PERFORMANCE OF HYPERTENSION MANAGEMENT BEHAVIORS BY OLDER ADULTS IN GEORGIA SENIOR CENTERS

by

MEGAN NICOLE ALLEN

(Under the Direction of Joan G. Fischer)

ABSTRACT

High blood pressure continues to be a significant contributor to morbidity and mortality in the United States (Fan et al 2010). Older adults are among the fastest growing segment of the U.S. population and have a high prevalence of hypertension (Lloyd-Jones et al 2005). The increase in the elderly population and prevalence of chronic disease has brought attention towards improving healthcare delivery systems that promote the prevention and management of chronic disease. This study examined the performance of hypertension management behaviors by older adults in senior centers from 12 Georgia Area Agencies on Aging. Participants were a convenience sample (N = 796, mean age = 75.9 years, 81.7% female, 62.6% Caucasian, 73% hypertensive), and participants' performance of hypertension management behaviors was determined using selected questions from the 2007 - 2008 Live Healthy Georgia questionnaire. The performance of hypertension management behaviors among those with and without hypertension was examined using ANOVA and chi-square analyses. Spearman correlations and logistic regression analyses were used to assess the characteristics associated with performance of hypertension management behaviors and the proportion of older adults performing these behaviors. More African American than white participants reported hypertension (81% vs. 69%). Mean intakes of fruits, vegetables, whole grains and dairy products were 2.2 ± 1.3, 2.8 ± 1.2, 1.6 ± 0.9 and 1.4 ± 1.0 servings per day, respectively. There was no significant difference in fruit and vegetable, whole grain or dairy product consumption between hypertensive and non-hypertensive participants. Compared with non-hypertensive participants, those with hypertension were more likely to reduce salt intake (89.3 vs. 79.7%), but less

likely to maintain a healthy body weight (20.3% vs. 38.5%) and engage in physical activity at least 5 days/week (47.4 vs. 57.6%) (all $P < 0.05$). Better self-reported health and more education were positively associated with performance of more hypertension management behaviors. Being African American was positively associated with reducing salt intake, but negatively associated with performing ≥2 dietary management behaviors. This study is unique because it included a target population of older adults in congregate meals and wellness programs at senior centers in Georgia. The findings of this study can be used to identify hypertension management behaviors and barriers to adherence that need to be targeted to improve the health of older adults and better target Older Americans Act Nutrition Program funding and chronic disease management programs.

INDEX WORDS: Hypertension Management, Hypertension Management Behaviors, Hypertension Management Characteristics, Older Americans Act Nutrition Program, Senior Center.

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MEGAN NICOLE ALLEN

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MEGAN NICOLE ALLEN

Major Professor:	Joan G. Fischer
Committee:	Mary Ann Johnson
	Jung Sun Lee

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
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DEDICATION

I would like to dedicate this work to my parents, Mahlon and Allison, for their unconditional love and support. I would also like to thank my sister Amanda for always being there for me. And last, but certainly not least, this work is dedicated to my soon-to-be husband, Daniel Bodie. Thank you for being by my side throughout these last couple of years and pushing me to do my best. I feel so lucky to have you and I cannot wait to be your wife! I could not have done this without the love and support of my family and friends.

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CHAPTER 1

INTRODUCTION

The older adult population in the U.S. is increasing faster than any other subset of the population. The state of Georgia is experiencing similar growth in the number of older adults. Prevention programs to reduce the risk of chronic disease are often focused on children and younger adults (Sahyoun et al 2004). Due to the growth of the older adult population, many have turned their attention to prevention programs to reduce risk of chronic disease in the elderly (Sahyoun et al 2004). Most older adults have at least one chronic condition and many older adults have multiple chronic conditions (AoA 2011). The increase in this segment of the population and the prevalence of chronic disease will contribute to increased healthcare costs. Therefore, there is a need to tailor health promotion services to prevent, delay and treat the onset of chronic disease among the older adult population.

To live independently and reduce risk for adverse health conditions means promoting healthy lifestyles (Kennedy 2006). The Older Americans Act of 1965, as amended by the U.S. federal government in 2006, was established to promote the health and well-being of community-dwelling older adults. The Older Americans Act provides grants to states for nutrition and related health services through the Older Americans Act Nutrition Program (OAANP), including congregate and home delivered meal services, nutrition screening and nutrition education (AoA 2011). The purpose of the Older Americans Act Nutrition Program is to promote the health and well-being of older adults and delay adverse health conditions through access to nutrition and other disease prevention and health promotion services (Administration on Aging (AoA 2011). Previous studies in Georgia revealed that OAANP participants have a particularly high prevalence of chronic conditions, including hypertension, diabetes, overweight and obesity (Clune et al 2010; Hendrix et al 2008; Speer et al 2007).

Hypertension is one of the most common health problems in older adults (Park et al 2010) and is a serious problem in the U.S., affecting over 60% of the older adult population (CDC 2011; Roger et al

2012; Keenan and Rosendorf 2011). Studies have shown that after the age of 69, the prevalence of hypertension rises (Rigaud and Forette 2001). Hypertension rates are higher in African Americans than in Caucasians and higher in women than in men (Delgado et al 2012; Hertz et al 2005; Riguad and Forette 2001). Hypertension was reported by approximately 72% of participants in Georgia senior centers in 2007 (Johnson et al 2007). The goal of hypertension management is to maintain normal blood pressure, prevent the development of hypertension related health complications and reduce the burden associated with hypertension. Interventions for hypertensive patients, including older adults, should be designed to increase compliance to lifestyle modification (Park et al 2011). Hypertension management is a multifaceted regimen of behaviors that can prevent the complications associated with high blood pressure. Most lifestyle therapies concentrate on reducing sodium intake, engaging in physical activity, consuming fruits, vegetables, whole grains and low-fat dairy products, checking blood pressure, not smoking and maintaining a healthy weight (Fan et al 2010; Forman et al 2009). Characteristics associated with performance of hypertension management behaviors include age, race, gender, education, social and emotional support, self-reported health and food security (Cushman et al 2002; Fan et al 2010; Lancaster 2004; Riguad and Forette 2001). Understanding the effect of age, gender, race, education, self-reported health, social and emotional support and food security status on performance of hypertension management behaviors may provide knowledge to better target services towards older adults with high blood pressure. The goal of the present study was to determine performance levels of hypertension management behaviors and characteristics associated with performance of these behaviors by older adults attending senior centers in Georgia. It was hypothesized that older adults would be more likely to reduce sodium intake, avoid smoking and have their blood pressure checked than they would be to consume fruits and vegetables, engage in physical activity and maintain a healthy weight. It was also hypothesized that all behaviors would be more prevalent in those with hypertension than those without the disease. Our results indicate that the majority of participants with or without hypertension did not meet the recommendations of the DASH diet for fruit, vegetable, whole grains or dairy product consumption. Individuals without hypertension were more likely to report that they engage in recommended levels of

physical activity compared to individuals with hypertension. The majority of participants in this study are reducing their salt intake, checking their blood pressure monthly and refraining from smoking.

CHAPTER 2

LITERATURE REVIEW

Hypertension prevalence

Hypertension is a serious health condition that increases the risk for heart disease and stroke, which are leading causes of death in the United States (Keenan and Rosendorf 2011). Approximately 68 million Americans have hypertension; the majority are older adults (CDC 2011). Long-term consequences of hypertension include coronary artery disease, stroke, congestive heart failure and renal failure, which impose a considerable burden on the U.S. healthcare system (Fan et al 2010). Successful management of high blood pressure decreases the risk of cardiovascular and cerebrovascular complications (Fan et al 2010; Riguad and Forette 2001). Georgia has one of the highest rates of hypertension in the U.S. (30.4%) and this number has increased during recent years (CDC 2011). In addition, nearly 36% of adults ages 65 years and older in Georgia were not aware they had high blood pressure in 2009 (CDC 2009).

Aging population

The older adult population is increasing faster than any other age group of the population. In 2009, 39.6 million Americans were 65 years of age or older and represented 12.9% of the U.S. population (AoA 2011). Older adults aged 65 years and older are expected to represent 19% of the population by 2030 (AoA 2011). Further, the U.S. Department of Commerce reports the population of adults aged 65 years and older is expected to more than double in the next four decades (U.S. Department of Commerce 2010). By the year 2050, it is estimated that 86.7 million adults 65 years and older will be living in the U.S., and 20.9 million of these adults will be 85 years and older (U.S Department of Commerce 2010).

Georgia is experiencing a similar increase in the older adult population and, according to the Georgia Department of Health Services (GDHS), ranks ninth in the nation in rate of growth for the population ages 60 and older and eighteenth in rate of growth for ages 85 and older (GDHS 2010). The

Administration on Aging (AoA) estimates that the percentage of older adults ≥65 years in Georgia will increase from 10% to 16% by the year 2030 (AoA 2011). This population growth will have a remarkable impact on the U.S. healthcare system because of the disproportionate rates at which older adults utilize healthcare services. For example, in 2009, older consumers averaged $4,846 in out-of-pocket healthcare expenses (AoA 2011). This represents an increase of 61% since 1999 (AoA 2011). Compared to the older adult population, the total population spent an average of $3,126 in out-of-pocket healthcare expenses (AoA 2011). Due to medical advances, life expectancy is also increasing and with increased life expectancy comes the complications associated with the onset of chronic disease seen among this age group. Most older adults have at least one chronic condition, and many others have more than one (AoA 2011). Therefore, the need to educate older adults about chronic disease management has become more evident.

Older Americans Act Nutrition Program

The increasing number of older adults in the U.S. has directed attention towards identifying effective, cost-efficient healthcare services for this segment of the population (Millen et al 2002). Increasing healthcare costs are in large part related to the rising incidence of chronic disease among older adults. The Academy of Nutrition and Dietetics, American Society for Nutrition and Society for Nutrition Education indicate that both the increasing elderly population and the healthcare focus on prevention accentuate the fundamental need for food and nutrition programs for community-dwelling older adults (Kamp et al 2010). The Older Americans Act Nutrition Program (OAANP) was established in order to promote the health and well-being of older adults, especially those with adverse health conditions, by providing access to nutrition and disease prevention and health promotion services. The Older Americans Act (OAA) provides for Nutrition Services for older adults under Title III (Grants for State and Community Programs on Aging) of the act. The OAANP implements its goals through grants to states to support nutrition services to older adults (ages 60 years and older) through congregate nutrition services (Title III C1) and home-delivered nutrition services (Title III C2) (AoA 2011). OAA services, including OAANP, are targeted toward individuals in greatest economic and social need, with an emphasis on low-

income minorities and rural individuals (AoA 2011). Title III participants are more likely than older adults not receiving Title III services to have lower income, poor self-reported health, less education and to suffer from a disability. The Area Agencies on Aging (AAAs) receive funds to provide the services of congregate and home-delivered meals, nutrition screening, education and counseling (AoA 2011). The goals of these programs are to maintain and improve the health of older adults, delay the onset of adverse health conditions and prevent institutionalization (AoA 2011). Due to limited resources, these services need to be targeted and tailored toward health problems seen in older adults and to the behaviors most in need of intervention.

Hypertension management behaviors

Pharmacological management of hypertension has proven to be an effective treatment approach. However, this form of treatment is costly and may have adverse effects (Krousel-Wood 2009; Krousel-Wood 2010; Forman et al 2009). Medications may alter appetite, taste, swallowing and salivation, which can influence dietary intakes (Krousel-Wood et al 2009; Krousel-Wood et al 2010; Lancaster et al 2004). Primary prevention of hypertension is an alternative approach that reduces the risk of adverse effects from medications. Studies have documented the importance of lifestyle modifications in the treatment and prevention of high blood pressure (Fan et al 2010). According to the U.S. Department of Health and Human Services (USDHHS) and the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7), lifestyle modification is a key element to managing hypertension (Lancaster et al 2004; USDHHS 2004). Lifestyle behaviors including consumption of fruits and vegetables, reducing sodium intake, maintaining a healthy body weight, refraining from tobacco use, physical activity and checking blood pressure can contribute to the overall management of hypertension. Each of these behaviors can help reduce blood pressure and therefore reduce the risk for other cardiovascular complications.

Several modifiable risk factors for hypertension have been identified and many research studies have focused on using a combination of hypertension management behaviors to prevent and treat cases of high blood pressure. Forman et al (2009) concluded that women with a combination of having a body

mass index (BMI) <25, engaging in daily physical activity and using a Dietary Approaches to Stop Hypertension (DASH) style diet had a hypothetical population attributable risk of 53% (Forman et al 2009). This indicates that 53% of new onset high blood pressure cases could have been prevented if participants were in compliance with these behaviors (Forman et al 2009). Whelton et al (1998) reported that the combination of weight reduction and reduced sodium intake by hypertensive older adults (between ages 60 and 80) significantly reduced blood pressure levels ($P < 0.001$). Sacks et al (2001) found that the combination of the DASH diet and reduced sodium intake resulted in greater reductions in systolic and diastolic blood pressure than either the DASH diet alone or sodium reduction alone. This shows the effects of the combination of both sodium reduction and consumption of the DASH diet on blood pressure. Good health and optimal function across the life span can be achieved through lifestyle modifications including a balanced diet and regular physical activity (U.S. Department of Commerce 2010).

Consumption of fruits and vegetables, whole grains, low-fat dairy products and hypertension management

Dietary behavior patterns can affect with hypertension management. The DASH diet emphasizes consumption of fruits, vegetables, low-fat dairy products, whole grains, poultry, fish and nuts (Appel 2010). This dietary pattern is associated with reduced risk for hypertension and with the prevention and management of health complications that contribute to increasing healthcare costs (Fan et al 2010; Fung et al 2008). The DASH Clinical Trial tested the effects of modifying whole dietary patterns on adults with stage I hypertension and those without hypertension ($N = 459$, 133 with hypertension, 326 without hypertension) (Appel et al 1997). This trial demonstrated that a diet rich in fruits and vegetables, low-fat dairy products and reduced saturated and total fat lowered systolic blood pressure by 5.0 mm Hg and diastolic blood pressure by 3.0 mm Hg more than a control diet ($P < 0.001$). Among adults with hypertension, the DASH diet reduced systolic blood pressure by 11.4 mm Hg and diastolic blood pressure by 5.5 mm Hg more than the control diet ($P < 0.001$ for each) (Appel et al 1997). Among participants without hypertension, the corresponding reductions were 3.5 mm Hg ($P < 0.001$) and 2.1 mm Hg ($P =$

0.003) (Appel et al 1997). The DASH diet reduced blood pressure in the absence of weight loss and at sodium intakes comparable to adult consumption in the U.S. (Appel et al 1997). Conlin et al (2000) examined a subgroup of participants of the DASH study. Participants were given a control diet, a diet similar to the control diet, but rich in fruits and vegetables or a combination diet consistent with the DASH diet. Sodium levels were held constant for all three groups (Conlin et al 2000). The DASH diet produced significantly greater effects on blood pressure compared to both the control diet and the control plus fruits and vegetables diet ($P < 0.05$) (Conlin et al 2000). Furthermore, Fung et al (2008) examined the effects of the DASH diet on blood pressure in middle-aged women without a history of cardiovascular disease. The results of this study indicated that participants who followed the DASH diet had a reduction of 4.0 mm Hg in systolic pressure and a 1.5 mm Hg reduction in diastolic blood pressure. In the same study, a higher DASH score was significantly associated with lower risk of stroke and coronary heart disease ($P < 0.001$) (Fung et al 2008). Research has also shown that participants of the DASH-Sodium Trial had sustained reductions in blood pressure (Ard et al 2004). A study by Ard et al (2004) found that DASH participants significantly increased their intakes of fruits and vegetables one year after intervention, while control participants had no change in DASH food group intake. Both groups increased sodium intake over the one year period (Ard et al 2004). For DASH participants, though, changes in dietary sodium intake during follow up did not significantly impact their blood pressure (Ard et al 2004). The DASH diet is consistent with the Dietary Guidelines for Americans, 2010 and is recommended by the American Heart Association (AHA) and the U.S. Department of Agriculture (USDA) (Lancaster et al 2004; USDA 2010).

