PERFORMANCE OF DIABETES SELF-MANAGEMENT BEHAVIORS

BY OLDER ADULTS IN GEORGIA SENIOR CENTERS

by

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(Under the direction of Joan G. Fischer)

ABSTRACT

This study examined the performance levels and predictors of diabetes self-management (DSM) behaviors in older adults in senior centers from 12 Georgia Area Agencies on Aging. Participants were a convenience sample (N = 240, mean age = 74 years, 78% female, 51% Caucasian, 49% African American), and participants' levels of DSM behaviors were assessed using questions from the Summary of Diabetes Self-Care Activities, a validated self-report tool (Toobert et al., 2000). The questions assess current physical activity and personal self-care behaviors and were recorded as number of days of the past week the behavior was performed. Tobacco use was also assessed. The mean days of performance by participants were higher for medically-related DSM behaviors (testing blood glucose (BG), taking medications, and checking feet) than for lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and participating in at least 30 minutes of moderate physical activity (PA)). The percentage of participants performing behaviors at a high level (performing a behavior on 5 or more days of the past week) was recorded: 66% for following a healthy diet, 42% for spacing carbohydrates, 45% for being moderately active (≥ 30 min), 73% for testing blood glucose, 97.5% for taking medications, and 65% for checking feet. Tobacco use was recorded in 6% of participants. Only

11% reported performing all DSM behaviors at a high level. The association of predictors, including age, gender, race, education, self-reported health, social and emotional support, and food security, with performance of DSM behaviors was examined using logistic regression. Older adults reported performing medically-related behaviors more frequently than life-style related behaviors. Receiving more social and emotional support was strongly associated with performing more DSM behaviors at a high level. This study provides knowledge about DSM and its predictors in vulnerable older adults in Georgia senior centers. This information can be used for planning and developing future programs needed to reduce the burden of diabetes complications among vulnerable older adults.

INDEX WORDS: Diabetes Self-Management, Diabetes Self-Management Behaviors, Performance of Diabetes Self-Management, Diabetes Self-Management Predictors, Older Americans Act Nutrition Program, Senior Center.

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DEDICATION

This work is dedicated to my husband, for his never ending support through this process. I could not have done this without him. Well, I could have, but it would not have been as fun. To my dad, for always believing in me, and to my sister, who is an inspirational woman, wife, mother, and professional.

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CHAPTER 1

INTRODUCTION

The population of older adults in the U.S. is expected to more than double within the next four decades (NCHS, 2010). Chronic diseases are expected to increase along with the aging population. Diabetes is a serious problem in the U.S., Georgia and particularly in older adults. While 18% of older adults in the U.S. have diabetes, approximately 23% of older adults in Georgia have this disease (CDC NDSS, 2010a). Type 2 diabetes accounts for 90% to 95% of all diagnosed cases of diabetes in older adults (CDC, 2008). If diabetes is not managed it can lead to serious health complications and health care costs. Chronic diabetes-related complications account for a third of the total national economic cost ($174 billion) of diabetes, and include kidney disease, blindness, heart attack and stroke, dental disease, and amputations (ADA, 2008a). Diabetes self-management (DSM) is a complex regimen of behaviors that contribute to glycemic control, help monitor the effect of other behaviors, or help prevent complications. DSM behaviors include following a healthy diet, spacing carbohydrates, participating in moderate physical activity, testing blood glucose (BG), taking diabetes medications, and checking feet. Refraining from tobacco use is also part of DSM. The goal of DSM is to maintain blood glucose levels, prevent the development of diabetes complications, and improve quality of life for those with diabetes (Goodall & Halford, 1991). Those that participate in DSM behaviors accrue fewer total disease-related health care costs than those who do not participate in DSM behaviors (Touchette & Shapiro, 2008).

Promoting the health and well-being of older individuals and delaying adverse health conditions through access to nutrition and other disease prevention and health promotion services is one of the purposes of the Older Americans Act Nutrition Program (O'Shaughnessy, 2008; AoA, 2009a). Older adults receive the services of congregate meals, nutrition screening, education and counseling, and other supportive and health services at senior centers managed by local Area Agencies on Aging (AAA's). Diabetes was reported by approximately 33% of participants in Georgia senior centers at the end of 2007; this is ten percentage points higher than all older adults ages 65-74 year olds and ≥ 75 years old in Georgia (CDC NDSS, 2010a).

Predictors of DSM include age, gender, race, education, social and emotional support, self-reported health, and food security. Studies are inconclusive as to whether demographic factors (age, gender, race, and education) are associated with performance of diabetes self-management (Glasgow et al., 1997; Ruggiero et al., 1997). Social and emotional support improves DSM in older adults and fosters positive effects on health and longevity in older adults (Banerjee et al., 2010). Managing diabetes can be stressful, and having access to support when needed may provide a coping mechanism and result in better self-management in older adults with diabetes (Tuncay et al., 2008). Self-reported health is used to assess perceived health of an individual and has been associated with health outcomes (Banerjee et al., 2010). There are many aspects of health that may affect the likelihood of performing diabetes self-management behaviors. Food security (FS) 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 (Bickel et al., 2000). Adults with diabetes report higher rates of food insecurity compared to those without diabetes. Understanding the effect of factors such as age, gender, race, education, self-reported health, social and emotional support, and food

security status on performance levels of DSM behaviors may provide knowledge to better target services towards older adults with diabetes.

