)	.05[a] .17[b]
< 1	349	44.6	43.9	
≥ 1	437	55.4	56.1	.87
How often do you eat whole wheat or whole grain cereals such as oatmeal, Cheerios®, bran flakes or bran cereal? (servings/day)		0.7 (0.5) 0.9 (0.0-14.0)	0.7 (0.5) 0.7 (0.0-1.4)	.71[a] .66[b]
< 1	429	53.0	57.8	
≥ 1	361	47.0	42.2	.22
Total whole wheat or whole grain bread and cereals. (servings/day)		1.6 (1.0) 1.4 (0.1-3.3)	1.7 (1.0) 1.6 (0.0-3.3)	.36[a] .35[b]
< 1	175	23.4	20.6	
≥ 1	596	76.6	79.4	.41
How many whole grain servings should people eat each day?				
Don't know	260	30.9	35.5	
Incorrect (2 or less)	289	37.2	32.5	
Correct (3 or more)	257	31.8	32.1	.35
Milk to drink (servings/day)		0.8 (0.7) 0.7 (0.0-2.0)	0.8 (0.7) 0.9 (0.0-2.4)	.27[a] .27[b]
< 1	420	53.9	50.9	
≥ 1	372	46.2	49.1	.46

	n	Included Mean (SD) Median (95% CI) or % n = 572	Excluded Mean (SD) Median (95% CI) or % n = 199-243	P-value
Milk with cereal (servings/day)		0.6 (0.5)	0.6 (0.5)	.28[a]
		0.6 (0.0-1.0)	0.6 (0.0-1.4)	.54[b]
< 1	460	58.0	59.3	
≥ 1	328	42.0	40.7	.76
Drinking milk and cereal milk (servings/daily)		1.4 (1.0)	1.5 (1.1)	.15[a]
		1.1 (0.0-3.0)	1.4 (0.0-3.0)	.26[b]
< 1	244	30.9	32.4	
≥ 1	535	69.1	67.6	.71
How many servings of milk products should older people eat daily?				
Don't know	244	28.3	34.6	
Incorrect (2 or less)	307	38.1	37.6	
Correct (3 or more)	258	33.6	27.9	.14
Do you get stomachache, gas, or diarrhea after drinking milk?				
Yes	190	25.4	19.6	
No	612	74.7	80.4	.08

[a]P-value for two sample comparisons is from Two-Sample *t* test

[b]P-value for two sample comparisons is from Mann-Whitney U test

CHAPTER 4

CONCLUSION

The primary goal of this study was to assess the characteristics of FI older adults participating in Georgia senior centers. The first specific aim of this study was to determine the prevalence and severity of FI. The first hypothesis was that senior center participants were more FI compared to the national average in older adults. The second specific aim was to assess characteristics of FI participants. The second hypothesis was that FI participants were more likely to be younger, minority, have lower education, have poorer dietary intakes, use tobacco, have poorer overall health, and use food banks or pantries and food stamps compared to FS participants.

This study supports that the prevalence (19.8% in senior center participants vs. 6.5% nationally) and severity (4.0% in senior center participants vs. 1.2% nationally of VLFS) of FI among senior center participants is above the national average for older adults and remains so even in light of usage of congregate meals, food banks or pantries, and food stamps (Nord, 2005). This finding could be due to that fact that the congregate meal program targets low-income individuals (OAA, 2006). Similar to other studies assessing FI in older adults, age, race, social and emotional support, food bank or pantries and food stamp usage, and daily vegetable intake were associated with FI across all measures (Lee & Frongillo, 2001; Nord, 2002; Sahyoun & Basiotis, 2000; Kendall, 1996). Not having enough money to buy needed food (NSI-2) was the only measure associated with tobacco, self-reported health, and daily whole grain cereal intake. FI tends to be higher in older adult men than women although none of the measures used

in this study found this association to be true (Duerr, 2006; Nord, 2002). This could be attributed to the high female representation of this study sample (81.8%). Living in an urban area vs. a non-urban area is typically associated with FI in older adults (Nord 2002), however, the current study found the highest prevalence of FI in areas defined as urbanizing (Bachtel, 2007). Senior center participants are not home-bound and often utilize transportation offered by the senior center to access services provided by the senior center and to go shopping for food; these factors may attenuate the influence of community-related factors on FI status.