A diet high in fruits and vegetables is also associated with reduced risk for coronary heart disease and stroke (Fung et al 2008; Lancaster et al 2004). The DASH diet recommends four to five servings of fruit and four to five servings of vegetables per day. However, studies show that older adults fail to comply with these recommendations. Lancaster et al (2004) assessed the dietary patterns of older adults (≥65 years) with hypertension compared to older adults without hypertension. Neither group met the DASH recommendations for fruits and vegetables (Lancaster et al 2004). Another study conducted by

Lancaster (2004) examined the daily consumption of fruits and vegetables by adults aged 65 years and older. The results of this study indicated that the majority of participants reported consuming fruits and vegetables at least once per day. Fan et al (2010) found that compared to adults without hypertension, adults with hypertension were less likely to consume five or more servings of fruits and vegetables per day.

In addition, the DASH diet emphasizes the daily consumption of two to three servings of low-fat dairy products. Dairy foods are a good source of calcium, which is associated with reduced blood pressure, decreased bone loss and reduction risk of certain cancers (Lancaster et al 2004). It is recommended that adults ages ≥51 consume 1,200 mg of calcium per day (IOM 2010). Lancaster et al (2004) found that neither older adults with hypertension nor those without hypertension reported consuming the recommended level of low-fat dairy products set forth by the DASH diet. Participants mainly ate high fat dairy products and calcium intake was less than half the recommended level (Lancaster et al 2004). In the study, milk was the main source of calcium, but contained about 4g of fat per serving (Lancaster et al 2004). Most participants also consumed cheese, which is not only high in saturated fat, but also contributes to increased sodium intake (Lancaster et al 2004). Another study by Lancaster (2004) revealed that slightly over half of participants (n = 303, 51.2%) reported consuming dairy foods at least once a day. Daily intake of low-fat dairy products was associated with participation in physical activity, not smoking and taking a multivitamin (Lancaster 2004). Intake of low-fat dairy foods is also associated with reduced risk for obesity (Heaney et al 2002). Heaney et al (2002) found that intake of 1,200 mg calcium was associated with reduced proportion of individuals with a BMI of >26 compared to those who consumed <500 mg calcium per day.

Whole grains are nutrient dense foods that add protein, fiber, vitamin E, B vitamins, minerals and phytochemicals to the diet. Studies show that diets high in whole grains are associated with reduced risk of hypertension, stroke, cardiovascular disease and diabetes (Behall et al 2006; Kochar et al 2012). Research shows there are several health benefits associated with consumption of whole grains. For example, Behall et al (2006) found that a diet consisting of all whole grains significantly reduced blood

pressure (systolic pressure: $P < 0.021$, diastolic pressure: $P < 0.009$). Whole grains are also associated with lower body weight (O'Neil et al 2010). The Dietary Guidelines for Americans, 2010 and the DASH diet recommend consuming at least half of all grains as whole grains (USDA 2010). However, research indicates that most adults are failing to meet this requirement, including older adults. A secondary analysis of 1999 - 2004 NHANES data revealed that only 4.9% of adults ages 19 - 50 and 6.6% of adults ≥51 years consumed three or more servings of whole grains per day (O'Neil et al 2010). Results from the same study indicated that about 66% of adults ≥51 years consumed less than 0.6 servings of whole grains daily (O'Neil et al 2010). An inverse association was found between intake of whole grain breakfast cereals and incident hypertension among middle-aged males (mean age 52.4, $P < 0.0001$) (Kochar et al 2012). Higher intake of whole grain breakfast cereals was also associated with increased physical activity, higher consumption of fruits and vegetables and lower prevalence of tobacco use and alcohol intake (Kochar et al 2012).

Reducing sodium intake and hypertension management

Sodium retention as a result of excessive intake can also contribute to hypertension (Riguad and Forette 2001). The Dietary Guidelines for Americans, 2010 recommend that adults consume less than 2,300 mg of sodium per day and that middle-aged and older adults, African Americans and individuals with hypertension consume less than 1,500 mg per day (USDA 2010). These guidelines are in large part related to the blood pressure reduction associated with lower sodium intake in short-term clinical trials (Cohen et al 2006; Sacks et al 2001). The most persuasive evidence regarding the effects of dietary sodium and blood pressure comes from controlled dose-response trials (Appel 2010). The largest of the dose-response trials was the DASH-Sodium trial, which tested the effects of three different sodium levels within two distinct diets: the DASH diet and a control diet more typical of what Americans consume (Appel et al 1997). The results of the DASH-sodium trial showed that reduced sodium intake significantly lowered blood pressure in each of the groups studied (men, women, African Americans and non-African Americans) (Appel et al 1997). This trial supported results from other research showing that reduced sodium intake is associated with reduced blood pressure, prevention of hypertension and improved

hypertension management (Karnanja et al 2007; Riguad and Forette 2001; Sacks et al 2001). A further analysis of the DASH-Sodium Trial found a strong association between age and effect of sodium on blood pressure (Bray et al 2004). There was a general greater reduction in blood pressure from reducing sodium intake with increasing quartile of age in both the control and DASH diets (Bray et al 2004). Systolic blood pressure decreased by 8.1 mm Hg for those aged 55 - 76 years compared to adults aged 21-43 years who had an average decrease of 4.8 mm Hg (Bray et al 2005). This shows the effect of both sodium reduction and consumption of the DASH diet on blood pressure levels amongst older adults. In a study comparing dietary intake patterns of older adults with and without hypertension, sodium intake of participants with hypertension was close to 2,400 mg per day while those without hypertension consumed close to 3,000 mg per day (Lancaster et al 2004). Sacks et al (2001) found that reduction of sodium intake significantly lowered systolic and diastolic blood pressure in both a control diet and the DASH diet. Three sodium levels (1,150 mg/day, 2,300 mg/day and 3,450 mg/day) were examined along with a control diet (similar to what Americans typically consume) and the DASH diet. When compared to the control diet with the highest sodium level, the DASH diet with the lowest sodium level resulted in a mean systolic blood pressure reduction of 7.1 mm Hg in those without hypertension and 11.5 mm Hg in participants with hypertension (Sacks et al 2001). These results provide support that sodium reduction in combination with the DASH diet can be used for the prevention and treatment of hypertension. Reducing sodium intake with either the control or DASH diet reduced systolic blood pressure in those with and without hypertension as well as African Americans, participants of other races, men and women (Sacks et al 2001). In addition, the effects of sodium reduction were greater for those with hypertension and for those who consumed the lowest level of sodium (1,150 mg/day) (Sacks et al 2001). These results indicate that sodium reduction consistently lowers blood pressure amongst individuals with and without hypertension, different ethnic groups, men and women. Another important finding of this study was that sodium reduction resulted in lowered blood pressure regardless of consuming the control diet or DASH diet; however, the effects were greater for those who consumed the DASH diet. Furthermore, Karnanja et al (2007) conducted a randomized cross over trial of three sodium levels among participants randomly

assigned to either a control diet or DASH diet. Participants received their assigned diet at each of the three levels of sodium (1,200 mg/day, 2,300 mg/day and 3,500 mg/day) (Karnanja et al 2007). The purpose of this study was to determine the acceptability of the three sodium levels for both dietary patterns. It was found that both the lower and intermediate sodium levels were acceptable to participants, including those with or at risk for hypertension (Karnaja et al 2007). Participants consuming the DASH diet were more willing to consume a diet lower in sodium compared to the control diet (Karnanja et al 2007).

Maintaining a healthy weight

The prevalence of obesity is increasing among the U.S. population. It is estimated that 35.5% of adult men and 35.8% of adult women in the U.S are obese (Flegal et al 2012). In 2009, approximately 27% of adults aged 60 years and older reported a body mass index categorizing them as obese (AoA 2011). Obesity contributes to disability in older adults and is associated with poor nutritional status (Johnson et al 2011). In 2009 – 2010, obesity was most common among non-Hispanic black women (55.5%) and Hispanic women ages 60 years and older (42.8%) (Flegal et al 2012). In 2008, healthcare expenditures for obese Medicare recipients were approximately $600 a year more than for non-obese recipients (Finkelstein et al 2009). Increasing BMI increases the risk for development of chronic disease, including hypertension (NIH 1998). There is a consistent body of evidence from observational and clinical studies documenting that weight is directly associated with blood pressure (Appel 2010). Forman et al (2009) reported the strongest risk factor associated with hypertension was overweight and obesity. In this study, 40% of new onset hypertension cases could be attributed to overweight and obesity (Forman et al 2009). Research supports weight reduction and maintaining a healthy body weight as effective approaches to prevent and treat elevated blood pressure (Appel 2010; Forman et al 2009; Stevens et al 2001). For example, a meta-analysis of 25 trials showed mean and systolic blood pressure reductions were 4.4 mm Hg and 3.6 mm Hg, respectively, as a result of an average weight loss of 5.1 kg (Neter et al 2003). Reductions in blood pressure occur before and without attainment of ideal body weight (Appel 2010). According to the JNC7 a ten pound weight loss can reduce blood pressure in overweight

individuals (USDHHS 2004). Other trials have shown that modest weight loss can also reduce risk of hypertension by approximately 20% among pre-hypertensive individuals (Langford et al 1985; Whelton et al 1998; Appel 2010). In a study specifically focusing on older adults participating in senior center programs, Penn et al (2009) found that as BMI or waist circumference increased, there were significant increases in the prevalence of high blood pressure.

Available evidence supports weight reduction and attainment of a BMI <25 as an effective approach to prevent and treat hypertension (Appel 2010; Forman et al 2009). Stevens et al (2001) examined the results from the weight loss intervention used in the Trials of Hypertension Prevention, Phase II study. The intervention was a three year program of group meetings and individual counseling focusing on dietary changes, physical, activity and social support (Stevens et al 2001). The mean weight change from baseline was -4.4 kg at 6 months, -2.0 kg at 18 months and -0.2 kg at 36 months for the intervention group and 0.1 kg, 0.7 kg and 1.8 kg for same time period for the control group (Stevens et al 2001). Blood pressure was significantly lower in the intervention group compared to the control group at all three time points (Stevens et al 2001). These results indicate that a significant long-term reduction in blood pressure and reduced risk for hypertension can be achieved through weight loss (Stevens et al 2001). Due to the well-recognized difficulties associated with sustaining weight loss, efforts to prevent weight gain among those with a normal body weight are of vital importance (Appel 2010).

Physical activity

The Agency for Healthcare Research and Quality (AHRQ) estimates that millions of Americans, and particularly older adults, suffer from chronic illnesses that can be prevented or delayed by regular physical activity (AHRQ 2002). Lack of physical activity is an important contributor to many chronic diseases for older Americans, including heart disease, diabetes, colon cancer and high blood pressure (AHRQ 2002). Being physically active is associated with the prevention and treatment of hypertension and cardiovascular disease (Forman et al 2009). In a study by Forman et al (2009) women reported the amount of time they spent participating in vigorous physical activity. A higher physical activity level was associated with reduction in blood pressure and a lower risk of incident hypertension (Forman et al 2009).

A study by Fan et al (2010) found that compared to adults without hypertension, adults with hypertension were significantly less likely to engage in recommended levels of physical activity. In this study, 48% of individuals with hypertension and 36% of individuals without hypertension did not engage in recommended levels of physical activity (Fan et al 2010). The American Heart Association recommends engaging in at least 30 minutes of physical activity five days per week (AHA 2011). Few older adults achieve the minimum recommended amount of physical activity. Approximately 33% of older adults reported no leisure time physical activity in 2008 (CDC 2010). Inactivity is more common in older adults than in middle-aged adults and women are more likely than men to report no leisure-time activity (AHRQ 2002). Park et al (2011) examined the effectiveness of a health education and exercise program on community-dwelling older adults with hypertension. Results from this study indicated that physical activity reduced blood pressure levels (Park et al 2011). Lee and Laffrey (2006) examined characteristics associated with physical activity performance by older hypertensive adults (ages 60 – 75). Out of the 267 participants, most (n = 251, 94%) reported they participate in some form of physical activity each week and about half (n = 132, 49.4%) were hypertensive. Gender, income, previous exercise experience, self-efficacy and motivation were associated with performance of regular physical activity (Lee and Laffrey 2006). Barriers to engaging in physical activity may prevent older adults from participating in regular exercise or maintaining their activity level. Those who need to promote physical activity and encourage older adults to be physically active include healthcare providers, aging service organizations and public health agencies (AHRQ 2002).

Not smoking and checking blood pressure

Smoking status is important to document when examining persons with hypertension. Smoking is the leading cause of preventable death in the U.S. and accounts for nearly 443,000 deaths each year (CDC 2011). Approximately 9.5% of adults ages 65 years and older are current smokers (CDC 2011). The National Heart, Blood and Lung Institute (NHBLI) reports that smoking increases risk for the development of cardiovascular disease and hypertension (NHLBI 2010). Smoking injures the walls of blood vessels and increases the rate at which arteries harden (NHBLI 2010). Nicotine absorption

stimulates the release of catecholamines and along with free radicals and aromatic compounds, diminishes the ability of nitric oxide to relax the endothelium of the blood vessel (Powell 1998). In addition, smoking increases the oxidation of low-density lipoprotein in the intima of blood vessels (Powell 1998). These effects lead to the development of atherosclerosis (Powell 1998). Tobacco use has been shown to increase aortic stiffness and blood pressure in male smokers with hypertension and the effects persist longer than in male smokers without hypertension (Rhee et al 2007). Smoking may be associated with other unhealthy behaviors. For example, Fung et al (2008) concluded that smoking was inversely related to adherence to the DASH diet. Smoking cessation improves health outcomes and is associated with reduced risk for hypertension (Fan et al 2010; NHBLI 2010).

Use of preventive healthcare has been shown to be associated with controlling blood pressure and preventing complications related to hypertension (Fan et al 2010). In 2007, older adults aged 65 years and older averaged 7.1 doctor's visits compared to those aged 45 - 65 years of age who averaged 3.7 doctor's visits (AoA 2011). In 2009, approximately 97% of older persons reported they had a usual place to go to receive medical care (AoA 2011). One component of hypertension management is checking one's blood pressure. JNC7 recommends follow-up visits within two months for individuals with stage 1 hypertension (defined as a systolic blood pressure of ≥140 - 159 mm Hg and a diastolic blood pressure of ≥90 - 99 mm Hg) and one month for individuals with stage 2 hypertension (defined as a systolic blood pressure of ≥160 mm Hg and a diastolic blood pressure of ≥100 mm Hg) (NHLBI 2004). In 2006, 66.2% of adults who visited their doctor got their blood pressure checked (Cherry et al 2008). Fan et al (2010) found that individuals receiving treatment for hypertension were more likely than individuals without hypertension to have a routine health checkup.