The goal of the present study was to determine performance levels of DSM behaviors and their predictors in older adults attending senior centers throughout Georgia. It was hypothesized that demographic factors, self-reported health, social and emotional support, and food security would be associated with performance of DSM. An important finding of this study was that performance levels of DSM behaviors were higher in this sample than in other samples of adults with diabetes, with the exception of checking feet (Katon et al., 2010; Glasgow et al., 1992; Rosland et al., 2008; Speer et al., 2008; Redmond et al., 2006). However, only 11% performed all behaviors at a high level. Older adults reported performing medically-related behaviors more frequently than life-style related behaviors. Each DSM behavior had a different set of predictors, reinforcing that DSM is a complex regimen of varied behaviors. Receiving more social and emotional support was strongly associated with performing more DSM behaviors at a high level.

Chapter 2 is a review of literature outlining the seriousness of diabetes in older adults, the DSM behaviors and their importance for glycemic control or complication prevention, the predictors of DSM that are commonly found in literature, and a review of the diabetes self-management studies conducted in older adults participating in Georgia senior centers.

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

Chapter 4 summarizes the major findings and conclusions about performance of diabetes self-management found in this study.

CHAPTER 2

LITERATURE REVIEW

A Growing Older Adult Population

The population of older adults ages 65 and older in the U.S. is expected to more than double within the next four decades from an estimated 40 million to almost 90 million (NCHS, 2010). Currently, those 60 years and older make up 15% of Georgia's population and concurrent with the national population, this population is expected to grow to 21% by 2030 (AoA, 2009b). Over the past one hundred years, life expectancy has increased, partly due to medical advances in the 20th century that decreased death from acute infections, especially in the older population (USDHHS, 2000; Gorina & Lentzner, 2005). The average life expectancy for those that reach 65 years of age is an additional 18.2 years. As the population has aged and continued to live longer, chronic diseases, including heart disease and diabetes, have replaced acute infections as the major causes of death in this group. Diabetes is the 5th leading cause of death (as of 2006) for the age group 65-84 years (Gorina & Lentzner., 2008). Preceding death, an increasing life expectancy brings many years of diabetes, its complications, and expensive health care bills. The rising prevalence of chronic diseases and their complications has turned America's attention toward disease prevention and disease management measures.

Diabetes Statistics

Diabetes is the sixth and seventh leading cause of death in the United States and Georgia, respectively (Heron & Tejada-Vera, 2009). In 2007, 23.6 million Americans had diabetes- 7.8% of the population (NCCDPHP DDT, 2008). Georgia's high prevalence of diabetes (15.0% in GA

vs. 7.8% in the U.S.) may be due to high rates of overweight/obesity and physical inactivity, and a larger African American population – all risk factors for diabetes (Hosey et al., 1998; ADA, 2010f; GaDHR, 2008; NCCDPHP DDT, 2008). Diabetes continues to drain Georgia's resources by contributing to morbidity, hospitalizations, lost productivity, and a number of health complications. Chronic diabetes-related complications account for a third of the total national economic cost ($174 billion) of diabetes, and include kidney disease, blindness, heart attack and stroke, dental disease, and amputations (ADA, 2008a). The risk of diabetes and its complications increases with age. For example, in Georgia, the percentage of those with diabetes in the age groups 18-44 year olds and 44-64 year olds is 4% and 14 %, respectively, while, 23% of 65-74 year olds and 23% of those 75 years or older have diabetes (CDC NDSS, 2010a). Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes in older adults (CDC, 2008).

Diabetes Self-Management Behaviors

Diabetes self-management is a complex regimen of behaviors that fall under six main categories: healthy diet, physical activity, checking blood glucose, taking medications, checking feet, and not smoking (NDIC, 2008; Toobert et al., 2000). Since diabetes has no known cure, the goal of DSM is to maintain blood glucose levels, prevent the development of diabetes complications, and improve quality of life for those with diabetes (Goodall & Halford, 1991). Each behavior contributes to glycemic control or helps monitor the effect of other behaviors or prevents complications.

Healthy Diet

For persons with diabetes, a healthy diet includes moderate energy intake with a balance of macronutrients (carbohydrate, protein, and fat), spacing the amount and time carbohydrates