Findings of the current study can assist Georgia Area Agencies on Aging in educating local communities and policymakers at all levels about the extent of FI and nutritional risk among older adults in their communities. The findings will provide insight and enhance the understanding of the risk factors associated with older adult FI as well as provide guidance for improving the food- and nutrition-related services for older adults in community settings. The findings from this study can also be used to advocate for the importance and need of sufficient local, state, and federal assistance for older adults and to assess current and future program planning and policy-making related to FI. The findings of this study support one of the intended purposes of the OAANP, to reduce hunger and FI among older adults (OAA, 2006).

This study hopes to contribute to the goal of finding validated measures for measuring FI in older adults. Although the USDA Food Security Survey Module been used to assess FI status of households with elderly since the 1990's and the USDA Food Security Survey Module 18-item has been shown to represent FI similarly in older and non-older adults, augmented measures containing indicators specifically tailored to older adults may be more sensitive and appropriate (Wolfe et al., 2003; Duerr, 2006). Studies need to be conducted using all or some of the suggested augmented items, along with the USDA Food Security Survey Module items, in order

to determine which, if not all, of the augmented items would provide a more comprehensive assessment of older adult FS status. Further studies need to be conducted with a variety of other older adult groups so that findings can be generalized to more of the older adult population. Longitudinal studies would provide insight into fluctuations in FI as well as the impact of economic changes on the older adult population. It has long been held that older adults maintain a high prevalence of FS due to their low poverty rate, a stable income of Social Security and pensions, as well as home ownership and a lack of home mortgages (Nord, 2002). The US health system is bracing itself for a large influx of a larger, more diverse, and longer-lived older adult population that it has seen in the past. This growth comes at a time of economic decline and as a result the incoming older adult population, already facing a possible collapse of the Social Security system, may be less financially secure than older adult populations of the past. This financial strain is reflected in current reports from the AARP (AARP, 2006). Accurate measures need to be in place in order to accurately assess changes in FS status among the aging population, as well as to address potential increases of FI in older adults.

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APPENDICES

APPENDIX A
PARTICIPANT CONSENT FORM

LIVE HEALTHY GEORGIA! CONSENT FORM

I, _____, agree to participate in the research study titled "Live Healthy Georgia!" conducted by Dr. Mary Ann Johnson in the Department of Foods and Nutrition at the University of Georgia and at my local Senior Center. I understand that participation is voluntary and I do not have to take part if I do not want to. I can refuse to participate and stop taking part anytime without giving any reason and without penalty. I can ask to have all information concerning me removed from the research records, returned to me, or destroyed. My decision to participate will not affect the services that I receive at the Senior Center.

By participating in this study, I may improve my nutrition and physical activity habits and self-management of diabetes and other chronic conditions. This study will also help the investigators learn more about good ways to help older adults improve their nutrition and physical activity habits and self-management of diabetes and other chronic conditions. This study will be conducted at my local Senior Center. If I volunteer to take part in this study, I will be asked to do the following things:

1) Answer questions about my health, nutrition and physical activity.

2) Obtain physician clearance to participate in a physical activity program.

3) Provide information about my health, nutrition, and physical activity and complete a physical measurement of weight and waist circumference in a pre-test and post-test. The pre-test will last up to 60 minutes that may be divided into two sessions. The post-test will last up to 30 minutes that also may be divided into two sessions.

4) Attend up to 12 health, nutrition and physical activity programs that will last about 30 to 60 minutes each over a four-month period. I will learn how to use a step counter and record my daily number of steps and minutes of physical activity.

5) Take part in a physical activity program of chair exercises and walking to improve my strength, balance, endurance, and flexibility.