Characteristics associated with hypertension prevalence and performance of hypertension management behaviors

Demographics

Differences in age, gender, ethnicity and education may contribute to disparities in prevalence and management of hypertension. Fan et al (2010) found that the majority of those with hypertension

were of older age, had less education and were nonwhites. Data from the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) showed that age, gender and ethnicity were correlated with blood pressure control (Cushman et al 2002). Self-reported prevalence of hypertension increased with increasing age in Caucasians and Hispanics, but not African Americans (Cushman et al 2002). Hypertension prevalence was also higher in women than in men in all three ethnic groups, but the largest gender difference was seen in African Americans (Cushman et al 2002). Caucasians were more likely to agree that lifestyle changes including weight reduction, decrease in alcohol and tobacco use, decrease in stress and increase in amount of physical activity will result in better blood pressure management (Cushman et al 2002). A cross-sectional analysis of data from the National Health and Nutrition Examination Survey (1999 - 2002) revealed that hypertension prevalence between the years of 1994 and 2002 increased significantly from 35.8% to 41.4% among African Americans and 24.3% to 28.1% among Caucasian and rates remain significantly higher in African Americans (Hertz et al 2005). Awareness rates of hypertension were higher among African Americans than Caucasians (77.7% vs. 70.4%; $P < 0.001$) as well as treatment rates (68.2% vs. 60.4%; $P < 0.001$) (Hertz et al 2005). Natarajan et al (2009) evaluated hypertension control among various ethnic groups and found that compared to non-Hispanic whites, African Americans were more likely to report use of medication to control blood pressure and being advised to reduce salt intake. Non-Hispanic blacks and Mexican-Americans were more likely to refrain from smoking, restrict alcohol intake, reduce stress and modify diet (Natarajan et al 2009). There was a significant difference in hypertension control rates between ethnic groups and both non-Hispanic blacks and Mexican-Americans were more likely to have uncontrolled blood pressure despite efforts to manage hypertension (Natarajan et al 2009). In addition, a study by Delgado et al (2012) examined blood pressure control rates among older adults ≥65 years and found that older African Americans had a higher prevalence rate of hypertension (74% vs. 63%; $P < 0.001$) compared to older non-Hispanic whites. African Americans also had higher rates of awareness (81% vs. 72%; $P < 0.001$) and poorer rates of blood pressure control (45% vs. 51%; $P < 0.001$) (Delgado et al 2012). Furthermore, a study by Gallant and Dorn (2001) examined the characteristics related to health

behaviors within genders and have found that for women, higher socioeconomic status, older age, greater education and having a supportive social network are predictive of positive health behaviors (N = 1,266, mean 69 for African American males and females, 68 for white males and 70 for white females). Characteristics related to positive health behaviors seen in men include higher education and having a supportive social network (Gallant and Dorn 2001). Lancaster (2004) found that women, whites and those with higher education were more likely to report eating fruits and vegetables every day. A study by Lloyd-Jones et al (2005) demonstrated that overall prevalence of successful blood pressure management declined with advancing age due to substantially lower rates of control in women ≥60 years. Among participants treated for hypertension, the overall prevalence of controlled blood pressure (systolic blood pressure <140 mm Hg and diastolic blood pressure <90 mm Hg) was 47.0%, with significantly lower rates of control with advancing age in both men and women (P < 0.001) (Lloyd-Jones et al 2005).

Impact of self-reported health, social support and food security on hypertension management

Self-reported health is associated with performance of health behaviors. In 2000-2009, 40.0% of non-institutionalized older persons reported their health as excellent or very good (AoA 2011). Older African-Americans(26.0%), older American Indians/Alaska Natives (24.3%) and older Hispanics (28.2%) were less likely to rate their health as excellent or very good compared to older whites (42.8%) or older Asians (35.3%) (AoA 2011). Penn et al (2009) examined a sample of congregate meal participants attending Georgia senior centers and concluded that mean self-reported health was significantly lower among individuals with a BMI ≥40 compared to other BMI categories. Analysis of data from participants of NHANES III, aged 60 years and older, found that poor self-reported health was among the strongest predictors of low fruit and vegetable intake (Sahyoun et al 2005). Gallant and Dorn (2001) indicated that self-reported health was strongly associated with level of physical activity. This relationship was significant for black males and white females (Gallant and Dorn 2001). Self-reported hypertension has also been shown to be associated with performance of hypertension management behaviors. Forman et al (2009) documented that adherence to low-risk dietary and lifestyle behaviors was associated with a significantly lower incidence of self-reported hypertension (P < 0.05).

Social and/or emotional support may be associated with performance of a number of behaviors associated with hypertension management (Gallant and Dorn 2001). Gallant and Dorn (2001) showed that Caucasian males receiving some form of support were less likely to be physically active, while Caucasian females with some form of support were more likely to be physically active. Receipt of support also had an influence on smoking status. Caucasian females with a supportive social network were more likely to smoke cigarettes; however African American females with a supportive social network were less likely to smoke cigarettes (Gallant and Dorn 2001). Lancaster (2004) concluded that spending time with others was positively associated with daily fruit and vegetable intake. Zack (2010) found that social and emotional support was strongly associated with performance of diabetes self-management behaviors and following a healthy diet. Participants in this study were from Georgia senior centers and received support from senior center directors, nutrition educators and other participants in senior centers (Zack 2010). Older adults with a support system may receive more encouragement to engage in healthy eating behaviors, whereas those without a form of support are without additional encouragement (Lancaster 2004).

Food security is access at all times to enough food for an active and healthy life, including the ready availability of nutritionally adequate and safe foods and the ability to acquire these foods in socially acceptable ways (USDA 2011). Food security in the U.S. has been assessed using the Household Food Security Survey Module (HFSSM) since 1995 when it was implemented into the U.S. Census Bureau's Current Population Survey (CPS) (USDA 2011). The HFSSM, 18-item or 6-item, can be scored as two categories, food security and food insecurity, and has been used to detect food insecurity in older adults (USDA 2011). In 2010, 14.5% of U.S. households were classified as food insecure at some point, while 7.9% of households with elderly and 8% of households with elderly living alone were classified as food insecure (USDA 2011). In 2007 - 2008, 19% of those receiving congregate meals and 59% of those waitlisted for home-delivered meals were identified as food insecure (Lee et al 2011). Georgia is one of the poorest states in the nation and the increasing older adult population is at risk of food insecurity (Ziliak and Gundersen 2009). In 2009, Georgia was ranked sixth in the nation for prevalence of food

insecurity in older adults (U.S. Census Bureau 2008). Catlett (2009) examined a sample of older adults (≥60 years) in Georgia senior centers in 2007 and reported that almost 20% of older adults were food insecure. Food insecurity in older adults is associated with increased healthcare costs and increased risk for comorbidities (Seligman et al 2010). More specifically, research suggests that food insecurity is related to obesity, physical and mental health complications, chronic disease management and poor nutritional status (Johnson et al 2011). An increase in the prevalence of food insecurity among older adults may cause a decline in dietary quality (Johnson et al 2011). Food insecure older adults in Georgia reported lower perceived affordability of food and also ranked low in performance of health behaviors including consumption of ≥5 fruits and vegetables daily, engaging in physical activity and seeking preventative care (Lee et al 2010). Common household responses to inadequate food supplies include food budget adjustments, reduced food intake and alterations to type of food served (Seligman et al 2010). Seligman (2010) reported adults from food-insecure households had a 21% higher risk of clinical hypertension than those from food-secure households (Seligman 2010). Food-insecure elderly persons have poorer dietary intake, nutritional status and health status compared to food-secure elderly persons (Lee and Frongillo 2001).

Live Healthy Georgia – Seniors Taking Charge

The Live Healthy Georgia (LHG) - Seniors Taking Charge project was a statewide community intervention implemented in approximately 40 Georgia senior centers annually under the Older Americans Act Nutrition Program in three fiscal years (2006, 2007 and 2008). LHG was a collaborative effort among many organizations in Georgia including the Division of Aging Services and the Department of Foods and Nutrition at the University of Georgia. The target population of LHG was older adults attending senior centers, thus serving mainly congregate meals and wellness program participants. Participants included individuals with low socioeconomic status, multiple chronic diseases, poor nutrition and low physical activity. As reported in previous studies (Bell et al 2009; Fitzpatrick et al 2008; Hendrix et al 2008; Penn et al 2009), this process resulted in a convenience sample each year of approximately 800 individuals ages 50 years and older from the 12 Area Agencies on Aging. Programs included

increasing fruit and vegetable intake, increasing physical activity, decreasing falls and fractures, weight management and improving diabetes self-management (Clune et al 2010; Fitzpatrick et al 2008; Hendrix et al 2008; Penn et al 2009; Zack 2010).

Health belief model

The Health Belief Model (HBM) is a psychological model that is used to predict and change health behaviors and focuses on an individual's attitudes and beliefs (Green and Kreuter 1999). The HBM is a prominent conceptual framework of health behavior and serves as a guide for many public health interventions, including those previously administered through LHG (Fitzpatrick et al 2008; Hendrix et al 2008; Speer et al 2008). The HBM is based on the theory that a person's willingness to change their health behaviors is primarily due to perceived susceptibility, perceived severity, perceived benefits and perceived barriers (Green and Kreuter 1999). Perceived susceptibility is an individual's opinion of their chances of developing a certain condition (Green and Kreuter 1999). Perceived severity is how serious one believes their health condition to be and the consequences of that condition (Green and Kreuter 1999). In the treatment and prevention of hypertension, some of the desired health behaviors include following a healthy diet, reducing sodium intake and engaging in physical activity (Appel 2010; Fan et al 2010; Lancaster et al 2004). Perceived benefits are the belief that the advised change in behavior will reduce the risk or severity of an individual's condition (Green and Kreuter 1999). For individuals with hypertension, the value of behavior change stems from the belief that modifying disease management behaviors will reduce the risk of cardiovascular disease, congestive heart failure, stroke and renal failure. Perceived barriers include the tangible and psychological costs that may result from changes in behavior (Green and Kreuter 1999). Hypertensive individuals, especially older adults, may be apprehensive to changing their dietary habits because of their developed eating patterns and may feel they are unable to modify their lifestyle habits. Cues to action are another component of the HBM. These are strategies that stimulate readiness, provide information on how to change one's behavior and promote awareness of changes in behavior (Green and Kreuter 1999). In addition, self-efficacy is a key part of the HBM in that

it is the confidence in an individual's ability to take the necessary steps in changing behaviors (Green and Kreuter 1999).

The components of the HBM are applicable to older adults because of their increased risk for illness (Sahyoun et al 2004). Older adults who understand their health condition and the seriousness and consequences of certain chronic diseases would use such factors as motivation for changing behaviors (Sahyoun et al 2004). Research shows that health beliefs are positively related to performance of healthy behaviors and that this relationship continues throughout the lifespan. However, factors such as socioeconomic status, health complications related to chronic disease and external influences can have an impact on how perceived susceptibility and perceived severity effect an individual's willingness to engage in certain health behaviors. The likelihood of engaging in health behavior increases when cues to action, such as recommendations from wellness programs provided at senior centers, to engage in a health behavior are present (Clune et al 2010; Green and Kreuter 1999). Thus, health and wellness programs are in a unique position to modify the health beliefs of older adults with hypertension and thereby influence the likelihood of modifying lifestyle behaviors associated with management of high blood pressure.

Rationale, specific aims and hypothesis

Hypertension is one of the most common risk factors for cardiovascular disease and stroke (CDC 2010). Identification of modifiable behaviors has the potential to decrease the prevalence of hypertension in older adults. In addition, funding for OAANP is aimed towards a population in need, and understanding this population will improve the development and targeting of services for older adults attending senior centers. Engaging in disease management behaviors, such as following a healthy diet, physical activity and weight control, are related to reduced blood pressure in older adults (Fan et al 2010; Lancaster et al 2004). A high consumption of fruits and vegetables and reducing sodium intake are also associated with reduction of hypertension in older adults (Fan et al 2010). This study filled in gaps about our knowledge of the relationship between hypertension management behaviors and hypertension among older adults in Georgia senior centers. A large state representative sample (Live Healthy Georgia) of older adults who demonstrate a variety of disease management behaviors was examined. The research question

was “What is the prevalence of hypertension management behaviors by older adults in Georgia senior centers?” Behaviors recommended for those with hypertension include consumption of fruits and vegetables, physical activity, maintain a healthy weight, reduced sodium intake, refrain from tobacco use and checking blood pressure. The first specific aim of this study was to determine the level of performance of individual and totaled hypertension management behaviors among older adults with and without hypertension in senior centers in Georgia. The first hypothesis was that having hypertension would be associated with a higher level of performance of lifestyle-related disease management behaviors (follow a healthy diet, reduce sodium intake, maintain a healthy weight and engage in physical activity) because of the nutrition, physical activity and wellness programs offered at most senior centers on a regular basis. The second specific aim of this study was to identify the disease management behaviors most in need of intervention for individuals with hypertension and those without hypertension. The second hypothesis was that older adults were more likely to reduce sodium intake, have their blood pressure checked and avoid smoking than they were to consume fruits and vegetables, engage in physical activity and maintain a healthy weight. The third specific aim of this study was to identify characteristics associated with performance of disease management behaviors by older adults. The third hypothesis was that higher self-reported health, self-reported hypertension, receipt of some form of support and more years of education would be positively associated with performance of hypertension management behaviors, while food insecurity and African American ethnicity would be negatively associated with behaviors of all older adult participants.

CHAPTER 3

PERFORMANCE OF HYPERTENSION MANAGEMENT BEHAVIORS BY OLDER ADULTS IN GEORGIA SENIOR CENTERS

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Abstract

High blood pressure continues to be a significant contributor to morbidity and mortality in the United States (Fan et al 2010). Older adults are among the fastest growing segment of the U.S. population and have a high prevalence of hypertension (Lloyd-Jones et al 2005). The increase in the elderly population and prevalence of chronic disease has brought attention towards improving healthcare delivery systems that promote the prevention and management of chronic disease. This study examined the performance of hypertension management behaviors by older adults in senior centers from 12 Georgia Area Agencies on Aging. Participants were a convenience sample (N = 796, mean age = 75.9 years, 81.7% female, 62.6% Caucasian, 73% hypertensive), and participants' performance of hypertension management behaviors was determined using selected questions from the 2007 - 2008 Live Healthy Georgia questionnaire. The performance of hypertension management behaviors among those with and without hypertension was examined using ANOVA and chi-square analyses. Spearman correlations and logistic regression analyses were used to assess the characteristics associated with performance of hypertension management behaviors and the proportion of older adults performing these behaviors. More African American than white participants reported hypertension (81% vs. 69%). Mean intakes of fruits, vegetables, whole grains and dairy products were 2.2 ± 1.3, 2.8 ± 1.2, 1.6 ± 0.9 and 1.4 ± 1.0 servings per day, respectively. There was no significant difference in fruit and vegetable, whole grain or dairy product consumption between hypertensive and non-hypertensive participants. Compared with non-hypertensive participants, those with hypertension were more likely to reduce salt intake (89.3 vs. 79.7%), but less likely to maintain a healthy body weight (20.3% vs. 38.5%) and engage in physical activity at least 5 days/week (47.4 vs. 57.6%) (all $P < 0.05$). Better self-reported health and more education were positively associated with performance of more hypertension management behaviors. Being African American was positively associated with reducing salt intake, but negatively associated with performing ≥2 dietary management behaviors. This study is unique because it included a target population of older adults in congregate meals and wellness programs at senior centers in Georgia. The findings of this study can be used to identify hypertension management behaviors and barriers to adherence that need to be targeted to

improve the health of older adults and better target Older Americans Act Nutrition Program funding and chronic disease management programs.