are consumed, and incorporation of fiber (Am Diet Assoc EAL, 2008). The American Diabetes Association reports that at this time there are no optimal macronutrient percentage levels for those with diabetes, and that recommendations should be made based on an individual patient's circumstances (ADA, 2008). However, they do suggest using recommendations of the Dietary Reference Intakes (DRI's) which recommend that adults should consume 45% to 65% of total energy from carbohydrate, 20% to 35% from fat, and 10% to 35% from protein (ADA, 2008; IOM, 2005). People with diabetes are encouraged to choose a variety of fiber-containing foods, such as whole grains, fruits and vegetables because they provide vitamins, minerals, fiber, and other substances important for good health (ADA, 2002). There is inconclusive evidence that increasing dietary fiber will influence glycemic outcome in people with diabetes, so recommendations for fiber intake for people with diabetes are similar to the recommendations for the general public (DRI: 14 grams per 1000 kcal) (Am Diet Assoc EAL, 2008; IOM, 2005). Diets with usual fiber intakes (up to 24 grams per day) have not shown beneficial effects on glycemic control, however high fiber diets (44 to 50 grams per day) are reported to improve hyperglycemia (Hagander et al., 1998; Chandalia et al., 2000; Giacco et al., 2000). These high amounts of fiber needed to improve hyperglycemia may be difficult for individuals to consume, and are known to potentially cause undesirable gastrointestinal side effects which are common in older adults. Recommended diets for adults with diabetes may differ from actual diets followed by adults with diabetes. Glasgow et al. (1997) suggested that some of the variance in DSM behaviors (including following a healthy diet) is due to personal models (example: an individual's belief about the effectiveness of a treatment for their disease). Glasgow et al. (1997) concluded that personal model scores for DSM components reflected the belief that diabetes management primarily consists of avoiding sweets and taking medications, and that other

components of a diet regimen (i.e. following a low-fat, high-fiber eating plan, following a low calorie diet, and limiting alcohol) are not viewed as effective as avoiding sweets for treating diabetes (Glasgow et al., 1997). More studies are needed to assess what adults with diabetes believe is a healthy diet and what diets they are actually following.

Spacing Carbohydrates

Spacing carbohydrates is an important part of a healthy diet for persons with diabetes. As listed above, carbohydrates should make up 45% to 65% of total energy intake according to the Dietary Reference Intakes (IOM, 2005; ADA, 2008; Am Diet Assoc EAL, 2008). Studies evaluating different percentages of carbohydrate have been inconclusive (Garg et al., 1994; Komiyama et al., 2002; Gerhard et al., 2004; Nielsen et al., 2005). Persons with diabetes are recommended to keep carbohydrate intake consistent on a day-to-day basis because it results in glycemic control (Am Diet Assoc EAL, 2008). Studies based on day-to-day consistency in carbohydrate intake resulted in improved glycemic control (Wolever et al., 1999; Boden et al., 2005; Nielsen et al., 2005). Spacing the amount and time carbohydrates are consumed, particularly complex carbohydrates, such as whole grains, fruits, and vegetables provides a steady stream of energy throughout the day and prevents spikes in blood glucose. Maintaining consistency allows for assessment to see if the diet is working, and also helps minimize the need for insulin adjustments.

Physical Activity

Physical activity helps to maintain blood glucose by increasing insulin sensitivity (Balkau et al., 2008; Mayer-Davis et al., 1998; Cauza et al., 2005). Muscle contraction during physical activity has an insulin-like effect of promoting the transport of glucose from the blood through the muscle membrane, possibly by increasing the number or function of glucose transporters,

decreasing insulin resistance (Henriksen, 2002). The 2005 Dietary Guidelines for Americans recommends at least 30 minutes of moderate-intensity physical activity on most days of the week to reduce the risk of chronic diseases (USDHHS & USDA, 2005). This recommendation has been important for those managing diabetes. In people with type 2 diabetes, 90 - 150 minutes of weekly physical activity (both aerobic exercise and resistance/strength training) has been shown to improve and support long term blood glucose control, indicated by reductions in hemoglobin A1c (HbA1c) (Boulé et al., 2001; Dunstan et al., 2002; Goldhaber-Fiebert et al., 2003; Kirk et al., 2003; Kirk et al., 2004; Sigal et al., 2004; Van Rooijen et al., 2004; Cauza et al., 2005; Di Loreto et al., 2005). Physical activity particularly benefits older adults with diabetes by reducing functional decline, loss of lean body mass, and the shift to central adiposity, all which have a negative effect on glucose control and overall health (USDHHS & USDA, 2005; Eaton et al., 2009; Vischer et al., 2009).

Self-Monitoring of Blood Glucose (SMBG)

Self-monitoring of blood glucose (SMBG) allows individuals with diabetes to assess their glycemic control. The ADA Standards of Medical Care (2010) for Diabetes lists the following glycemic recommendations for adults with diabetes: preprandial capillary plasma glucose between 70-130 mg/dl, peak postprandial capillary plasma glucose of <180 mg/dl (made 1-2 hours after the beginning of the meal), and an HbA1c of <7.0% (ADA Standards of Medical Care, 2010). Recommendations for the frequency and timing of SMBG are dictated by the particular needs and goals of the patient. For most patients with type 1 diabetes or other patients using multiple insulin injections, SMBG is recommended three or more times daily, but for individuals with type 2 diabetes not using insulin, the optimal frequency and timing of SMBG is unclear (ADA Standards of Medical Care, 2010). A meta-analysis of SMBG in non-insulin-