6) **If I have diabetes**, then I may be asked if I would like to provide blood samples for hemoglobin A1c. A licensed nurse, medical technologist, or phlebotomist will obtain 2-3 drops (about 35 microliters) of whole blood via finger stick and/or up to 3 ml of whole blood via venipuncture on two occasions about four to six months apart. Or, I can provide a hemoglobin A1c value from my physician, health department, clinical laboratory, or hospital. This test will help determine if 12 lessons at my senior center are helping me manage my diabetes. The risks of drawing blood from my finger or arm include the unlikely possibilities of a small bruise or localized infection, bleeding and fainting. These risks will be reduced in the following ways: my blood will be drawn only by a qualified and experienced person who will follow standard sterile techniques, who will observe me after the blood draw, and who will apply pressure and a Band-Aid to the blood draw site. My blood will not be tested for HIV-AIDS. Any unused portion of my blood sample will be discarded. I understand that these questions and blood tests are not for diagnostic purposes. I should see a physician if I have questions about my test results. In the event that I have any health problems associated with the blood draw or my blood sample, my insurance or I will be responsible for any related medical expenses.

7) Someone from the study may contact me to clarify my information throughout the study.

The instructor may provide food to taste. Mild to no risk is expected by tasting food. However, I will not taste foods that I should not eat because of swallowing difficulties, allergic reactions, dietary restrictions, or other food-related problems.

There is minimal risk to participation in this study. I may experience some discomfort or stress when the researchers ask me questions about my nutrition, health, and physical activity habits. There is a possibility that I could temporarily injure a muscle or be sore from physical exertion. This risk is minimized by ability to rest at any time. The leaders will advise me to stop exercising if I experience any discomfort or chest pains. If additional care is needed, then my insurance company or myself will be responsible for any expense that may be incurred. As a

participant, I assume certain risks of physical injury. The researchers will exercise all reasonable care to protect me from harm as a result of my participation. However, I do not give up or waive any of my rights to file a claim with the University of Georgia's insurer (Department of Administrative Services) or pursue legal action by signing this form.

In case of a research-related injury, please contact Dr. Mary Ann Johnson at 706-542-2292.

No information concerning myself or provided by myself during this study will be shared with others without my written permission, unless law requires it. I may choose not to answer any question or questions that may make me uncomfortable. I will be assigned an identifying number and this number will be used on all of the questionnaires I fill out. Data will be stored in locked file cabinets under the supervision of Dr. Mary Ann Johnson at the University of Georgia; only the staff involved in the study will have access to these data and only for the purpose of data analyses and interpretation of results. My identity will not be revealed in any reports or published materials that might result from this study. The data will be destroyed by January 1, 2015.

If I have any further questions about the study, now or during the course of the study I can call Ms. Tiffany Sellers Lommel (706-542-4838) or Dr. Mary Ann Johnson (706-542-2292). I will sign two copies of this form. I understand that I am agreeing by my signature on this form to take part in this study. I will receive a signed copy of this consent form for my records.

_____   _____   _____

Signature of Participant   Participant's Printed Name   Date

_____

Participant Address and Phone

_____   _____Mary Ann Johnson___   Oct 19, 2007
Signature of Investigator   Printed Name of Investigator   Date
Email: mjohnson@fcs.uga.edu

_____   _____   _____

Signature of Staff who Reads   **Printed Name of Staff**   **Date**
Consent Form to Participant

For questions or problems about your rights as a research participant please call or write: The Chairperson, Institutional Review Board, University of Georgia, 612 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu.

Project # _070702_
Consent Form Approval Period
From: _9-11-07_ To: _9-1-08_
Authorization: _mp_

University of Georgia
Institutional Review Board
Approved: _9-10-07_
Expires _6-4-08_