INDEX WORDS: Hypertension Management, Hypertension Management Behaviors, Hypertension Management Characteristics, Older Americans Act Nutrition Program, Senior Center.

Introduction

Hypertension is a serious problem with a high prevalence among older adults. Approximately 64% of older men and 78% of older women have high blood pressure (Mitka 2011). In Georgia senior centers, a diagnosis of hypertension was reported by 72% of older adults in 2007 (Johnson et al 2007). Health complications associated with high blood pressure include stroke, renal failure, cardiovascular disease and congestive heart failure (Fan et al 2010; Forman et al 2009).

The Older Americans Act Nutrition Program (OAANP) provides grants to states for nutrition services to older adults (≥60 years) through congregate meals (Title III C1) and home-delivered meals (Title III C2) (AoA 2011). Other services include nutrition screening, counseling and education (AoA 2011). The goals of these programs are to maintain and improve the health of older adults and delay the onset of chronic disease (AoA 2011). The Live Healthy Georgia (LHG)-Seniors Taking Charge project was a statewide community intervention implemented in Georgia senior centers in 2007 - 2008. The target population of LHG was older adults attending senior centers, thus mainly serving congregate meal and wellness program participants. Many participants were of low socioeconomic status, with multiple chronic diseases, and were at risk for poor nutritional status. Goals for intervention programs for this population included increasing fruit and vegetable intake, increasing physical activity, decreasing falls and fractures, weight management and improving diabetes self-management (Clune et al 2010; Fitzpatrick et al 2008; Hendrix et al 2008; Penn et al 2009; Zack 2010).

Hypertension management behaviors include high consumption of fruits and vegetables, reducing sodium intake, refraining from tobacco use, engaging in physical activity, checking blood pressure and maintaining a healthy weight (Fan et al 2010; Forman et al 2009; Fung et al 2008). Performance of hypertension management behaviors helps to reduce both systolic and diastolic blood pressure and improve overall health (Forman at el 2009; Fung et al 2008). Characteristics that may influence performance of these behaviors include, age, race, gender, education, self-reported health, self-reported hypertension and food security (Forman et al 2009; Gallant and Dorn 2001; Sayhoun et al 2004; Seligman et al 2010).

The goal of this study was to determine performance levels of individual and totaled hypertension management behaviors by older adults participating in Georgia senior centers. It was hypothesized that having hypertension would be associated with a higher level of performance of lifestyle-related disease management behaviors (following a healthy diet, reducing sodium intake, maintaining a healthy weight and engaging in physical activity) because of the nutrition, physical activity and wellness programs offered at most senior centers on a regular basis. It was also hypothesized that older adults would be more likely to reduce sodium intake, avoid smoking and have their blood pressure checked than they were to consume fruits and vegetables, engage in physical activity and maintain a healthy weight. Lastly, it was hypothesized that higher self-reported health, self-reported hypertension, receipt of some form of support and more years of education would be positively associated with performance of disease management behaviors, while food insecurity and African American ethnicity would be negatively associated with behaviors of all older adult participants.

Methods

Sample

In fall of 2007, wellness coordinators, senior center directors and their staff recruited older adults to participate in a nutrition education program, Live Healthy Georgia (LHG). A convenience sample of 815 individuals ages 50 years and older from the 12 Area Agencies on Aging (AAA) in Georgia participated in the survey. Most participants were recipients of Older Americans Act Nutrition Program (OAANP) congregate meals. Homebound elders were excluded. Another exclusion criterion, as determined by interviewer assessment, was the inability of participants to understand the informed consent form or answer questions. The data were collected during a three month period (November 2007 to January 2008). Written informed consent was obtained from all participants and the Institutional Review Boards of the University of Georgia and the Georgia Department of Human Resources approved all procedures.

Participants <60 years of age represent a small segment of the study population and were excluded with the intention of evaluating only older adults. Individuals of races other than Caucasian and

African-American were also excluded because they represent a small proportion of the population. This resulted in a final sample size of 796. All participants who answered the question "Do you have high blood pressure?" were included.

Questionnaire

Participant performance of hypertension management behaviors was determined using selected questions from the 2007 LHG questionnaire. Experts in nutrition and physical activity (faculty members and Registered Dietitians in the Department of Foods and Nutrition, University of Georgia and the Georgia Division of Aging Services) reviewed and edited the questionnaires (health, nutrition, physical activity and physical function) to ensure content validity and cultural appropriateness based on their experience working with the target population (Bell et al 2009; Clune et al 2010; Fitzpatrick et al 2008; Hendrix et al 2008; Zack 2010). Input from the Division of Aging Services staff and the wellness coordinators was solicited and incorporated into the questionnaires. For each participant, approximately one hour was required to explain the study, obtain informed consent and complete the questionnaire. In each AAA, trained staff read the questions to participants and recorded their responses (Clune et al 2010; Zack 2010). Assessment included demographic information, general health and current illnesses (diabetes, high blood pressure, heart disease, high cholesterol and arthritis), food security, diet, physical activity, emotional support, life satisfaction, physical function and anthropometrics (height, weight, and waist circumference). Questionnaires are available online (http://www.livewellagewell.info/study/2008/Test1-PreTest0708.doc).

Hypertension management behaviors

Performance of hypertension management behaviors was assessed using questions from the Live Healthy Georgia Questionnaire (Appendix B). A "yes/no" answer format was used to identify participants with high blood pressure. Dietary intakes were assessed as follows: "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), "On how many days of the last week (seven days) did you eat five or more servings of fruits and vegetables?"(range 0 to 7), "On how many days of the last week (seven

days) have you followed a healthful eating plan?" (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 do 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), "How often do you eat milk on cereal, including soy milk?" (range <1 time per week to 3 times per day). For some analyses each outcome variable was dichotomized into 0 for not engaging in a high level of behavior and 1 for engaging in a high level of behavior. The criteria for a high level of behavior were fruits (≥ 4 servings per day), vegetables (≥4 servings per day), fruits and vegetables combined (≥5 servings per day), milk (≥2 servings per day), whole grains (≥3 servings per day) and healthy diet (consuming healthy diet 5 days or more per week). Evaluation of physical activity was assessed using the question, "How many days of the last week (seven days) did you participate in at least 30 minutes of moderate physical activity? Examples of moderate activity are regular walking, housework, yard work, lawn mowing, painting, repairing, light carpentry, ballroom dancing, light sports, golf or bicycling" (range 0 to 7) (Appendix B, #33). Physical activity was dichotomized into 0 for <5 days per week and 1 for ≥ 5 days per week. Tobacco use was assessed with, "Do you use any tobacco products such as cigarettes, cigars, pipe or chewing tobacco?" (no = 0, yes = 1) (Appendix B, #8). Assessment of recent blood pressure measurement was done with the question, "About how long has it been since you last had your blood pressure checked?" (within past month, within past year, within past 2 years, 2 or more years ago, never) (Appendix B, #70). Checking blood pressure was dichotomized into 0 for within past year, within past 2 years, 2 or more years ago, never and 1 for within past month. Adherence to guidelines recommending reduction of sodium intake for managing hypertension (Appel 2010; Cohen et al 2006; USDA 2010; Gates et al 2004) was evaluated using "Are you cutting down on sodium or salt (to help lower or control your blood pressure)?" (no = 1, yes = 2, do not use salt = 3) (Appendix B, # 71). Analyses for reducing salt intake were dichotomized into 0 for no and 1 for yes and do not use salt. BMI and maintenance of a healthy weight was assessed using questions, "What is your current your current height without shoes?" and "What is your current weight?"(Appendix B). As

described by Penn et al (2009), weight was measured by: a) weighed with a scale without shoes and with clothes b) weighed with a scale with shoes and with clothes or c) self-reported and it was assumed without shoes and without clothes. Height was assessed by: a) measurement with a tape measure and shoes on or b) self-reported (Penn et al 2009). BMI was calculated (BMI = (weight (pounds)/height $(inches)^2$) x 703). Corrections were previously applied for clothes and/or shoes for height and weight and it was found that there were no significant differences between the corrected and uncorrected measures for BMI (Penn et al 2009). Therefore, uncorrected values for BMI were used in these analyses. Analyses for assessing BMI were dichotomized into 0 for a BMI <18.5 and ≥25 and 1 for a BMI ≥18.5 and <25.

Performance of the number of total dietary behaviors was the combination of meeting recommendations for daily fruit intake (≥4 servings/day), daily vegetable intake (≥4 servings/day), daily consumption of whole grains (≥3 servings/day), daily consumption of milk (≥ 2 servings/day) and reducing salt intake (for each category no = 0, yes = 1; totaled behaviors ranged from 0 to 5). Performance of totaled hypertension management behaviors was the combination of the previously mentioned dietary behaviors along with checking blood pressure, maintaining a healthy weight (measured using BMI), restraint from tobacco use and engaging in regular physical activity, which was defined as engaging in moderate physical activity 5 days per week or more (for each category no = 0, yes = 1; totaled behaviors ranged from 0 to 9).

Characteristics associated with performance of hypertension management behaviors

Age, race, gender and education were recorded and were assessed as characteristics associated with performance of hypertension management behaviors. Other potential characteristics associated with performance of hypertension management behaviors that were examined included self-reported health (Gallant and Dorn 2001; Penn at al 2009; Sayhoun et al 2005), emotional support (Zack 2010) and food security (Johnson et al 2011; Lee et al 2010; Lee and Frongillo 2001). Self-reported health was assessed using, "How would you rate your overall health?" (poor = 0, fair = 1, good = 2, very good = 3, and excellent = 4) (Appendix B, #7). Categories were dichotomized to poor and fair = 0, good, very good or excellent = 1 (Zack 2010). The question "How often do you get the social and emotional support that you

need?" was used to assess emotional support and was adapted from the Behavioral Risk Factor Surveillance System (BRFSS) (BRFSS 2006; Appendix B, #26). Categories were dichotomized to never, rarely or sometimes = 0 and usually or always = 1. Food-insecure older adults have been shown to have poorer dietary intake, nutritional status and health status than do food-secure elderly persons (Johnson et al 2011; Lee at al 2010; Lee and Frongillo 2001). Participant food security was assessed with a modified version of the U.S. Household Food Security Survey Module: Six-Item Short Form (USDA 2008) as described by Catlett (2009). Responses were summed to create a six-item food security scale that ranges from 0 to 6 (high score indicating food insecurity), which was then dichotomized into a two category measure (food secure is a score of 0 to 1, and food insecure is a score of 2 to 6; food secure = 0, food insecure = 1) as described by Catlett (2009).

Statistical Analysis

Data from the LHG questionnaires was sent to the University of Georgia where it was coded and entered into secure files with access restricted to key personnel. Data were analyzed using the Statistical Analysis System (SAS, Version 9.13, SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means and standard deviations were calculated. Means, standard deviations, ANOVA and/or chi-square analyses were used to compare the level of performance of individual and totaled hypertension management behaviors for those with and without hypertension. Means, standard deviations and frequencies were used to identify the disease management behaviors most in need of intervention. Spearman correlation coefficients and logistic regression analyses were used to determine if age, gender, race, education, self-reported hypertension, social and/or emotional support, self-reported health and food security were associated with adhering to each of the individual hypertension management behaviors and adherence to ≥2 dietary behaviors and ≥4 totaled hypertension management behaviors. $P < 0.05$ was considered statistically significant.

Results

Characteristics of participants included in the study are shown in **Table 3.1**. Of the 815 participants recruited into the study, 796 were ages 60 years and older and answered the question "Do you

have high blood pressure?" (no = 0, yes = 1). Participants had a mean age of 75.9 years, were mostly female (82%) and mostly white (63%). Nearly half (49%) had obtained a high school diploma or more. The majority of participants (77%) reported they usually or always receive some form of emotional support and reported their overall health as good, very good or excellent (60%). Some participants reported food insecurity (20%). **Table 3.2** compares characteristics of participants with and without hypertension. There was no significant difference in gender, education or receipt of emotional support between the hypertensive and non-hypertensive groups. There was a significant difference in age between the groups ($P = 0.02$) with a higher percentage of those aged 60 to 69 reporting hypertension than those aged 70 and above. There was a significant difference in race between hypertensive individuals and non-hypertensive individuals ($P = 0.0004$). A higher percentage of African American participants reported hypertension than white participants (81% vs. 69%). Individuals with high blood pressure were less likely to report their overall health to be very good or excellent ($P = 0.0001$), and were more likely to be food insecure ($P = 0.0417$).

Performance levels of the hypertension management behaviors are listed in **Table 3.3**. Participants' mean servings of fruits, vegetables, whole grains and dairy products were 2.2 ± 1.3, 2.8 ± 1.2, 1.6 ± 0.9 and 1.4 ± 1.0, respectively. Most participants (88%) reported having their blood pressure checked within the past month and reducing their salt intake (87%). The majority of participants (92%) indicated no use of tobacco. Only 50% of participant reported engaging in moderate physical activity (50%) and over a third (38%) reported a BMI ≥30. **Table 3.4** compares the performance of hypertension management behaviors by participants with and without high blood pressure. There was no significant difference in fruit, vegetable, whole grain or dairy product consumption between hypertensive and non-hypertensive participants. Compared with non-hypertensive participants, those with hypertension were more likely to reduce salt intake (89.3 vs. 79.7%, $P = 0.0004$), but less likely to engage in physical activity at least 5 days/week (47.4 vs. 57.6%, $P = 0.0102$). There was a significant difference in BMI between individuals with hypertension and those without hypertension. The mean BMI for the hypertensive group was 30.2, which was higher than that of the non-hypertensive group (mean BMI 27.1)

($P < 0.0001$). Those without hypertension were more likely to report maintaining a healthy weight (≥18.5 BMI <25) than those with hypertension (39% vs. 20%, $P < 0.0001$).

Spearman correlations for performance of hypertension management behaviors and demographics, emotional support and self-reported health are shown in **Table 3.5**. Having hypertension was positively associated with reducing salt intake ($P = 0.0001$) and negatively correlated with consuming a healthy diet 5 or more days per week ($P = 0.0094$), participation in physical activity ($P = 0.0064$) and maintaining a healthy weight ($P < 0.0001$). Age was negatively associated with consumption of ≥4 servings of vegetables per day ($P = 0.0259$) and positively associated with consuming ≥2 servings of milk per day ($P = 0.0002$). Being older was associated with consuming a healthy diet 5 days or more per week and maintaining a healthy weight ($P < 0.0001$). Being female was positively correlated with eating ≥5 servings of fruits and vegetables per day ($P = 0.0371$), reducing salt intake ($P = 0.0090$) and not using tobacco ($P = 0.0246$). Being African American was negatively associated with consumption of ≥5 servings of fruits and vegetables per day ($P = 0.0001$), consumption of ≥2 servings of milk per day ($P = 0.0306$), avoiding tobacco ($P = 0.0096$) and maintaining a healthy weight ($P = 0.0002$), but was positively correlated with reducing salt intake ($P = 0.0092$). Education was negatively associated with checking blood pressure ($P = 0.0077$). Having social and emotional support was negatively associated with consumption of ≥4 servings of fruit per day ($P = 0.0202$), but positively associated with consumption of a healthy diet 5 or more days per week ($P = 0.0003$). Better self-reported health was positively correlated with consumption of ≥5 servings of fruits and vegetables per day ($P = 0.0151$), consumption of a healthy diet 5 or more days per week ($P = 0.0020$) and more days of physical activity ($P = 0.0003$). Self-reported health was negatively associated with checking blood pressure ($P = 0.0210$).