treated patients with type 2 diabetes concluded that some regimen of SMBG was associated with a reduction in HbA1c of 0.4%; however it was difficult to assess the contribution of SMBG alone because of the inclusion of patient education with diet and exercise counseling and pharmacologic intervention in the studies (Welschen et al., 2005). Self-monitoring of blood glucose (SMBG) can indirectly improve glycemic control, and is feasible for most patients with diabetes (Schwedes et al., 2002). SMBG can help patients understand how the other DSM behaviors, including taking diabetes medications, affect their blood glucose (USDHHS, National Diabetes Education Program, 2005). If a patient notes an improvement in blood glucose during a blood glucose check, that patient may attribute the improvement to a DSM behavior, and be more likely to perform that DSM behavior (Green & Kreuter, 1999). Persons with diabetes tend to perform SMBG more often than other DSM behaviors (along with taking medications) and view SMBG as effective for treating their diabetes (Glasgow et al., 1997; Ruggiero et al., 1997). Testing blood glucose on 4 to 7 days of the week was reported in 56% of adults with diabetes in a nationally representative sample (Rosland et al., 2008). In Georgia, 68.5% of older adults (65+ years) reported checking their blood glucose daily (CDC NDSS, 2010a), and 60-63% of older adults participating in Georgia senior centers reported checking their blood glucose on 5 or more days of the week (Speer et al., 2008; Bell, 2008).

Taking Diabetes Medications

As the pancreas fails, individuals may require medications to control their glucose levels. Medication to aid glycemic control can include oral glucose-lowering medications and insulin injections. Medications can be prescribed alone or in combination with one another and/or with insulin, and work in different ways to lower blood glucose levels. The principal actions of oral diabetes medications include stimulating insulin secretion from the beta cells of the pancreas

(sulfonylureas and meglitinides), decreasing hepatic glucose production (biguanides), improving peripheral insulin sensitivity (thiazolidinediones (TZD's)), delaying carbohydrate absorption (alpha-glucosidase inhibitors), and preventing the breakdown of glucagon-like peptide-1 (DPP-4 inhibitors) (ADA, 2010e). Individuals are more likely to perform this behavior (and SMBG) more often than lifestyle behaviors, such as healthy diet and physical activity (Rosland et al., 2008). Individuals self-reported following a prescribed medication regimen most regularly, and least regularly followed recommendations for lifestyle changes of diet and exercise (Ruggiero et al., 1997). For those that are prescribed diabetes medication, failure to take medications leads to poor health outcomes including exacerbated hypertension, hyperlipidemia, loss of limbs, and higher hospitalization rates (Touchette et al., 2008).

Not Smoking and Checking Feet

Although refraining from smoking is not considered a DSM "behavior", smoking status or tobacco use is important to document when giving advice to persons with diabetes. Smoking raises blood glucose, blood cholesterol and other fats, and increases the chance of nerve damage and kidney disease (ADA, 2008b). As reviewed by Tonstad (2009) smoking was strongly associated with increased blood glucose concentrations, higher mean HbA1c levels, increased risk of stroke, difficulty attaining blood pressure and total cholesterol goals, and onset and progression of nephropathy in adults with type 2 diabetes. Among patients with diabetes, smoking also increases the risk of cardiovascular disease, the number one killer of persons with diabetes (Cigolle et al., 2009; Tonstad, 2009; NDIC, 2010). Health immediately improves with cessation of smoking (ADA, 2008b). Smoking can constrict blood vessels and damage nerves (neuropathy) which can cause and worsen foot problems. Poor blood circulation to the feet decreases the ability to fight infections, and neuropathy can deaden sensations of pain, leaving a

patient unaware of any foot problems or injuries (ADA, 2010c). In those with diabetes, foot sores and blisters that go unnoticed may lead to amputations. Early detection of foot problems by regularly checking one's feet can prevent or delay adverse outcomes including amputations by allowing earlier initiation of treatment (Larsson, 2008; ADA, 2000; APMA, 2008). Bare feet should be examined for red spots, cuts, swelling, and blisters (ADA, 2010b). Daily checking feet has been reported in 77% of adults with diabetes (Rosland et al., 2008) with similar results reported for older adults in Georgia (Speer et al., 2008) and in the U.S. (CDC NDSS, 2010b).

Predictors of Diabetes Self-Management

Demographics

Studies are inconclusive as to whether demographic factors (age, gender, race, and education) are associated with performance of diabetes self-management (Glasgow et al., 1997; Ruggiero et al., 1997). According to Georgia Surveillance Data from the Centers for Disease Control and Prevention (CDC), older adults with diabetes (ages 65 years and older) are slightly more likely to perform daily self-monitoring of blood glucose (SMBG) and daily self-examination of feet than younger adults (ages 18-64) (CDC NDSS, 2010a). Females with diabetes are slightly more likely to perform daily SMBG, and there was a minute difference between genders for performance of daily self-examination of feet (CDC NDSS, 2010a). Using a list of individuals with diabetes designed to represent a national sample, Ruggiero et al. (1997) found that performance of self-management behaviors (diet and glucose testing) was significantly higher in older age groups (ages 55-64 and ages 65+) compared to younger age groups (ages 18-44 and ages 45-54). There was no significant difference among age groups for exercise as well as no significant difference across sex, race, or education groups for glucose testing, diet, and exercise (Ruggiero et al., 1997). There is currently no study that assesses the

association between demographic factors and all areas of diabetes self-management in older adults.