UGA project number: #2006-10842   DHR project number: #070702

APPENDIX B

QUESTIONNAIRE

LIVE HEALTHY GEORGIA

			Line 1
Name of Interviewer:			
ID of Participant:			1-4
Phone number to use to clarify information and get step counts:			
1. County/Senior Center			10-12
2. Date (M/D/Y): ___/___/___			13-18
3. Age of Participant: ___ ___ ___			19-21
4. Gender: Male (0) Female (1)			22
5. Ethnicity: White (1) Black (2) Hispanic/Latino (3) Asian (4) Other (5)			23
6. How many years did you complete in school: _____ years			24-25
7. How would you rate your overall health? Circle one: Poor (0) Fair (1) Good (2) Very good (3) Excellent (4)			26
8. Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?	No (0) Yes (1)		27
9. Do you have diabetes?	No (0) Yes (1)		28
10. Do you have high blood pressure?	No (0) Yes (1)		29
11. Do you have heart disease such as angina, congestive heart failure, heart attack or other heart problems?	No (0) Yes (1)		30
12. Do you have arthritis?	No (0) Yes (1)		31
13. During the past 30 days, have you had symptoms of pain, aching, or stiffness in or around a joint?	No (0) Yes (1)		32
MEDICATION MANAGEMENT			x
14. How many prescription medications, including insulin, do you take?			34-35
15. How many over-the-counter medications do you take? *(such as a daily multivitamin, supplements, Aspirin®, etc.)*			36-37
16. Do you go to one pharmacy for **all** of your medications?	No (0) Yes (1)		38
17. Do you have a written list of **all** of your prescription medications, non-prescription medications, and dietary supplements?	No (0) Yes (1)		39
18. Do you carry this written list with you in your purse or wallet?	No (0) Yes (1)		40
19. Have you had a physician, pharmacist, or other health professional look at all of your medications in the past 6 months?	No (0) Yes (1)		41
20. Do you **always** throw out your medications when they are expired (past their "use by" date)?	No (0) Yes (1)		42
21. Do you use a pillbox or other system to help you take your medications?	No (0) Yes (1)		43

22.	Do you know the name of **each** of your medications?	No (0) Yes (1)		44
23.	Do you know what **each** of your medications is for?	No (0) Yes (1)		45
24.	Do you know the possible side effects of **each** of your medications?	No (0) Yes (1)		46
Emotional Support, Life Satisfaction, and Depression				
25.	Do you attend a support group for health conditions, such as diabetes, heart disease, cancer, grief, or other conditions?	No (0) Yes (1)		47
26.	How often do you get the social and emotional support that you need?	1) Always 4) Rarely 2) Usually 5) Never 3) Sometimes	7 Don't know/ not sure 9 Refused 48	
27.	Has a doctor or other health care provider EVER told you that you have a depressive disorder?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 49	

Read Questions to Participants and Circle their Answers

DIET AND PHYSICAL ACTIVITY			Line 1
28.	How many fruits and vegetables should older people eat each day? (Circle the participant's response) 0 1 2 3 4 5 6 7 8 9 10 "5 a day" "5 or more a day" "7 to 10 a day" DK Missing		50-52
29.	How many servings of fruits and 100% fruit juices do you usually have each day?	0 1 2 3 4 5 6 7	53
30.	How many servings of vegetables do you usually eat each day?	0 1 2 3 4 5 6 7	54
31.	On how many DAYS of the last WEEK (seven days) did you eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7	55
32.	How many DAYS of the last WEEK (seven days) have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	56
33.	How many DAYS of the last WEEK (seven days) did you participate in at least **30 minutes** of **moderate** physical activity? Examples of **moderate** activities are regular walking, housework, yard work, lawn mowing, painting, repairing, light carpentry, ballroom dancing, light sports, golf, or bicycling on level ground.	0 1 2 3 4 5 6 7	57
34.	How many days of the week do you participate in any physical activity (light or moderate)?	0 1 2 3 4 5 6 7	58
35.	About how many minutes of physical activity do you do on the days you are physically active?	_____ minutes	59-61