Logistic regression analyses of characteristics associated with performance of hypertension management behaviors are shown in **Table 3.6**. Hypertension was positively associated with reducing salt intake ($P = 0.0006$) and negatively associated with participation in physical activity ($P = 0.0491$) and maintaining a healthy weight ($P = 0.0003$). Age was positively associated with consumption of ≥2 servings of milk per day ($P = 0.0004$), consumption of a healthy diet 5 or more days per week ($P =$

0.0032), refraint from tobacco use ($P = 0.0396$) and maintaining a healthy body weight ($P < 0.0001$), but negatively associated with consumption of ≥4 servings of vegetables per day ($P = 0.0367$). Being female was positively associated with consumption of ≥5 servings of fruits and vegetables per day ($P = 0.0371$), reduction of salt intake ($P = 0.0369$) and refraint from tobacco use ($P = 0.0097$). Being African American was negatively associated with consumption of ≥5 servings of fruits and vegetables per day ($P = 0.0001$) and maintenance of a healthy body weight ($P = 0.0016$), but was positively associated with reduction of salt intake ($P = 0.0287$) and tobacco use ($P = 0.0205$). Education was positively associated with physical activity ($P = 0.0491$) and negatively associated with having blood pressure checked ($P = 0.0081$)**.** Having emotional support was positively associated with consumption of a healthy diet 5 days or more per week ($P = 0.0132$). Better self-reported health was positively associated with consuming ≥5 servings of fruits and vegetables per day ($P = 0.0366$) and engaging in physical activity ($P = 0.0274$).

Table 3.7 shows logistic regression analysis of totaled dietary behaviors and all hypertension management behaviors. There were no significant associations between high blood pressure, age, gender, race, education, emotional support, self-reported health or food security with performance of ≥2 dietary behaviors, although there was a trend such that African Americans were less likely to engage in 2 or more dietary behaviors. Age was negatively associated, while education was positively associated ($P = 0.0444$) with performance of ≥4 all hypertension management behaviors ($P = 0.0269$). Logistic regression analysis of characteristics associated with performance of hypertension management behaviors by participants with hypertension are shown in **Table 3.8**. Age was negatively associated with consumption of ≥4 servings of vegetables per day ($P = 0.0110$), but positively associated with consumption of ≥2 servings of milk per day ($P < 0.0001$), consuming a healthy diet 5 days or more per week ($P = 0.0035$) and maintaining a healthy body weight ($P < 0.0001$). Women with hypertension were more likely to reduce their salt intake ($P = 0.0493$) and refrain from tobacco use ($P = 0.0064$). African Americans with hypertension were less likely to consume ≥4 servings of vegetables per day ($P = 0.0135$), consume ≥5 servings of fruits and vegetables per day ($P = 0.0002$), report eating a healthy diet 5 days or more per week ($P = 0.0272$) or maintain a healthy weight ($P = 0.0035$), but were more likely to reduce their salt

intake (P = 0.0248). More education was negatively associated with checking blood pressure (P = 0.0135) and positively associated with engaging in physical activity (P = 0.0439) in those with hypertension. Receipt of emotional support was positively correlated with consuming a healthy diet 5 days or more per week (P = 0.0055). Higher self-reported health was associated with consuming ≥5 servings of fruits and vegetables per day (P = 0.0406) and engaging in physical activity (P = 0.0146). **Table 3.9** shows logistic regression analysis of dietary and totaled hypertension management behaviors in participants with hypertension. African American participants with hypertension were less likely to perform ≥2 dietary behaviors (P = 0.0178). Higher education (P = 0.0153) and higher self-reported health (P = 0.0149) were positively associated with performance of ≥4 totaled hypertension management behaviors. Food insecurity was not associated with performance of totaled hypertension management behaviors.

Only a small percentage of the population reported consuming ≥4 servings of fruit per day (12.2%) and ≥3 servings of whole grains per day (11.0%), as shown in **the three tables of Appendix D**. Therefore, we examined less restrictive standards to determine the relative performance of these behaviors. We examined the performance of consuming ≥2 servings of fruits per day and ≥2 servings of whole grains per day. Approximately 68.5% consumed ≥2 servings of fruits per day and 29% consumed ≥2 servings of whole grains per day. Logistic regression analysis of the performance of these behaviors, performance of dietary behaviors and totaled hypertension management behaviors among all participants is shown in **Appendix E1**. Both age (P = 0.0046) and higher self-reported health (P = 0.0453) were positively associated with consumption of ≥2 servings of fruit per day. There were no significant associations between high blood pressure, age, gender, race, education, emotional support, self-reported health or food security and consumption of ≥2 servings of whole grains per day or performance of ≥2 dietary behaviors. Older participants were less likely to perform ≥4 hypertension management behaviors (P = 0.0269), while those with more education were more likely to perform ≥4 hypertension management behaviors (P = 0.0444). Logistic regression analysis of consumption of fruit, whole grains, performance of dietary behaviors and totaled hypertension management behaviors among hypertensive participants is

shown in **Appendix E2**. Both age (P = 0.0173) and self-reported health (P = 0.0168) were positively associated with consumption of ≥2 servings of fruit per day. There were no significant associations between high blood pressure, age, gender, race, education, emotional support, self-reported health or food security and consumption of ≥2 servings of whole grains per day or performance of ≥2 dietary behaviors. Hypertensive participants with more education (P = 0.0153) and higher self-reported health (P = 0.0149) were more likely to perform ≥4 hypertension management behaviors.

Discussion

Hypertension is one of the most common health problems in older adults and affects nearly one billion people worldwide (Park et al 2011). Lifestyle modification has been shown to be effective in the treatment of high blood pressure and therefore is widely recommended (Fan et al 2010; Forman et al 2009; Fung et al 2008; Lancaster et al 2004). The high prevalence of hypertension seen among senior center participants emphasizes the importance of hypertension management. However, noncompliance or insufficient compliance to performance of hypertension management behaviors prevent older adults from receiving the full benefits of lifestyle modification. An important finding of this study was that performance of dietary management behaviors was low for both participants with and without hypertension, with the exception of reducing salt intake. In addition, those without hypertension were more likely to engage in recommended levels of physical activity and maintain a healthy weight compared to those with hypertension.

Our analyses indicate that OAANP participants with and without hypertension are making some lifestyle modifications, but there is much room for improvement. The hypothesis that older adults would be more likely to reduce sodium intake, avoid smoking and have their blood pressure checked than consume fruits and vegetables, engage in physical activity and maintain a healthy weight was confirmed. For example, the results of the current study indicate that only 12, 26, 11 and 33 percent of this population met the recommendations of the DASH diet for fruit, vegetable, whole grain or milk consumption, respectively. In contrast, at least 85 percent indicated that they reduced salt intake, avoided tobacco and checked their blood pressure regularly.

A second hypothesis was that those who had a diagnosis of hypertension would be more likely to engage in lifestyle-related disease management behaviors. This was only confirmed for one behavior. Hypertensive participants were more likely to reduce their salt intake, which is consistent with the findings of others (Lancaster et al 2004). An additional finding was that hypertensive African Americans were more likely to reduce their salt intake than white participants with hypertension. This is similar to the findings of Natarajan et al (2009) who concluded that non-Hispanic blacks were more likely to report salt restriction. In the current study there was no difference in consumption of fruits, vegetables, milk or whole grains for hypertensive and non-hypertensive participants. Those with hypertension had lower performance of some lifestyle behaviors than those without hypertension. Only 47% of individuals with hypertension, while 58% of those without hypertension reported that they engage in recommended levels of physical activity. Furthermore, individuals with hypertension were more likely to be obese. These results are consistent with a study by Fan et al (2010) in which adults with hypertension did not meet the recommended intake of fruits and vegetables. Fan and colleagues also found that 52% of participants with hypertension and 64% of participants without hypertension met recommendations for physical activity and hypertensive participants were more likely to be obese.

It was further hypothesized that having better self–reported health, social or emotional support and more education would be positively associated with performance of disease management behaviors, while food insecurity and African American ethnicity would be negatively associated with performance of behaviors. Higher self-reported health was associated only with participation in physical activity and consumption of ≥5 servings of fruits and vegetables per day. Gallant and Dorn (2001) previously indicated that self-reported health was strongly associated with level of physical activity. An analysis of data from participants of NHANES III, for those aged 60 years and older, similarly showed that higher self-reported health was associated with more frequent consumption of fruit and vegetables (Sahyoun et al 2005). Several studies have indicated that social and emotional support is associated with healthy lifestyle behaviors (Gallant and Dorn 2001; Lancaster 2004; Sayhoun et al 2004). Approximately 77% of participants of the current study reported always or usually receiving some form of emotional or social

support, but this was positively associated only with consuming a healthy diet 5 or more days per week. These findings are consistent with results from a study by Lancaster (2004) who found that receipt of support was positively associated with daily fruit and vegetable intake. Zack (2010) found social and emotional support to be associated with performing diabetes self-management behaviors, including following a healthy diet.

Others have reported that individuals with a greater level of education are more likely to engage in healthy behaviors (Gallant and Dorn 2001; Lancaster 2004; Lloyd-Jones et al 2005). The results of the current study found that education was positively associated with engaging in recommended levels of physical activity. In addition, those with higher levels of education were more likely to perform ≥4 total hypertension management behaviors. However, more education was negatively associated with checking blood pressure. This may be because participants with more education may feel they are better at managing their hypertension because they are more knowledgeable regarding disease management and therefore do not feel the need to check their blood pressure as frequently. OAANP targets individuals at greatest economic need and therefore the participants in the current study are more likely to have a lower education level (Bell et al 2009; Clune et al 2010; Fitzpatrick et al 2009; Hendrix et al 2008; Zack 2010). Thus, in a population where the education level is higher (the mean number of years of education in the current study was 10.5, SD 3.3), education may be positively associated with a greater number of behaviors. Finally, in the current study, those who were older were also more likely to consume a healthy diet. This is consistent with the results from a study by Zack (2010). This may be because as adults age, their social networks shrink and therefore those who are older may be more likely to spend more time at senior centers compared to those who are younger (Zack 2010). As a result, these older individuals may be more likely to receive congregate meals more frequently. More frequent consumption of congregate meals may contribute to more days following a healthy diet.

Food insecurity has been associated with difficulties in engaging in disease management behaviors (Johnson et al 2011; Lee and Frongillo 2001; Lee et al 2010). The prevalence of food insecurity in this sample of older adults was higher than the national average (19.7% vs. 14.5%) (USDA 2011). For

those with hypertension, the prevalence of food insecurity was even higher (21.6%). Despite the high prevalence of food insecurity among this sample, it was not associated with performance of ≥2 dietary management behaviors or ≥4 total hypertension management behaviors. This is similar to the findings of Zack (2010), which found that food insecurity was not associated with performance of diabetes self-management behaviors. Food insecurity may not significantly impact performance of hypertension management behaviors in this study population because of an overall low adherence to recommended behaviors by all participants. Finally, it was proposed that African American ethnicity would be negatively associated with performance of hypertension management behaviors. This was confirmed for two behaviors, maintaining a healthy body weight and not smoking. However, as mentioned above, being African American was positively associated with reduction of salt intake. Although it was not included in the hypothesis, a gender effect was noted for some outcomes. Female gender was associated with consumption of ≥5 servings of fruits and vegetables daily. This is consistent with the findings of Lancaster (2004). In addition, women were more likely than men to reduce their salt intake. However, gender was not significantly related to performance of other hypertension management behaviors.

An unusual effect of age on prevalence of hypertension was found in this population. There was a lower percentage of hypertensive participants among those who were ≥80 years compared to those who were between the ages of 60 and 69. This may demonstrate a survival effect, which may be associated with the length of time since diagnosis of high blood pressure. In addition, a higher percentage of men than women have high blood pressure until around age 45 and between the ages 45 – 64, the percentage of men and women with high blood pressure is similar (Roger et al 2012). Beginning at age 65, women have much higher prevalence rates of hypertension compared to men (Roger et al 2012). There may have been a higher percentage of men who are ≥80 years in the current study, which could have contributed to lower rates of hypertension seen among this age category.

There have been many successful nutrition, physical activity and health interventions among older adults, including participants of LHG. For example, Hendrix et al (2008) evaluated a fruit and vegetable intervention program among OAANP participants in Georgia. In this study, there was a 21%

increase in the number of participants meeting the Dietary Guidelines for Americans recommendation of at least seven servings of fruits and vegetables daily (Hendrix et al 2008). The results from this study indicate that community based interventions can increase fruit and vegetable intake by OAANP participants attending senior centers. Fitzpatrick et al (2009) examined the effects of a nutrition and physical activity intervention on physical function of senior center participants in Georgia. The primary interventions used were educator-led chair exercises and promotion of physical activity (Fitzpatrick et al 2009). This 16-week program resulted in a significant improvement in physical performance and amount of physical activity, thus providing more evidence that OAANP participants are capable of making lifestyle modifications (Fitzpatrick et al 2009). In addition, Sayhoun et al (2004) found that participants (≥55 years of age) with a specific health condition, such as hypertension, were more successful in making dietary modifications and the use of nutrition education and addressing health concerns were effective forms of intervention. Park et al (2011) implemented a physical activity program among community-dwelling, hypertensive older adults attending senior centers. The intervention group in this study showed significantly greater reduction in systolic blood pressure and scores of self-efficacy for exercise (Park et al 2011). It is clear that successful evidence-based hypertension management programs can be developed and targeted for various population groups. Thus, it is important to know what factors are associated with performance of disease management behaviors in this study population. A final analysis specifically looked at factors associated with disease management behaviors among those with hypertension. Age and African American ethnicity was negatively associated with consumption of vegetables and/or fruits, while having better self-reported health was positively associated with consuming 5 or more fruits and vegetables per day. Age, however, was positively associated with consumption of 2 or more servings of milk per day, so targeting the younger older adults with education on dairy product consumption may be appropriate. Male gender and Caucasian ethnicity were negatively associated with reduction of salt intake. Those with greater amounts of social and emotional support were more likely to report following a healthy diet 5 days per week or more. Finally, having more education and better self-reported health was

associated with physical activity. Future research and intervention programs for hypertensive older adults should be tailored to meet the needs of these individuals.

Pharmacological treatment is often used to treat adults with hypertension. Approximately 70% of adults with high blood pressure use medication to treat their condition (CDC 2011). It is possible that a large percentage of our study participants are taking medications for hypertension However, our study did not include analysis of whether or not participants were on antihypertensive medications. Studies show that individuals on antihypertensive medications are more likely to have uncontrolled high blood pressure, have a routine health checkup, be obese, be a current smoker and less likely to engage in recommended levels of physical activity (Fan et al 2010; Krousel-Wood et al 2009; Krousel-Wood et al 2010). Therefore, taking antihypertensive medication may influence performance of non-pharmacological hypertension management behaviors. In addition, some participants may feel less obligated to make lifestyle modifications due to medication use. In contrast, low adherence to antihypertensive medication further indicates the need for lifestyle modification. Pharmacological treatment can be difficult amongst hypertensive older adults because of the physiological changes associated with aging, such as reduced kidney and liver function, and therefore result in more extreme adverse effects compared to younger adults (Cohen 2001). In addition, older adults often times require the use of several medications and therefore increasing the risk of adverse drug effects. Some patients experience distress about having hypertension and fear long-term use of drug therapy, which may lead to low medication compliance (Cohen 2001). This then leads to decreased blood pressure control. Future studies should examine the relationship between antihypertensive medication and performance of lifestyle hypertension management behaviors among older adults participating in senior center programs.