Social Support, Self-Reported Health, and Food Security

Social and/or emotional support has been proposed as a predictor of diabetes self-management in adults with diabetes (Goodall & Halford, 1991). Provision of social support and continued involvement in activities fosters positive effects on health and longevity in older adults (Banerjee et al., 2010). The majority of studies that assessed the effect of social support on DSM were conducted with children and their families, and there is currently not a study that assesses social support as a predictor for all DSM behaviors in older adults. However, among middle and older aged adults of various ethnicities, social support was positively associated with testing blood sugar (Rosland et al., 2008), following a meal plan (Bailey & Lherisson-Cedeno, 1997; Rosland et al., 2008; Shaw et al., 2006), exercise (Bailey & Lherisson-Cedeno, 1997), and foot care (Shaw et al., 2006). Nicklett & Liang (2009) concluded that diabetic support was strongly associated with adherence to health-promoting activities in adults older than 60 years of age, meaning that the extent to which an individual received support for a given regimen component was highly positively correlated with adhering to that component (Nicklett & Liang, 2009). Managing diabetes can be stressful, and having access to support when needed may help as a coping mechanism and result in better self-management in older adults with diabetes (Tuncay et al., 2008).

Self-reported health is a widely used measure to assess perceived health of an individual and overall health status within a population, and has been associated with health outcomes (Banerjee et al., 2010). There are many aspects of health that may affect the likelihood of performing diabetes self-management behaviors. Community dwelling older adults who

reported fair or poor health were significantly more likely to have diabetes and difficulty managing their health. They were also significantly more likely to have difficulty coping with health problems and to have physical limitations suggesting that older adults who self-report poor health may have a hard time keeping up with the mental and physical demands of diabetes self-management (Pan et al., 2006; Banerjee et al., 2010).

Food security (FS) 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 (Bickel et al., 2000). Food security in the U.S. has been assessed using the Household Food Security Survey Module (FSSM) since 1995 when it was implemented into the U.S. Census Bureau's Current Population Survey (CPS). Information on FS is published in a regular report series (Bickel et al., 2000). A standard 6-item "short form" of the 18-item core module was developed for circumstances where there are limitations on survey time or length. Compared to the 18-item FSSM, the short form has been shown to have high specificity and sensitivity and minimal bias (Blumberg et al., 1999). The FSSM, 18-item or 6-item, can be scored as two categories, food security and food insecurity (FI), and has been used to detect food insecurity in the elderly (Nord, 2008; Catlett, 2009).

In 2008, 14.6 percent of U.S. households were food insecure at least some time during the year, including 5.7 percent with very low food security—meaning that the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources for food (Nord, 2009). In 2007, Nord (2008) found that 6.5% of U.S. households with elderly (defined as 65+ years) and 7.3% of U.S. households with elderly living alone, were food insecure (Nord, 2008). Older adults with diabetes seem to be more at risk for food insecurity. Using this same measure with a

sample of older adults (60+yrs) in Georgia senior centers in 2007, Catlett (2009) reported that almost 20% of older adults and 26% of older adults with diabetes were food insecure. High percentages of food insecurity among adults with diabetes have been reported elsewhere (Nelson et al., 1998). Food insecure adults with diabetes may have a harder time adhering to a nutritionally adequate diet and may have to choose between food and medications resulting in negative health outcomes (Nelson et al., 1998; Nelson et al., 2001; Lee & Frongillo, 2001). Thus, food insecurity appears to have a negative impact on DSM behaviors and consequently health outcomes, suggested by more reports of fair or poor health status and more physicians' encounters among food insufficient adults with diabetes compared to food sufficient adults with diabetes (Nelson et al., 2001). There are currently no studies that assess food security as a predictor of DSM; however studies suggest that persons with diabetes experiencing hunger may have worse disease control and require more health services (Nelson et al., 2001).

Older Americans Act Nutrition Program

With the increase in chronic disease awareness, national attention has turned towards identifying effective, cost-efficient forms of health care delivery (Millen et al., 2002). It is the position of the American Dietetic Association, American Society for Nutrition, and Society for Nutrition Education, that the growing number of older adults, the health care focus on prevention, and the global economic situation accentuate the fundamental need for food and nutrition programs for community-dwelling older adults (Kamp et al., 2010). Escalating health care costs are largely related to chronic diseases in which nutrition interventions have proven effective The Older Americans Act Nutrition Program (OAANP) was established in 1972 with the purpose of promoting the health and well-being of older individuals and delaying adverse health conditions through access to nutrition and other disease prevention and health promotion

services, promoting socialization of older individuals, and reducing hunger and food insecurity (O'Shaughnessy, 2008; AoA, 2009a). Consolidated and authorized under Title III (Grants for State and Community Programs on Aging) of the Older Americans Act (OAA) of 1965, the OAANP provides 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, 2009a; AoA, 2008). The Older Americans Act provides for agencies, programs, and activities, or the "aging services network". The Administration on Aging (AoA), part of the U.S. Department of Health and Human Services, interacts with this aging network comprised of 56 State Units on Aging (SUAs), 655 Area Agencies on Aging (AAAs) and thousands of local providers (O'Shaughnessy, 2008; National Resource Center on Nutrition, Physical Activity & Aging, 2005). The twelve Area Agencies on Aging (AAAs) in Georgia receive these federal funds, supplemented by other federal funds, such as Medicaid, and state and local funds, to provide the services of congregate and home-delivered meals, nutrition screening, education and counseling, and other support (O'Shaughnessy, 2008; National Resource Center on Nutrition, Physical Activity & Aging, 2005). These services can be carried out in a variety of settings that include senior centers, faith-based settings, schools, and in the homes of homebound older adults (AoA, 2008; AoA, 2009a). Those who are in great economic and social need, living in rural areas, are the main target populations of OAANP services, with the goal of keeping older individuals independent and in their communities (AoA, 2009a).