36.	How many DAYS of the last WEEK (seven days) did you participate in a specific **exercise session** other than what you do around the house or as a part of your daily activities *(e.g., chair exercises, yoga, aerobics, organized walking programs, using workout machines, etc.)*?	0 1 2 3 4 5 6 7	62
HOME FOOD SAFETY			
37.	In the past month, did you **always** wash your hands with **warm water** and **soap** for **20 seconds** before eating food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 63
38.	In the past month, did you **always** rinse fresh fruits and vegetables with cold running water before eating them??	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 64
39.	In the past month, have you checked the temperature of your refrigerator?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 65
40.	Do you cook, reheat or prepare meals in your home?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 66
41.	Do you own a meat thermometer?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 67
FALLS AND FRACTURES			
42.	Have you had a fracture or broken bone after age 50?	No (0) Yes (1)	68
43.	Have you fallen in the past year?	No (0) Yes (1)	69
44.	Do you feel limited in your daily life by a fear of falling?	No (0) Yes (1)	70
45.	Have you ever been told by a doctor or other health professional that you have osteoporosis?	No (0) Yes (1)	71
FOODS AND SUPPLEMENTS			Line 1
46.	Do you get a stomachache, gas, or diarrhea after drinking milk?	No (0) Yes (1)	72
47.	How many servings of milk products should most older people eat daily?	0 1 2 3 4 DK	73
48.	How many whole grain servings should people eat each day?	0 1 2 3 4 DK	74

How often do you eat or drink or take these items? (*includes 3 or more per day)	Line 2
49. Whole wheat or whole grain bread (such as 100% whole wheat bread)? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	1-2
50. Whole grain cereals (such as oatmeal, Cheerios®, bran flakes or bran cereal)? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	3-4
51. Milk as a beverage (including soy milk)? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	5-6
52. Milk on cereal (including soy milk)? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	7-8
53. Calcium-fortified orange juice? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	9-10
54. Calcium supplement? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	11-12
55. Calcium supplement with vitamin D? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	13-14
56. Multivitamin with vitamin D? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	15-16
57. Vitamin D-only supplement? <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK	17-18
For the data coder: <1/wk 1/wk 2/wk 3/wk 4/wk 5/wk 6/wk 1/day 1-2/day 2/day 2-3/day 3/day* DK/Miss 00 01 02 03 04 05 06 07 10 14 17 21 99 19-20	
FOOD SECURITY	

58. Do you always have enough money to buy the food you need?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 21

59. In the past month, have you received food from a food pantry or food bank?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 22
60. Do you currently receive food stamps?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 23
Think about the past 30 days. I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for you since last (name of current month).		
61. The food that you bought just didn't last, and you didn't have money to buy more.	1) Often 2) Sometimes 3) Never	7 Don't know/ not sure 9 Refused 24
62. You couldn't choose the right food and meals for your health because you couldn't afford them.	1) Often 2) Sometimes 3) Never	7 Don't know/ not sure 9 Refused 25
63. Did you ever cut the size of your meals or skip meals because there wasn't enough money for food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 26
63a. If yes, in the last 30 days, how many days did this happen? *(interviewer-please write in participant's response)*	_____days	7 Don't know/ not sure 9 Refused 27-28
64. Did you ever eat less than you felt you should because there wasn't enough money to buy food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 29
65. Were you ever hungry but didn't eat because you couldn't afford enough food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 30

Get Checked Questions
(Adapted from **BRFSS,** http://www.cdc.gov/brfss/questionnaires/pdf-ques/2005brfss.pdf)

Question	Write or Circle Answer	Code
		Line 2
66. **About how long has it been since you last had a bone mineral density test?**	1) Within the past year 2) Within the past 2 yr 3) Within the past 5 yr 4) 5 or more yrs ago 5) Never	7 Don't know/not sure 9 Refused 31
67. **About how long has it been since you last had your blood cholesterol checked?**	1) Within the past year 2) Within the past 2 yr 3) Within the past 5 yr 4) 5 or more yrs ago 5) Never	7 Don't know/not sure 9 Refused 32
68. **Have you ever been told by a doctor, nurse, or other health professional that your blood cholesterol is high?**	1) Yes 2) No	7 Don't know/not sure 9 Refused 33
69. **Are you cutting down on saturated fat in your diet (to help manage or lower your risks of developing heart disease)?**	1) Yes 2) No	7 Don't know/not sure 8 Refused 34
70. **About how long has it been since you last had your blood pressure checked?**	1) Within past month 2) Within past year 3) Within past 2 yrs 4) 2 or more years ago 5) Never	7 Don't know/not sure 9 Refused 35
71. **Are you cutting down on sodium or salt (to help lower or control your blood pressure)?**	1) Yes 2) No 3) Do not use salt	7 Don't know/not sure 9 Refused 36
72. **When was the last time you visited ANY eye care professional? (To have your eyes and vision checked?)**	1) Within past month 2) Within past year 3) Within past 2 yrs 4) 2 or more years ago 5) Never	7 Don't know/not sure 9 Refused 37