There are some limitations to this study. Participants were attending senior centers that provide congregate meals; however, the frequency at which they receive these meals is unknown. Congregate meals funded by state and federal funds under OAANP must comply with the Dietary Guidelines for Americans and provide at least 33% of the recommended dietary allowances (RDA) in each meal served (Georgia Division of Aging Services). This could have impacted the participants' interpretation of

consumption of a healthy diet. Another limitation of the study was the potential for different approaches to data collection at different senior centers. This was addressed through training of wellness coordinators and educators, site visits and email and telephone support by UGA staff to provide additional information about data collection.

Self-reported responses by participants is also a concern. However, many studies have used self-reported data to examine health behaviors and the validity of self-reported hypertension has been shown to be relatively high in all ethnic-sex groups (Fan et al 2010). In addition, the primary outcome variables of hypertension management behaviors in this study were adapted from a validated questionnaire. Logistic regression models accounted for small percentages of the variability of performance of hypertension management behaviors. This suggests that other factors, besides those examined in this study, may be associated with hypertension management amongst this population. Therefore, more studies are needed to assess other potential characteristics associated with performance of hypertension management behaviors.

Lastly, generalizations of the findings of this study may only be applicable to OAANP participants and congregate meal recipients in Georgia. The use of a convenience sample may have led to a sample population that does not accurately represent the older adult population participating in Georgia senior centers. However participants of OAANP programs in Georgia share many characteristics as other community-dwelling older adults who are looking to delay, prevent or manage chronic disease. In addition, the findings of this study would be valuable to healthcare professionals working with older adults, caregivers and families of older adults who strive to help these individuals maintain quality of life, wellness programs designed to promote the health of community-dwelling older adults, and older adults with hypertension who aim to prevent and/or manage disease and maintain their independence.

In summary, participants did not meet the standards set forth by the DASH diet for fruit, vegetable, whole grains or dairy product consumption. Individuals without hypertension were more likely to report that they engage in recommended levels of physical activity compared to individuals with hypertension. The majority of participants are reducing their salt intake, checking their blood pressure

monthly and refraining from smoking. Future studies should assess the influence of antihypertensive medication and knowledge of hypertension treatment methods on the performance of lifestyle-related hypertension management behaviors. Senior centers and intervention programs such as Live Healthy Georgia have the potential to play a significant role in the performance of hypertension management behaviors and therefore prevent or delay the onset of the health complications associated with high blood pressure. This can improve the overall health and quality of life for older adults attending senior centers in Georgia.

Table 3.1. Characteristics of Older Adults in Georgia Senior Centers, 2007

	n	Participants Mean (SD) Median (95% CI) or %
Do you have high blood pressure?	**796**	
No	213	26.8
Yes	583	73.2
Age (Years)	**796**	75.9 (7.8) 76.0 (75.4-76.6)
60-69	187	23.5
70-79	354	44.5
≥80	255	32.0
Gender	**796**	
Male	146	18.3
Female	650	81.7
Race	**787**	
White	493	62.6
Black	294	37.4
Education (Years)	**782**	10.5 (3.3) 11.0 (10.8-11.2)
0-11	399	51.0
≥12	383	49.0
How would you rate your overall health?	**796**	
Poor	49	6.2
Fair	269	33.8
Good	344	43.2
Very good	105	13.2
Excellent	29	3.6
How often do you get the social and emotional support that you need?	**773**	
Never	49	6.3
Rarely	31	4.0
Sometimes	95	12.3
Usually	170	22.0
Always	428	55.4
Food Security	**751**	
Food secure	603	80.3
Food insecure	148	19.7

Percentages may not add up exactly to 100 due to rounding.

Table 3.2 Characteristics of Participants With and Without Hypertension in Georgia Senior Centers, 2007

	n	Non-Hypertensive Mean (SD) or % (n)	Hypertensive Mean (SD) or % (n)	*p*-value
Age (Years)		77.2 (7.9)	75.4 (7.7)	0.0035
60-69	187	19.3 (36)	80.8 (151)	0.02
70-79	354	27.7 (98)	72.3 (256)	
≥80	255	31.0 (79)	69.0 (176)	
Gender				
Male	146	32.2 (47)	67.8 (99)	NS
Female	650	25.5 (166)	74.5 (484)	
Race				
White	493	31.0 (153)	69.0 (340)	0.0004
Black	294	19.4 (57)	81.0 (237)	
Education (Years)		10.6 (3.6)	10.5 (3.2)	NS
0-11	399	25.3 (101)	75.0 (298)	NS
≥12	383	28.7 (110)	71.3 (273)	
How would you rate your overall health?				
Poor	49	24.5 (12)	75.5 (37)	0.0001
Fair	269	19.3 (52)	80.7 (217)	
Good	344	27.0 (93)	73.0 (251)	
Very good	105	41.0 (43)	59.1 (62)	
Excellent	29	44.8 (13)	55.2 (16)	
How often do you get the social and emotional support that you need?				
Never	49	18.4 (9)	81.6 (40)	NS
Rarely	31	29.0 (9)	71.0 (22)	
Sometimes	95	21.1 (20)	79.0 (75)	
Usually	170	28.0 (47)	72.4 (123)	
Always	428	28.3 (121)	71.7 (307)	
Food Security				0.0417
Food secure	603	28.0 (169)	72.0 (434)	
Food insecure	148	20.2 (30)	79.7 (118)	

Percentages may not add up exactly to 100 due to rounding.

Table 3.3 Performance of Hypertension Management Behaviors by Senior Center Participants in Georgia, 2007

	n	Overall Population Mean (SD) or % (n) Participating in Designated Behaviors
Fruit (servings/day)	781	2.2 (1.3)
(consumed ≥4 servings/day)		12.2 (95)
Vegetables (servings/day)	788	2.8 (1.2)
(consumed ≥4 servings/day)		26.0 (204)
Whole grains (servings/day)	753	1.6 (0.9)
(consumed ≥3 servings/day)		11.0 (82)
Milk (servings/day)	762	1.4 (1.0)
(consumed ≥2 servings/day)		32.6 (248)
Reduce salt intake (% yes)	793	86.8 (688)
Tobacco (% no)	789	92.0 (726)
Check blood pressure (within past month)	794	87.7 (696)
Physical activity	788	50.0 (394)
(at least 30 min./day, 5 days/week)		
Maintain healthy weight (BMI)	742	29.4 (6.6)
(<18.5)		1.5 (11)
(≥18.5-<25)		25.2 (187)
(≥25-<30)		35.4 (263)
(≥30)		38.0 (281)

Percentages may not add up exactly to 100 due to rounding.

Table 3.4 Performance of Hypertension Management Behaviors by Senior Center Participants With and Without Hypertension in Georgia, 2007

	n	Non-Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	*p*-value
Fruit (servings/day)	781	2.1 (1.3)	2.2 (1.3)	NS
(consumed ≥4 servings/day)		13.4 (28)	11.7 (67)	NS
Vegetables (servings/day)	788	2.9 (1.2)	2.8 (1.2)	NS
(consumed ≥4 servings/day)		29.1 (61)	24.7 (143)	NS
Whole grains (servings/day)	753	1.6 (1.0)	1.6 (0.9)	NS
(consumed ≥3 servings/day)		12.9 (26)	10.2 (56)	NS
Milk (servings/day)	762	1.4 (0.9)	1.4 (1.0)	NS
(consumed ≥2 servings/day)		33.8 (68)	32.1 (180)	NS
Reduce salt intake (% yes reduced salt intake)	793	79.7 (169)	89.3 (519)	0.0004
Tobacco use (% no)	789	91.0 (192)	92.4 (534)	NS
Check blood pressure (within past month)	794	85.4 (181)	88.5 (515)	NS
Physical activity (at least 30 min. on 5 days/week)	788	57.6 (122)	47.2 (272)	0.0102
Maintain healthy weight (BMI)	742	27.1 (5.8)	30.2 (6.7)	<0.0001
(<18.5)	11	1.5 (3)	1.5 (8)	<0.0001
(≥18.5-<25)	187	38.5 (77)	20.3 (110)	
(≥25-<30)	263	35.5 (71)	35.4 (192)	
(≥30)	281	24.5 (49)	42.8 (232)	

Percentages may not add up exactly to 100 due to rounding.

Table 3.5 Spearman Correlations among Performance of Hypertension Management Behaviors and Demographics, Emotional Support and Self-Reported Health

	≥4 servings fruit/day (<4/d = 0, ≥4/d = 1) n= 781		**≥4 servings vegetables/day (<4/d = 0, ≥4/d = 1) n = 788**		**≥5 servings fruits and vegetables/day (<5 = 0, ≥5 = 1) n = 778**		**≥2 servings milk/day (<2/d = 0, ≥2/d = 1) n = 762**	
	rho	*p*-value	rho	*p*-value	rho	*p*-value	rho	*p*-value
Do you have high blood pressure? (no = 0, yes = 1)	-	NS	-	NS	-	NS	-	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	-	NS	-0.08	0.0259	-	NS	0.14	0.0002
Gender (Male = 0, Female = 1)	-	NS	-	NS	0.07	0.0371	-0.07	0.0699
Race (White = 1, African American = 2)	-	NS	-0.07	0.0616	-0.14	0.0001	-0.08	0.0306
Education (0 – 11 = 0) (≥12 = 1)	0.06	0.1198	-	NS	0.06	0.0740	-	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.08	0.0202	-	NS	-	NS	-	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.06	0.0757	0.06	0.1132	0.09	0.0151	-	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.5 Spearman Correlations among Performance of Hypertension Management Behaviors and Demographics, Emotional Support and Self-Reported Health

	≥3 servings whole grains/day (<3 = 0, ≥3 = 1) n = 753		**Reduce Salt Intake (no = 0, yes = 1) n = 656**		**Healthy Diet 5 days/week (no = 0, yes = 1) n = 742**		**All Dietary Behaviors (fruit, vegetables, milk, whole grains, reduce salt) n = 606**	
	rho	*p*-value	rho	*p*-value	rho	*p*-value	rho	*p*-value
Do you have high blood pressure? (no = 0, yes = 1)	-	NS	0.15	0.0001	-0.10	0.0094	-	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.06	0.0827	-	NS	0.14	0.0001	-	NS
Gender (Male = 0, Female = 1)	-	NS	0.10	0.0090	-	NS	-	NS
Race (White = 1, African American = 2)	-	NS	0.10	0.0092	-	NS	-	NS
Education (0 – 11 = 0) (≥12 = 1)	-	NS	-	NS	-	NS	-	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-	NS	-	NS	0.13	0.0003	-	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	-	NS	-	NS	0.11	0.0020	0.07	0.0638

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.5 Spearman Correlations among Performance of Hypertension Management Behaviors and Demographics, Emotional Support and Self-Reported Health

	Check Blood Pressure (Past year, 2 years, >2 years, never = 0, monthly = 1) n = 656		**Tobacco Use (yes = 0, no = 1) n = 656**		**Moderate Physical Activity 5 days/week (<5d/wk = 0, ≥5d/wk = 1) n = 734**		**Maintain Healthy Weight, BMI ≥18.5 and <25 (no = 0, yes = 1) n = 656**	
	rho	*p*-value	rho	*p*-value	rho	*p*-value	rho	*p*-value
Do you have high blood pressure? (no = 0, yes = 1)	-	NS	-	NS	-0.10	0.0064	-0.19	<0.0001
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	-	NS	0.07	0.0522	-	NS	0.21	<0.0001
Gender (Male = 0, Female = 1)	-	NS	0.09	0.0246	-	NS	-	NS
Race (White = 1, African American = 2)	-	NS	-0.10	0.0096	-0.07	0.0697	-0.15	0.0002
Education (0 – 11 = 0) (≥12 = 1)	-0.10	0.0077	-	NS	0.07	0.0518	-	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-	NS	-	NS	-	NS	0.06	0.1360
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	-0.09	0.0210	-	NS	0.13	0.0003	-	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.6 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors

	≥4 servings fruit/day (<4/d = 0, ≥4/d = 1) n = 741		**≥4 servings vegetables/day (<4/d = 0, ≥4/d = 1) n = 748**		**≥5 servings fruits and vegetables/day (< 5/d = 0, ≥ 5/d = 1) n= 739**		**≥3 servings whole grains/day (<3 = 0, ≥3 = 1) n = 718**	
	Parameter Estimate ±SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-2.19 ± 0.67	0.0010	-0.04 ± 0.49	NS	0.45 ± 0.44	NS	-2.43 ± 0.70	0.0005
Do you have high blood pressure? (no = 0, yes = 1)	-0.16 ± 0.26	NS	-0.23 ± 0.19	NS	-0.02 ± 0.18	NS	-0.21 ± 0.26	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.03 ± 0.16	NS	-0.24 ± 0.12	0.0367	0.08 ± 0.11	NS	0.27 ± 0.17	0.1079
Gender (Male = 0, Female = 1)	0.07 ± 0.31	NS	0.16 ± 0.22	NS	0.41 ± 0.20	0.0371	0.04 ± 0.31	NS
Race (White = 1, African American = 2)	0.11 ± 0.24	NS	-0.34 ± 0.18	0.0671	-0.62 ± 0.16	0.0001	-0.23 ± 0.26	NS
Education (0 – 11 = 0) (≥12 = 1)	0.30 ± 0.24	NS	0.10 ± 0.17	NS	0.17 ± 0.16	NS	0.20 ± 0.24	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.50 ± 0.26	0.0503	-0.24 ± 0.20	NS	-0.13 ± 0.18	NS	0.26 ± 0.31	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.39 ± 0.25	0.1181	0.23 ± 0.18	NS	0.33 ± 0.16	0.0366	-0.14 ± 0.24	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.6 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors

	≥2 servings milk/day (<2 = 0, ≥2 = 1) n = 726		**Healthy Diet 5 days/week (no = 0, yes = 1) n = 628**		**Reduce Salt Intake (no = 0, yes = 1) n = 628**		**Moderate Physical Activity 5 days/week (<5d/wk = 0, ≥5d/wk = 1) n = 583**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-1.03 ± 0.45	0.0228	-0.17 ± 0.51	NS	-0.22 ± 0.71	NS	-0.13 ± 0.49	NS
Do you have high blood pressure? (no = 0, yes = 1)	0.00039 ± 0.18	NS	-0.23 ± 0 .21	NS	0.86 ± 0.25	0.0006	-0.38 ± 0.19	0.0491
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.40 ± 0.11	0.0004	0.37 ± 0.13	0.0032	0.21 ± 0.17	NS	-0.01 ± 0.12	NS
Gender (Male = 0, Female = 1)	-0.33 ± 0.20	0.0991	-0.02 ± 0.23	NS	0.58 ± 0.28	0.0369	0.06 ± 0.22	NS
Race (White = 1, African American = 2)	-0.24 ± 0.17	NS	-0.11 ± 0.19	NS	0.66 ± 0.30	0.0287	-0.12 ± 0.19	NS
Education (0 – 11 = 0) (≥12 = 1)	0.20 ± 0.17	NS	0.03 ± 0.18	NS	-0.04 ± 0.25	NS	0.34 ± 0.17	0.0491
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.04 ± 0.07	NS	0.51 ± 0.21	0.0132	-0.31 ± 0.32	NS	0.14 ± 0.21	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.05 ± 0.17	NS	0.32 ± 0.18	0.0783	0.16 ± 0.25	NS	0.39 ± 0.17	0.0274