The monthly nutrition education and physical activity programs provided by the University of Georgia's (UGA) Department of Foods and Nutrition is an example of service delivery. The department subcontracts with the Northeast Georgia AAA to provide these programs, typically involving a nutrition-based lesson, chair exercises and/or walking, and a

brief session on medication management. Similar programs are delivered in Georgia to over 200 senior centers within each of the 12 AAA in order to maintain and improve the health of older adults with the goal of keeping them independent and in their communities.

Live Healthy Georgia-Seniors Taking Charge

The Live Healthy Georgia (LHG) – Seniors Taking Charge project was a statewide community intervention implemented in forty Georgia senior centers under the OAANP in three fiscal years (FY 2006, 2007, and 2008). LHG was a collaboration of many Georgia organizations including the Division of Aging Services, Diabetes Association of Atlanta, and UGA's Department of Foods and Nutrition with the goal of better disease prevention and management. The target population of LHG – Seniors Taking Charge was older adults attending senior centers, thus serving mainly OAANP participants with low socioeconomic status, multiple chronic diseases, poor nutrition, and low physical activity. Programs included increasing fruit and vegetable intake, increasing physical activity, decreasing falls and fractures, and improving diabetes self-management (available at http://www.livewellagewell.info/study/materials.htm). As described earlier, the UGA Department of Foods and Nutrition provided nutrition, health, and wellness education programs in each Northeast Georgia senior center at least once each month. Information was collected by survey before and after the interventions each year and a report was submitted to the Northeast Georgia AAA. A secondary analysis of a subset of data from the pre-test (2007) was used for this study.

Health Belief Model

Scientists use the Health Belief Model (HBM) to predict and change health behaviors. The HBM is based on the theory that a person's willingness to change their health behaviors is primarily due to *perceived susceptibility*, do they believe they are at risk, *perceived severity*, how

severe they view the consequence if they do not change their behaviors, *perceived benefits*, if they view there is something in it for them, and *perceived barriers*, whether they view something as difficult (Green and Kreuter, 1999). How a person views their condition guides the processing of incoming information and subsequent disease-related behaviors such as self-management (Glasgow et al., 1997). The DSM education intervention implemented in the LHG project is based on these principles for changing health behaviors. Predictors of diabetes self-management relate to the concept of perceived barriers. Glasgow et al. (1997) determined that patients view diabetes as a serious disease and that their DSM activities will control their diabetes and reduce the likelihood of long-term complications. Highest-rated self-management activities were taking prescribed medications and avoiding sweets (Glasgow et al., 1997).

Diabetes Self-Management Studies

Heisler et al. (2003) found that higher patient self-reported evaluations of DSM behaviors were significantly associated with lower HbA1c levels ($P < 0.01$) and receipt of diabetes services showing they had greater glycemic control (Heisler et al., 2003). It was previously found that in a sample of participants from North GA senior centers, DSM behaviors improved and HbA1c levels decreased following nutrition education that included DSM education (Burnett, 2003; Redmond et al., 2006). In a study assessing DSM education as part of the Live Healthy Georgia (LHG) intervention (2005-2006), Speer et al. (2008) found that participants increased some DSM behaviors, mean HbA1c decreased for the entire sample, and that those with an initial HbA1c > 8% had a clinically and statistically significant decrease in HbA1c, following an educational intervention that was specifically designed to improve diabetes management within the target population. To assess DSM behaviors, Speer et al. (2008) used the validated and reliable self-

report instrument by Toobert et al. (2000) that was also used for this study (Speer et al., 2008; Toobert et al., 2000).

Rationale, Specific Aims, and Hypothesis

This study builds on other studies describing diabetes self-management in older adults participating in programs at senior centers (Speer et al., 2008; Redmond et al., 2006) by assessing the level of performance of diabetes self-management behaviors, individually and combined, and identifying the predictors of diabetes self-management. A high percentage of diabetes, approximately 32%, was self-reported among senior center participants in Georgia in 2007. This high prevalence of diabetes supports a need for studies assessing performance of DSM behaviors and its predictors. There are numerous variables that may predict performance of DSM behaviors (Green and Kreuter, 1999), and currently, there are few studies assessing the level of DSM performance, and no studies assessing DSM predictors among older adults attending senior centers in Georgia. This study not only filled a gap of knowledge, but provides insight into areas of DSM that need to be improved among this population. OAANP dollars are targeted towards a needy population, and understanding this population will improve the efficiency and targeting of services.