73.	When was the last time you visited ANY ear care professional? (To have your hearing or hearing aids checked?)	1) Within past month 2) Within past year 3) Within past 2 yrs 4) 2 or more years ago 5) Never	7 Don't know/not sure 9 Refused 38
74.	When was the last time you had your feet checked by a health care professional, such as a doctor or nurse?	1) Within past month 2) Within past year 3) Within past 2 yrs 4) 2 or more years ago 5) Never	7 Don't know/not sure 9 Refused 39
75.	If you thought someone was having a heart attack or a stroke, what is the first thing you would do? *Read list to participant and circle their answer.*	1-Take them to the hospital 2-Tell them to call their doctor 3-Call 911 4-Call their spouse or a family member 5-Do something else	7 Don't know/not sure 9 Refused 40

WEIGHT QUESTIONS		
76. Do you consider yourself to be:	1) Underweight? 2) Overweight? 3) About the right weight?	7 Don't know/ not sure 9 Refused 41
77. Would you like to weigh:	1) More 2) Less 3) Stay about the same	7 Don't know/ not sure 9 Refused 42
78. Your primary concern about your current weight is:	1) My health 2) My appearance 3) My weight is about right, no concerns	7 Don't know/ not sure 9 Refused 43
79. Does your current weight affect your ability to do daily activities such as walk, do housework, shop, etc?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 44
80. In the past year, have you been told by a doctor or health care professional to reduce your weight?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 45
81. What do you think is the best way to lose weight? *(interviewer-please write in participant's response)*		7 Don't know/ not sure 9 Refused 46
82. In the past year, have you lost weight?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 47
82a. If you have lost weight in the past year, how much? *(interviewer-please write in participant's response)*		7 Don't know/ not sure 9 Refused 48
82b. Was the weight loss intentional? That is, were you trying to lose weight?	No (0) Yes, trying to change it (1) No loss (2)	7 Don't know/ not sure 9 Refused 49
82c. What method(s) did you use to lose weight? *(interviewer-please write in participant's response)*		50-51

83. In the past year, have you gained weight?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 52
83a. If you have gained weight in the past year, how much? *(interviewer-please write in participant's response)*		53-54
83b.Was the weight gain intentional? That is, were you trying to gain weight?	No (0) Yes, trying to change it (1) No gain (2)	7 Don't know/ not sure 9 Refused 55

83c. What method(s) did you use to gain weight? *(interviewer-please write in participant's response)*		7 Don't know/ not sure
		  9 Refused
		  56-57

7 = Don't know/not sure, 9 = Refused

FOR THOSE WITH DIABETES		Line 2
1. What kind of effect does diabetes have on your daily activities? No effect (1)　　Little effect (2)　　Large effect (3)	1　2　3	58
2. Thinking about your diet, on how many DAYS of the last WEEK (seven days) did you space carbohydrates evenly?	0 1 2 3 4 5 6 7	59
3. On how many DAYS of the last WEEK (seven days) did you test your blood sugar?	0 1 2 3 4 5 6 7	60
4. What medications do you take for your diabetes? 0-None　　1-pills only　2-insulin only　3-pills and insulin		61
5. On how many DAYS of the last WEEK (seven days), did you take your diabetes medication as prescribed by your doctor?	0 1 2 3 4 5 6 7	62
6. On how many DAYS of the last WEEK (seven days) did you check your feet?	0 1 2 3 4 5 6 7	63
7. On how many DAYS of the last WEEK (seven days) did you inspect the inside of your shoes?	0 1 2 3 4 5 6 7	64
8. What should your hemoglobin A1c level be?　___% *(interviewer-please write in participant's response)*	77 Don't know/ not sure 99 Refused　　　65-66	
9. What things are the hardest for you to do when managing your diabetes? *(interviewer-please write in participant's response)*		67-68

WAIST CIRCUMFERENCE:

Instructions for Measuring Waist Circumference

The measurement should be made under the clothes.