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.6 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors

	Tobacco Use (yes = 0, no = 1) n = 628		**Check Blood Pressure (past year, 2 years, ≥2 years = 0, within past month = 1) n = 628**		**Maintain Healthy Weight, BMI ≥18.5 and <25 (no = 0, yes = 1) n = 628**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	2.38 ± 0.89	0.0072	3.35 ± 0.73	<0.0001	-1.45 ± 0.59	0.0132
Do you have high blood pressure? (no = 0, yes = 1)	0.04 ± 0.36	NS	0.31 ± 0.27	NS	-0.74 ± 0.21	0.0003
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.46 ± 0.22	0.0396	-0.27 ± 0.17	0.1099	0.68 ± 0.14	<0.0001
Gender (Male = 0, Female = 1)	0.91 ± 0.35	0.0097	-0.04 ± 0.32	NS	0.16 ± 0.25	NS
Race (White = 1, African American = 2)	-0.76 ± 0.33	0.0205	-0.42 ± 0.26	0.1163	-0.75 ± 0.24	0.0016
Education (0 – 11 = 0) (≥12 = 1)	-0.25 ± 0.33	NS	-0.68 ± 0.26	0.0081	0.04 ± 0.20	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	0.09 ± 0.36	NS	0.29 ± 0.28	NS	0.13 ± 0.25	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	-0.53 ± 0.34	0.1225	-0.47 ± 0.27	0.0835	0.08 ± 0.21	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.7 Logistic Regression Analysis of Characteristics Associated with Performance of ≥2 Dietary Management Behaviors and ≥4 Total Hypertension Management Behaviors in Georgia Senior Center Participants, 2007

	≥2 dietary behaviors (fruit, vegetables, milk, whole grains, reduce salt) (<2 = 0, ≥2 = 1) n = 583		**≥4 all behaviors (fruit, vegetables, milk, whole grains, reduce salt, tobacco, check blood pressure, physical activity, maintain healthy weight) (<4 = 0, ≥4 = 1) n = 583**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-0.15 ± 0.49	NS	0.53 ± 0.50	NS
Do you have high blood pressure? (no = 0, yes = 1)	0.21 ± 0.19	NS	-0.26 ± 0.20	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.15 ± 0.12	NS	-0.27 ± 0.12	0.0269
Gender (Male = 0, Female = 1)	0.03 ± 0.22	NS	-0.29 ± 0.22	NS
Race (White = 1, African American = 2)	-0.34 ± 0.19	0.0763	-0.17 ± 0.20	NS
Education (0 – 11 = 0) (≥12 = 1)	0.12 ± 0.17	NS	0.36 ± 0.18	0.0444
How often do you get the social and emotional support you need? (Never, rarely, sometimes =0) (Usually, always = 1)	-0.11 ± 0.20	NS	0.02 ± 0.21	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.30 ± 0.17	0.0885	0.33 ± 0.18	0.0655
Food Security (Food secure = 0) (Food insecure = 1)	0.10 ± 0.22	NS	-0.22 ± 0.23	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p < 0.1$ and < 0.15 was considered a weak trend; NS, not significant. Only ≥4 servings fruit and ≥4 servings vegetables were included in totaled behaviors.

Table 3.8 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors in Hypertensive Georgia Senior Center Participants, 2007

	≥4 servings fruit/day (<4/d = 0, ≥4/d = 1) n = 426		**≥4 servings vegetables/day (<4/d = 0, ≥4/d = 1) n = 426**		**≥5 servings fruits and vegetables/day (< 5/d = 0, ≥ 5/d = 1) n = 426**		**≥3 servings whole grains/day (<3 = 0, ≥3 = 1) n = 426**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-2.81 ± 0.72	<0.0001	0.21 ± 0.54	NS	0.35 ± 0.48	NS	-2.28 ± 0.77	0.0031
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.09 ± 0.18	NS	-0.34 ± 0.13	0.0110	0.11 ± 0.12	NS	0.11 ± 0.19	NS
Gender (Male = 0, Female = 1)	0.09 ± 0.34	NS	0.20 ± 0.26	NS	0.43 ± 0.22	0.0550	-0.01 ± 0.34	NS
Race (White = 1, African American = 2)	0.21 ± 0.27	NS	-0.54 ± 0.22	0.0135	-0.70 ± 0.19	0.0002	-0.26 ± 0.31	NS
Education (0 – 11 = 0) (≥12 = 1)	0.25 ± 0.26	NS	0.01 ± 0.20	NS	0.13 ± 0.18	NS	0.40 ± 0.28	0.1488
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.16 ± 0.30	NS	-0.21 ± 0.23	NS	-0.02 ± 0.21	NS	0.35 ± 0.35	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.50 ± 0.27	0.0670	0.26 ± 0.20	NS	0.36 ± 0.18	0.0406	-0.32 ± 0.27	NS

p < 0.05 was considered significant; p > 0.05 and < 0.1 was considered a trend; p > 0.1 and < 0.15 was considered a weak trend; NS, not significant.

Table 3.8 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors in Hypertensive Georgia Senior Center Participants, 2007

	≥2 servings milk/day (<2/d = 0, ≥2/d = 1) n = 426		**Reduce Salt (no=0, yes=1) n = 426**		**Healthy Diet 5 days/week (no = 0, yes = 1) n = 426**		**Check Blood Pressure (Past year, 2 years, >2 years, never = 0, monthly = 1) n = 426**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-1.29 ± 0.54	0.0163	0.57 ± 0.69	NS	-0.44 ± 0.51	NS	3.31 ± 0.76	<0.0001
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.51 ± 0.13	<0.0001	0.15 ± 0.17	NS	0.38 ± 0.13	0.0035	-0.14 ± 0.18	NS
Gender (Male = 0, Female = 1)	0.44 ± 0.23	0.0540	0.56 ± 0.29	0.0493	-0.06 ± 0.24	NS	0.01 ± 0.34	NS
Race (White = 1, African American = 2)	-0.37 ± 0.21	0.0738	0.68 ± 0.30	0.0248	-0.06 ± 0.20	0.0272	-0.39 ± 0.28	NS
Education (0 – 11 = 0) (≥12 = 1)	0.15 ± 0.19	NS	-0.14 ± 0.25	NS	0.01 ± 0.19	NS	-0.69 ± 0.28	0.0135
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	0.15 ± 0.23	NS	-0.41 ± 0.33	NS	0.60 ± 0.21	0.0055	0.23 ± 0.30	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.08 ± 0.19	NS	0.12 ± 0.25	NS	0.29 ± 0.19	0.1263	-0.43 ± 0.28	0.1282

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.8 Logistic Regression Analysis of Characteristics Associated with Performance of Hypertension Management Behaviors in Hypertensive Georgia Senior Center Participants, 2007

	Tobacco Use (yes = 0, no = 1) n = 426		**Moderate Physical Activity 5 days/week (<5d/wk = 0, ≥5d/wk = 1) n = 426**		**Maintain Healthy Weight, BMI ≥18.5 and <25 (no = 0, yes = 1) = 426**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	2.64 ± 0.89	0.0030	-0.40 ± 0.47	NS	-2.49 ± 0.74	0.0008
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.39 ± 0.23	0.0954	0.01 ± 0.12	NS	0.75 ± 0.19	<0.0001
Gender (Male = 0, Female = 1)	1.0 ± 0.37	0.0064	0.04 ± 0.22	NS	0.48 ± 0.36	NS
Race (White = 1, African American = 2)	-0.89 ± 0.34	0.0090	-0.16 ± 0.18	NS	-0.89 ± 0.30	0.0035
Education (0 – 11 = 0) (≥12 = 1)	-0.39 ± 0.34	NS	0.35 ± 0.17	0.0439	0.29 ± 0.26	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	0.17 ± 0.37	NS	0.15 ± 0.21	NS	0.16 ± 0.33	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	-0.43 ± 0.35	NS	0.42 ± 0.17	0.0146	-0.06 ± 0.26	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Table 3.9 Logistic Regression Analysis of Characteristics Associated with Performance of ≥2 Dietary Management Behaviors and ≥4 Total Hypertension Management Behaviors in Hypertensive Georgia Senior Center Participants, 2007

	≥2 dietary behaviors (fruit, vegetables, milk, whole grains, reduce salt) (<2 = 0, ≥2 = 1) n = 583		**≥4 all behaviors (fruit, vegetables, milk, whole grains, reduce salt, tobacco, check blood pressure, physical activity, maintain healthy weight) (<4 = 0, ≥4 = 1) n = 583**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-0.25 ± 0.54	NS	0.53 ± 0.50	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.21 ± 0.14	NS	-0.27 ± 0.12	0.0269
Gender (Male = 0, Female = 1)	0.26 ± 0.27	NS	-0.29 ± 0.22	NS
Race (White = 1, African American = 2)	-0.52 ± 0.22	0.0178	-0.17 ± 0.20	NS
Education (0 – 11 = 0) (≥12 = 1)	0.19 ± 0.20	NS	0.36 ± 0.18	0.0444
How often do you get the social and emotional support you need? (Never, rarely, sometimes =0) (Usually, always = 1)	0.10 ± 0.24	NS	0.02 ± 0.21	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.35 ± 0.20	0.0821	0.33 ± 0.18	0.0655
Food Security (Food secure = 0) (Food insecure = 1)	0.24 ± 0.26	NS	-0.22 ± 0.23	NS

p < 0.05 was considered significant; p >0.05 and < 0.1 was considered a trend; p > 0.1 and < 0.15 was considered a weak trend; NS, not significant. Only ≥4 servings fruit and ≥4 servings vegetables were included in totaled behaviors.

CHAPTER 4

CONCLUSION

The primary goal of this study was to assess performance of hypertension management behaviors by older adults participating in Georgia senior centers. The first specific aim of this study was to determine the level of performance of individual and totaled hypertension management behaviors. The first hypothesis was that having hypertension would be associated with a higher level of performance of lifestyle-related disease management behaviors (follow a healthy diet, reduce sodium intake, maintain a healthy weight and engage in physical activity) because of the nutrition, physical activity and wellness programs offered at most senior centers on a regular basis. The second specific aim of this study was to identify the disease management behaviors most in need of intervention for individuals with hypertension and those without hypertension. The second hypothesis was that older adults were more likely to reduce sodium intake, have their blood pressure checked and avoid smoking than they were to consume fruits and vegetables, engage in physical activity and maintain a healthy weight. The third specific aim of this study was to identify characteristics associated with performance of disease management behaviors by older adults with hypertension and those without hypertension. The third hypothesis was that higher self-reported health, self-reported hypertension, receipt of some form of support and more years of education would be positively associated with performance of disease management behaviors, while food insecurity and African American ethnicity would be negatively associated with behaviors of all older adult participants.

This study provides evidence that older adults are not meeting the recommendations for fruit, vegetables, whole grains or milk consumption, which is consistent with the literature (Fan et al 2010; Forman et al 2009; Lancaster 2004; Lancaster et al 2004; O'Neil et al 2010). This indicates the need for further nutrition education for both those with and without hypertension. For older adults with hypertension, dietary management is an important step to controlling blood pressure and to delay or

prevent the onset of health complications associated with high blood pressure (Conlin et al 2000; Fan et al 2010; Fung et al 2008; Sacks et al 2001). For older adults who did not report hypertension, consuming a healthy diet is essential to prevent the development of high blood pressure, especially because this age group is at high risk for hypertension (Appel et al 2010; Fung et al 2008; Lancaster et al 2004). The majority of participants reported that they reduce their salt intake, have their blood pressure checked and refrain from tobacco use. Those without hypertension were more likely to engage in recommended amounts of physical activity and maintain a healthy weight.

Different characteristics were associated with performance of hypertension management behaviors, supporting the principle that hypertension management is a complex regimen of behaviors. Older age was associated with lower BMI. Being African American was negatively associated with maintaining a healthy weight and consuming ≥5 servings of fruits and vegetables per day and positively associated with reducing salt intake. Participants with more education were more likely to perform more hypertension management behaviors. Emotional support was significantly associated with consuming a healthy diet 5 or more days per week and higher self-reported health was associated with participation in physical activity and consumption of ≥5 servings of fruits and vegetables per day. More studies, including longitudinal studies, are needed to determine characteristics associated with performance of hypertension behaviors by OAANP participants.

This study contributes to a better understanding of hypertension management by older adults attending Georgia senior centers. Hypertension is a serious health problem, especially in older adults. Uncontrolled blood pressure can lead to cardiovascular disease, kidney failure, stroke and premature death. In 2010, hypertension was estimated to cost the United States $93.5 billion in health care services, medications and missed days of work (CDC 2012). Many complications can be prevented with comprehensive management of blood pressure, and prevention and management of hypertension leads to decreased health care costs. Despite progress in the prevention, detection and treatment of high blood pressure, only 37% of U.S. adults with hypertension have their blood pressure under control (Krousel-Wood et al 2010). Senior centers and programs provided through senior centers, such as congregate

meals, may help older adults manage their blood pressure through the nutrition and health and wellness programs offered on a regular basis. This study provides valuable information to policy makers concerning future funding and program development needed to reduce the burden of hypertension among older adults participating in OAANP programs. Along with hypertension management, these programs emphasize the importance of preventing, delaying and managing chronic diseases associated with aging (AoA 2011). Rising health care costs are largely related to chronic diseases in which nutrition intervention have proven to be effective (Hendrix et al 2008). Appropriate food and nutrition programs for older adults include adequately funded food assistance and meal programs, nutrition education, screening and counseling to ensure more healthful aging (Lee et al 2010). The increasing number of older adults and the healthcare focus on prevention and management of chronic disease accentuate the need for these programs (AoA 2011). Due to limited resources, these services need to be targeted and tailored toward health problems seen in older adults and to the behaviors most in need of intervention in order to help older adults improve their quality of life and maintain their independence.

Future research and intervention programs for older adults with hypertension should be tailored to meet the needs of these individuals. Particularly in this population, there was low consumption of fruit and whole grains. Future interventions should assess the barriers to consumption and aim to increase intake of fruit and whole grains among this population. Future studies should also examine the relationship between antihypertensive medication and performance of lifestyle-related hypertension management behaviors among older adults participating in senior center programs.