The first specific aim of this study was to determine the level of performance of individual and totaled diabetes self-management behaviors. The first hypothesis was that older adults with diabetes would have a higher level of performance of medically-related DSM behaviors (self-monitoring of BG, taking diabetes medications, and checking feet) than lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and physical activity), and that less than 15% of the older adults with diabetes were performing all of the six diabetes self-management behaviors combined at a high level. The second specific aim of this study was

to determine the predictors of diabetes self-management in older adults in Georgia senior centers. The second hypothesis of this study was that higher self-reported health, more social and emotional support, more years of education, and older age would be positively associated with performance of DSM behaviors, while food insecurity, African American race/ethnicity, and male gender would be negatively associated with behaviors.

CHAPTER 3

PERFORMANCE OF DIABETES SELF-MANAGEMENT BEHAVIORS BY OLDER ADULTS IN GEORGIA SENIOR CENTERS[1]

[1]Zack, A. R., Fischer, J. G., Johnson, M. A., Lee, J. S., Reddy, S. To be submitted to the Journal of Nutrition for the Elderly.

Abstract

This study examined the performance levels and predictors of diabetes self-management (DSM) behaviors in older adults in senior centers from 12 Georgia Area Agencies on Aging. Participants were a convenience sample (N = 240, mean age = 74 years, 78% female, 51% Caucasian, 49% African American), and participants' levels of DSM behaviors were assessed using questions from the Summary of Diabetes Self-Care Activities, a validated self-report tool (Toobert et al., 2000). The questions assess current physical activity and personal self-care behaviors and were recorded as number of days of the past week the behavior was performed. Tobacco use was also assessed. The mean days of performance by participants were higher for medically-related DSM behaviors (testing blood glucose (BG), taking medications, and checking feet) than for lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and participating in at least 30 minutes of moderate physical activity (PA)). The percentage of participants performing behaviors at a high level (performing a behavior on 5 or more days of the past week) was recorded: 66% for following a healthy diet, 42% for spacing carbohydrates, 45% for being moderately active (≥ 30 min), 73% for testing blood glucose, 97.5% for taking medications, and 65% for checking feet. Tobacco use was recorded in 6% of participants. Only 11% reported performing all DSM behaviors at a high level. The association of predictors, including age, gender, race, education, self-reported health, social and emotional support, and food security, with performance of DSM behaviors was examined using logistic regression. Older adults reported performing medically-related behaviors more frequently than life-style related behaviors. Receiving more social and emotional support was strongly associated with performing more DSM behaviors at a high level. This study provides knowledge about DSM and its predictors in vulnerable older adults in Georgia senior centers. This

information can be used for planning and developing future programs needed to reduce the burden of diabetes complications among vulnerable older adults.

INDEX WORDS: Diabetes Self-Management, Diabetes Self-Management Behaviors, Performance of Diabetes Self-Management, Diabetes Self-Management Predictors, Older Americans Act Nutrition Program, Senior Center.

Introduction

Diabetes is a serious disease that is prevalent in older adults. In 2007, diabetes was reported in 17.6%-19.1% of older adults in America (65+ years) and 23% of older adults (65+ years) in Georgia (CDC NDSS, 2010b; CDC NDSS, 2010a). In Georgia senior centers, diabetes was reported in 33% of older adult participants (60+ years). Diabetes can lead to complications such as blindness, kidney failure, amputations, heart disease, stroke, hypertension, nerve damage, repeated infections, slow wound healing, sexual dysfunctions, skin disorders, periodontal disease, disability, and premature death (ADA, 2010a; GaDHR, 2008).

The Older American's Act Nutrition Program (OAANP), established in 1972, provides grants to states to support nutrition services to older adults (ages 60 years and older) through congregate nutrition services (AoA, 2009a; AoA, 2008). Services such as congregate meals, as well as nutrition screening, education and counseling, and other supportive and health services are provided (O'Shaughnessy, 2008; National Resource Center on Nutrition, Physical Activity & Aging, 2005). The Live Healthy Georgia (LHG) – Seniors Taking Charge project was a statewide community intervention implemented in forty Georgia senior centers under the OAANP with the goal of better disease prevention and management. The target population of LHG – Seniors Taking Charge was older adults attending senior centers, thus serving mainly OAANP participants with low socioeconomic status, multiple chronic diseases, poor nutrition, and low physical activity. Programs included increasing fruit and vegetable intake, increasing physical activity, decreasing falls and fractures, and improving diabetes self-management (available at http://www.livewellagewell.info/study/materials.htm).

Diabetes self-management (DSM) is a complex regimen of behaviors that fall under six main categories: following a healthy diet, physical activity, checking blood glucose, taking

medications, checking feet, and not smoking (NDIC, 2008; Toobert et al., 2000). The goal of DSM is to maintain blood glucose levels, prevent the development of diabetes complications, and improve quality of life for those with diabetes (Goodall & Halford, 1991). Each behavior contributes to glycemic control, helps monitor the effect of other behaviors, or helps prevent complications. Performance of DSM behaviors has been assessed using the Summary of Diabetes Self-Care Activities (Toobert et al., 2000). Age, gender, race, education, self-reported health, social and emotional support, and food security may impact the performance of DSM (Glasgow et al., 1997; Ruggiero et al., 1997; Goodall & Halford, 1991; Nicklett & Liang, 2009; Banerjee et al., 2010; Nelson et al., 2001).