To measure waist circumference, locate the upper hipbone and the top of the right iliac crest. Place a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest. Before reading the tape measure, ensure that the tape is snug, but does not compress the skin, and is parallel to the floor. The measurement is made at the end of a normal expiration.

A high waist circumference is associated with an increased risk for type 2 diabetes, dyslipidemia, hypertension, and CVD in patients with a BMI between 25 and 34.9 kg/m2.

High-Risk Waist Circumference

Men: > 40 in (> 102 cm)
Women: > 35 in (> 88 cm)

http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf
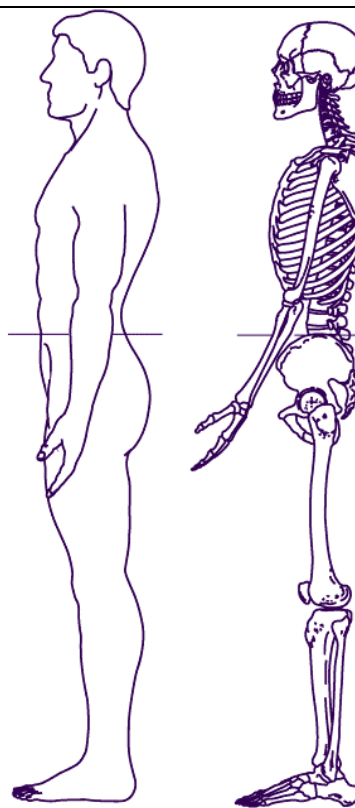
84. Waist Circumference = _____ INCHES		Line 4 1-3
85. How was measurement made? (1) Under clothes OR (2) Over clothes	1 2	4
86. What is your current height without shoes? _____ feet and ____ inches		5-7
87. How was the measurement made? (1) With a tape measure OR (2) Self-report	1 2	8

88. What is your current weight without clothes? _____ pounds		9-11
89. How was weight measurement made? PREFERRED: With a scale and without shoes (1) With a scale and with shoes (2) Self-report (3)		12
90. Chair Sit-and-Reach: sit in stable chair, knees straight, bend over, reach with arms straight to toes, then measure with a ruler: Number of inches person is short of reaching the toes: ___ ___ . ___ (-) *or* Number of inches person reaches beyond toes: ___ ___ . ___ (+) *Measure to the nearest ½ inch*		13-16 17-20

ID: _____ DATE (M/D/Year): _____ STAFF NAME: _____ PHYSICAL PERFORMANCE

Physical Performance Test-Task Descriptions Equipment: <u>Stopwatch</u>, 8-Ft Tape Measure, Ruler, Folding Chair		RECORD TIME IN SECONDS	LINE 4 UGA Staff can score with open coding
ASB	**STANDING BALANCE:** **Time each item until >10.0 sec. OR until participant moves feet or reaches for support.** **1a) SEMI-TANDEM** (heel of one foot placed at mid- position of the other) *If can hold for 10 seconds, move to **1b** *If can NOT hold for 10 seconds, move to **1c** **1b) TANDEM** (heel to toe, one foot directly in front of the other) **1c) SIDE-BY-SIDE (**toes lined up evenly and feet touching)	**Time to the nearest 10th second:** **a)** ___ ___ . ___ > 10.0 sec. Go to **b)** < 10.0 sec. Go to **c)** **b)** ___ ___ . ___ **c)** ___ ___ . ___	1-4 5-8 9-12

ASB D	DOMAIN SCORE:
	If A= <10 & C= 0-9, score= 0 A= <10 & C= 10, score= 1
	      A= ≥10 & B= 0-2, score= 2 A= ≥10 & B= 3-9, score= 3
	      A= ≥10 & B= ≥10, score= 4
		SCORE: _____	13