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APPENDICES

APPENDIX A

PARTICIPANT CONSENT FORM

PRE-TEST

To be completed in November/December 2007
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 8-9-08

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

APPENDIX B

LIVE HEALTHY GEORGIA QUESTIONNAIRE

LIVE HEALTHY GEORGIA

Name of Interviewer:		Line 1
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	7 Don't know/ not

	2) Usually 5) Never 3) Sometimes	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		

Read Questions to Participants and Circle their Answers		
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 **CDC,** http://www.cdc.gov/CDC/questionnaires/pdf-ques/2005CDC.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 THOUGHS 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	

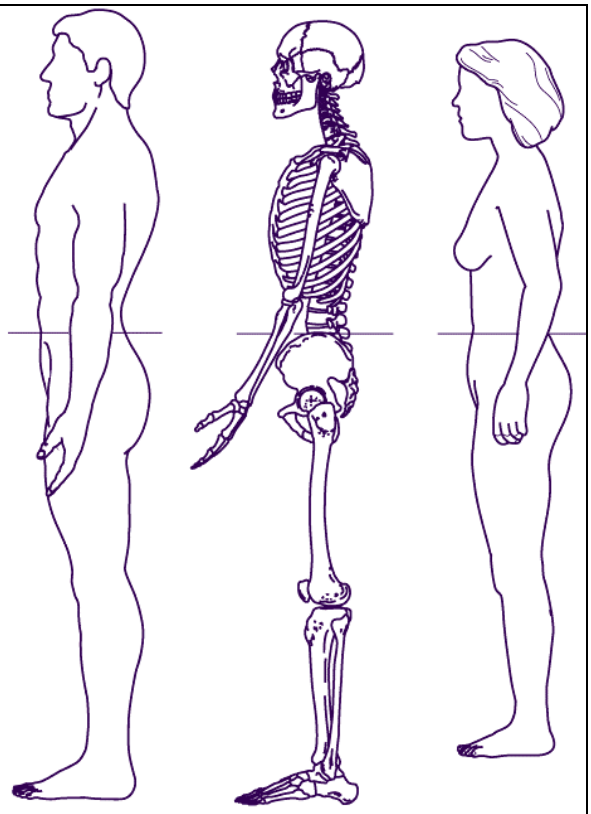
WAIST CIRCUMFERENCE:
Instructions for Measuring Waist Circumference

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 3 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

APPENDIX C

POWER ANALYSIS

Power Analysis

Adequate power is considered to be power = 0.80 and alpha = 0.05 and an online power calculator was used (Researcher's Toolkit 2010). The projected number of participants is 798. From ongoing and previous studies, the projected sample size of participants with hypertension is approximately 574 and without hypertension is approximately 224. This sample size is adequate to show an 11 percentage point difference between hypertensive and non-hypertensive participants who engage in at least 30 minutes a day most (5 or more) days of the week (80% power, alpha = 0.05), a measure that is considered to be one of the most variable of the hypertension management behaviors (Clune et al 2010; Fitzpatrick et al 2008; Hendrix et al 2008; Johnson et al 2007; Zack 2010). For example, if there were 798 participants of which 72% reported having high blood pressure (n = 574), and 50% of the hypertensive participants engaged in at least 30 minutes of physical activity most days of the week, while 39% of the non-hypertensive adults (n = 224) engaged in physical activity 3 days per week, then the current sample has 80.3% power to detect this 11% difference between groups.

APPENDIX D

FREQUENCY ANALYSIS OF FRUIT, VEGETABLE, WHOLE GRAIN AND MILK CONSUMPTION AND PERFORMANCE OF DIETARY AND TOTAL HYPERTENSION MANAGEMENT BEHAVIORS

Appendix D. Frequency Analysis of Fruit, Vegetable, Whole Grain and Milk Consumption among Georgia Senior Centers, 2007

	n	Participants % (n) Participating in Designated Behaviors
Fruit	**781**	
0 servings	53	6.8 (53)
1 serving	193	24.7 (193)
2 servings	254	32.5 (254)
3 servings	186	23.8 (186)
4 servings	55	7.0 (55)
5 servings	25	3.2 (25)
6 servings	6	0.8 (6)
7 servings	9	1.2 (9)
Vegetables	**788**	
0 servings	5	0.6 (5)
1 serving	79	10.0 (79)
2 servings	273	34.6 (273)
3 servings	227	28.8 (227)
4 servings	140	17.8 (140)
5 servings	50	6.4 (50)
6 servings	11	1.4 (11)
7 servings	3	0.4 (3)
Whole grains	**753**	
0 servings	30	4.0 (30)
>0 and <1 servings	139	18.5 (139)
≥1 and < 1.5 servings	219	29.1 (219)
≥1.5 and <2 servings	68	9.0 (68)
≥2 servings and <3 servings	215	29.0 (215)
≥3 servings	82	11.0 (82)
Milk	**762**	
0 servings	74	9.7 (74)
>0 and <1 serving	165	22.0 (165)
≥1 and <2 servings	275	36.1 (275)
≥2 and <3 servings	186	24.4 (186)
≥3 servings	62	8.1 (62)

Percentages may not add up exactly to 100 due to rounding.

Appendix D. Frequency Analysis of Dietary Management Behaviors by Senior Center Participants With and Without Hypertension in Georgia, 2007

	n	Non-Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	*p*-value
Fruit	781	2.1 (1.3)	2.2 (1.3)	NS
Consumed 0 servings/day		8.1 (17)	6.3 (36)	
Consumed ≥1 servings/day		92.0 (192)	93.7 (536)	
Consumed ≥2 servings/day		65.6 (137)	69.6 (398)	
Consumed ≥3 servings/day		38.3 (80)	35.1 (201)	
Consumed ≥4 servings/day		13.4 (28)	11.7 (67)	
Consumed ≥5 servings/day		2.9 (6)	5.9 (34)	
Consumed ≥6 servings/day		1.0 (2)	2.3 (13)	
Consumed ≥7 servings/day		0.0 (0)	1.6 (9)	
Vegetables	788	2.9 (1.2)	2.8 (1.2)	NS
Consumed 0 servings/day		0.5 (1)	0.7 (4)	
Consumed ≥1 servings/day		99.5 (209)	99.3 (574)	
Consumed ≥2 servings/day		89.1 (187)	89.5 (517)	
Consumed ≥3 servings/day		59.5 (125)	53.0 (306)	
Consumed ≥4 servings/day		29.1 (61)	24.8 (143)	
Consumed ≥5 servings/day		9.1 (19)	7.8 (45)	
Consumed ≥6 servings/day		1.9 (4)	1.7 (10)	
Consumed ≥7 servings/day		0.5 (1)	0.4 (2)	
Whole grains	753	1.6 (1.0)	1.6 (0.9)	NS
Consumed 0 servings/day		4.0 (8)	4.0 (22)	
Consumed ≥1 servings/day		77.7 (157)	77.5 (427)	
Consumed ≥2 servings/day		42.6 (86)	38.3 (211)	
Consumed ≥3 servings/day		12.9 (26)	10.2 (56)	
Milk	762	1.4 (0.9)	1.4 (1.0)	NS
Consumed 0 servings/day		6.0 (12)	11.1 (62)	
Consumed ≥1 servings/day		70.7 (142)	67.9 (381)	
Consumed ≥2 servings/day		33.8 (68)	32.1 (180)	
Consumed ≥3 servings/day		9.0 (18)	7.8 (44)	

Percentages may not add up exactly to 100 due to rounding.

Appendix D. Frequency Analysis of Performance of Dietary and Totaled Hypertension Management Behaviors by Senior Center Participants With and Without Hypertension in Georgia, 2007

	n	Non-Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	Hypertensive Mean (SD) or % (n) Participating in Designated Behaviors	*p*-value
Dietary Management Behaviors	656			0.0063
0 behaviors		10.8 (19)	5.0 (24)	
1 behaviors		39.8 (70)	42.7 (205)	
2 behaviors		26.1 (46)	36.0 (173)	
3 behaviors		19.3 (34)	12.5 (60)	
4 behaviors		4.0 (7)	3.1 (15)	
5 behaviors		0 (0)	0.6 (3)	
Totaled Hypertension Management Behaviors	656			NS
0 behaviors		1.1 (2)	0.2 (1)	
1 behaviors		0 (0)	0.8 (4)	
2 behaviors		5.7 (10)	6.7 (32)	
3 behaviors		19.3 (34)	21.5 (103)	
4 behaviors		28.4 (50)	35.8 (172)	
5 behaviors		22.7 (40)	21.9 (105)	
6 behaviors		16.5 (29)	9.4 (45)	
7 behaviors		4.6 (8)	2.9 (14)	
8 behaviors		1.7 (3)	0.6 (3)	
9 behaviors		0 (0)	0.2 (1)	

Percentages may not add up exactly to 100 due to rounding; Dietary management behaviors included daily consumption of ≥4 servings fruit, ≥4 servings vegetables, ≥3 servings whole grains, ≥2 servings milk and reducing salt intake; Totaled hypertension management behaviors included dietary management behaviors in addition to refaint from tobacco use, participation in at least 30 minutes of physical activity 5 days/week, checking blood pressure within past month and maintaining a healthy weight.

APPENDIX E

LOGISTIC REGRESSION ANALYSIS OF REDEFINED DIETARY HYPERTENSION MANAGEMENT BEHAVIORS

Appendix E1. Logistic Regression Analysis of Characteristics Associated with Performance of Redefined Dietary Hypertension Management Behaviors by Georgia Senior Center Participants, 2007

	≥2 servings fruit/day (<2/d = 0, ≥2/d = 1) n = 583		**≥2 servings whole grains/day (<2/d = 0, ≥2/d = 1) n = 583**		**≥2 dietary behaviors (fruit, vegetables, milk, whole grains, reduce salt) (0=<2, 1=≥2) n = 583**		**≥4 all behaviors (fruit, vegetables, milk, whole grains, reduce salt, tobacco, check blood pressure, physical activity, maintain healthy weight) (1 = <4, 2 = ≥4) n = 583**	
	Parameter Estimate ±SE	*p*-value	Parameter Estimate ±SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-0.35 ± 0.52	NS	-0.10 ± 0.50	NS	0.73 ± 0.61	NS	0.53 ± 0.50	NS
Do you have high blood pressure? (no = 0, yes = 1)	0.13 ± 0.21	NS	-0.25 ± 0.19	NS	0.17 ± 0.24	NS	-0.26 ± 0.20	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.35 ± 0.13	0.0046	0.14 ± 0.12	NS	0.24 ± 0.15	0.1077	-0.27 ± 0.12	0.0269
Gender (Male = 0, Female = 1)	0.43 ± 0.23	0.0689	-0.33 ± 0.22	NS	0.28 ± 0.27	NS	-0.29 ± 0.22	NS
Race (White = 1, African American = 2)	-0.14 ± 0.20	NS	-0.19 ± 0.20	NS	-0.31 ± 0.23	NS	-0.17 ± 0.20	NS
Education (0 – 11 = 0) (≥12 = 1)	0.21 ± 0.19	NS	0.12 ± 0.18	NS	0.14 ± 0.22	NS	0.36 ± 0.18	0.0444
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.28 ± 0.22	NS	0.04 ± 0.21	NS	0.04 ± 0.25	NS	0.02 ± 0.21	NS

Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.37 ± 0.19	0.0453	-0.02 ± 0.18	NS	0.21 ± 0.22	NS	0.33 ± 0.18	0.0655
Food Security (Food secure = 0) (Food insecure = 1)	0.23 ± 0.24	NS	-0.03 ±0.23	NS	0.24 ± 0.28	NS	-0.22 ± 0.23	NS

$p < 0.05$ was considered significant; $p > 0.05$ and < 0.1 was considered a trend; $p > 0.1$ and < 0.15 was considered a weak trend; NS, not significant.

Appendix E2. Logistic Regression Analysis of Characteristics Associated with Performance of Redefined Dietary Hypertension Management Behaviors in Hypertensive Georgia Senior Center Participants, 2007

	≥2 servings fruit/day (<2/d = 0, ≥2/d = 1) n = 426		**≥2 servings whole grains/day (<2/d = 0, ≥2/d = 1) n = 426**		**≥2 dietary behaviors (fruit, vegetables, milk, whole grains, reduce salt) (0=<2, 1=≥2) (0=<2, 1=≥2) n = 426**		**≥4 all behaviors (fruit, vegetables, milk, whole grains, reduce salt, tobacco, check blood pressure, physical activity, maintain healthy weight) (1 = <4, 2 = ≥4) n = 426**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	-0.77 ± 0.59	NS	-0.28 ± 0.56	NS	0.75 ± 0.68	NS	-0.13 ± 0.56	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.36 ± 0.15	0.0173	0.15 ± 0.14	NS	0.19 ± 0.18	NS	-0.15 ± 0.14	NS
Gender (Male = 0, Female = 1)	0.53 ± 0.27	0.0532	-0.39 ± 0.27	NS	0.26 ± 0.32	NS	-0.12 ± 0.27	NS
Race (White = 1, African American = 2)	0.04 ± 0.23	NS	-0.24 ± 0.23	NS	-0.28 ± 0.27	NS	-0.27 ± 0.23	NS
Education (0 – 11 = 0) (≥12 = 1)	0.27 ± 0.22	NS	0.06 ± 0.21	NS	0.12 ± 0.26	NS	0.50 ± 0.21	0.0153
How often do you get the social and emotional support you need? (Never, rarely, sometimes = 0) (Usually, always = 1)	-0.17 ± 0.26	NS	0.13 ± 0.25	NS	0.19 ± 0.29	NS	0.02 ± 0.25	NS
Self-Reported Health (Poor, fair = 0) (Good, very good, excellent = 1)	0.51 ± 0.21	0.0168	-0.10 ± 0.21	NS	0.44 ± 0.25	0.0775	0.51 ± 0.21	0.0149

Food Security (Food secure = 0) (Food insecure = 1)	0.23 ± 0.28	NS	0.08 ± 0.27	NS	0.32 ± 0.33	NS	-0.27 ± 0.27	NS

p < 0.05 was considered significant; p > 0.05 and < 0.1 was considered a trend; p > 0.1 and < 0.15 was considered a weak trend; NS, not significant. Only ≥4 servings fruit and ≥4 servings vegetables were included in totaled behaviors.

APPENDIX F

LOGISTIC REGRESSION ANALYSIS OF CHARACTERISTICS, EXCLUDING SELF-REPORTED HEALTH, ASSOCIATED WITH PERFROMANCE OF DIETARY AND TOTAL HYPERTENSION MANAGEMENT BEHAVIORS

Appendix F. Logistic Regression Analysis of Characteristics, Excluding Self-Reported Health, Associated with Performance of ≥2 Dietary Management Behaviors and ≥4 Total Hypertension Management Behaviors by Georgia Senior Center Participants, 2007

	≥2 dietary behaviors (fruit, vegetables, milk, whole grains, reduce salt) (<2 = 0, ≥2 = 1) n = 583		**≥4 all behaviors (fruit, vegetables, milk, whole grains, reduce salt, tobacco, check blood pressure, physical activity, maintain healthy weight) (<4 = 0, ≥4 = 1) n = 583**	
	Parameter Estimate ± SE	*p*-value	Parameter Estimate ± SE	*p*-value
Intercept	0.02 ± 0.54	NS	0.30 ± 0.50	NS
Age (60-69 years = 1) (70-79 years = 2) (≥80 years = 3)	0.17 ± 0.14	NS	0.17 ± 0.12	NS
Gender (Male = 0, Female = 1)	0.15 ± 0.27	NS	0.22 ± 0.22	0.0810
Race (White = 1, African American = 2)	-0.35 ± 0.22	0.0178	-0.29 ± 0.20	NS
Education (0 – 11 = 0) (≥12 = 1)	0.16 ± 0.20	0.0644	0.12 ± 0.18	NS
How often do you get the social and emotional support you need? (Never, rarely, sometimes =0) (Usually, always = 1)	-0.10 ± 0.24	NS	-0.04 ± 0.21	NS
Food Security (Food secure = 0) (Food insecure = 1)	0.09± 0.26	NS	-0.20 ± 0.23	NS

p < 0.05 was considered significant; p > 0.05 and < 0.1 was considered a trend; p > 0.1 and < 0.15 was considered a weak trend; NS, not significant; Only ≥4 servings fruit and ≥4 servings vegetables were included in totaled behaviors.