AFW	**8 FOOT WALK:** **Participant begins at standing position and will walk a straight distance of 8-feet, measured with tape on the floor.** **Instruct the participant to walk at normal gait using any assistive devices. If possible, have them begin walking a few feet before starting mark, and continue walking a few feet past the 8-foot mark. Tester will start and stop watch at the distance marks.** **Complete the walk twice.**	**Time to the nearest 10th second:** **1)** ___ ___ . ___ **2)** ___ ___ . ___ Use best (lowest) time **Assistive device used?** NO (0) YES (1) Describe	14-17 18

AFW D	**DOMAIN SCORE:** 1= ≥5.7 2= 4.1-5.6 3= 3.2-4.0 4= ≤3.1		**SCORE:**	19
ACS	**CHAIR STANDS:** **Participant is asked to stand one time from a seated position in an armless, straight-backed chair (such as a folding metal chair) with their arms folded across their chest.** **If able, participant is asked to stand-up and sit-down 5 times as quickly as possible while being timed.** **If not able to perform, then the test is complete.**	**Time to the nearest 10th second:** 1) ___ ___ . ___		20-23
ACSD	**DOMAIN SCORE:** 1= ≥16.7 2= 13.7-16.6 3= 11.2-13.6 4= ≤11.1	**SCORE:** _____		24
TDS	**TOTAL SCORE: Add all 3 domain scores (1-12)**	**TOTAL SCORE:__ __**		25-26
	Coding: 8 = physically unable, 9=refused, 7=not applicable. Good function (score of 10 to 12); moderate function (score of 6 to 9); poor function (score of 0 to 5).			

APPENDIX C

COMMUNTIY DESIGNATIONS FOR THE FIVE GEORGIAS

The Five Georgias
Urban (14 Counties)
Bibb*
Chatham*
Clarke
Dougherty*
Floyd
Fulton*
Glynn
Hall*
Houston*
Liberty
Lowndes
Muscogee
Richmond*
Whitfield
Urbanizing (29 Counties)
Atkinson
Baldwin
Ben Hill
Bulloch
Camden
Chattooga*
Coffee
Colquitt
Crisp*
Decatur*
Gordon
Habersham*
Hancock
Irwin
Laurens

Montgomery
Peach
Pierce*
Polk
Quitman
Stephens
Sumter
Thomas
Tift
Toombs*
Troup*
Upton
Ware
Wayne
Suburban (56 Counties)
Baker
Barrow
Bartow*
Brantley*
Brooks
Bryan
Burke
Butts
Carroll*
Catoosa*
Chattahoochee
Cherokee
Clayton
Cobb
Columbia
Coweta
Crawford
Dade
Dawson*
De Kalb
Douglas
Echols*
Effingham*

Fayette
Forsyth*
Gwinnett
Haralson*
Harris
Heard
Henry
Jasper
Jones*
Lamar
Lanier
Lee
Long
Madison
Marion
McDuffie*
McIntosh*
Meriwether
Monroe
Murray
Newton*
Oconee
Oglethorpe
Paulding
Pickens
Pike
Rockdale
Spalding
Terrell
Twiggs
Walker
Walton*
Worth
Rural Growth (30 Counties)
Appling*
Bacon*
Banks
Berrien
Bleckley*

Candler
Charlton
Cook
Elbert
Evans
Fannin
Franklin
Gilmer*
Grady*
Greene
Hart
Jackson*
Jeff Davis
Lincoln
Lumpkin
Mitchell
Morgan
Pulaski
Putnam
Rabun
Seminole
Tattnall
Towns
Union*
White
Rural Decline (30 Counties)
Calhoun
Clay*
Clinch
Dodge*
Dooley
Early
Emanuel
Glascock
Jefferson
Jenkins
Johnson
Macon*
Miller

Randolph
Schley
Screven
Stewart
Talbot*
Taliaferro
Taylor
Telfair
Treutlen
Turner
Warren
Washington
Webster
Wheeler
Wilcox
Wilkes
Wilkinson

* Counties included in this study

THE END