The goal of this study was to determine the level of performance of individual and totaled diabetes self-management behaviors and to determine the predictors of diabetes self-management in older adults participating in Georgia senior centers. It was hypothesized that older adults with diabetes will report higher levels of performance for medically-related DSM behaviors (self-monitoring of BG, taking diabetes medications, and checking feet) than lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and physical activity), and that less than 15% of the older adults with diabetes are performing all of the six diabetes self-management behaviors combined at a high level. It was also hypothesized that better self-reported health, emotional support, education, and age will be positively associated, while food insecurity, African American race/ethnicity, and male gender will be negatively associated with performance of DSM behaviors.

Methods and Design

Sample

Questionnaires and procedures were approved by the Institutional Review Boards on Human Subjects of the University of Georgia and the Georgia Department of Human Resources. Participants were a convenience sample of people ages 50 (2% were under 60) and older recruited from 40 senior centers in the fall of 2007, similar to previous studies (Fitzpatrick et al., 2008, Bell, 2008). Briefly, each of the 12 Area Agencies on Aging in Georgia were asked to recruit about 70 people from senior centers in their area. Senior centers were selected based on the support of the senior center director and interest of the participants. Most participants received OAANP congregate meals. Procedures were explained, the consent forms were read to participants, and written informed consent was obtained from participants. Potential participants were excluded if they were homebound or when the interviewer determined that the individual was unable to understand the informed consent and/or answer questions. **Figure 3.1** shows the exclusion characteristics used for the final sample. These recruitment procedures yielded 815 participants of which 811 responded to a self-reported diabetes question ("Do you have diabetes? No (0) Yes (1)). One of the four individuals who had an incomplete response for this question was added into the analytic sample based on responses to other questions. The remaining three were concluded to not have diabetes based on other responses and so were excluded from the sample. Two hundred and sixty-five participants (33%) were recorded as having diabetes of which 240 were used for analyses. Those younger than 60 years of age (n=7) were not included in the analytic sample in order to assess only older adults. Individuals representing races other than white or black (n=3) were excluded because they represented such a small portion of the

sample population. Other potential participants were excluded if they left too many questions blank (n=14), or because they did not indicate whether they used tobacco (n=1).

Questionnaire

Data from the pre-test questionnaire for the 2007-2008 LHG – Seniors Taking Charge intervention was used for this study. Experts in nutrition, physical activity, and diabetes (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 pre- and post-test questionnaires to ensure content validity and cultural appropriateness based on their collective experience working with the target population. Input from other Division of Aging Services staff and the Wellness Coordinators also was solicited and incorporated into the questionnaire. Participants were interviewed as previously described, and assessments included age, gender, ethnicity, and years of education (Bell, 2008; Ellis et al., 2005; Fitzpatrick et al., 2008; Hendrix et al., 2008).

Participants' levels of diabetes self-management were assessed using questions from the Summary of Diabetes Self-Care Activities, a validated self-report tool (Toobert et al., 2000). The questions assess current physical activity and personal self-care behaviors in six main areas considered essential for diabetes care (diet, exercise, self-glucose monitoring, foot care, smoking, and medications), but without specifically measuring the participant's compliance to a specific regimen or plan provided by a healthcare provider. Participants were asked to respond with how many days of the past week they performed each DSM behavior: followed a healthful eating plan, spaced carbohydrates evenly, participated in at least 30 minutes of moderate physical activity, tested their blood sugar, took diabetes medication as prescribed by their doctor, and checked their feet. Participants who reported performing a behavior 5 or more days per week

were considered to be performing at a high level of self-care for that behavior (high level (≥5 days) = 1, low level (<5 days) = 0) (Toobert & Glasgow, 2003). If a response was missing or the participant responded "Don't Know" to a DSM behavior question, it was assumed that the behavior was not being done and was re-coded as being performed 0 days within the past week. Behaviors were summed to determine number of behaviors performed at a high level. If individuals did not take any diabetes medication, as indicated by "What medications do you take for your diabetes? (none = 0)", they were considered to be performing at a high level for medication use.

Tobacco use was assessed with, "Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?" (no = 0, yes = 1). Although this question is not in the same format as the other DSM questions, it assesses tobacco use in the same current time frame. Tobacco use was not included in the summary score of diabetes self-management because it is not considered a "DSM behavior", although it was assessed independently since it is still essential to the management of diabetes.

Age was self-reported and divided into three categories: 60-69, 70 to 79, and ≥ 80 years. Gender (male = 0 and female = 1), race/ethnicity (white = 1, black = 2), and years of education completed (no high school (HS) diploma was ≤11 years = 0, >11 years = 1) were self-reported.

Frequency of social and emotional support was assessed with, "How often do you get the social and emotional support that you need?" (always = 1, usually = 2, sometimes = 3, rarely = 4, never = 5; dichotomized to never, rarely, or sometimes = 0, usually or always = 1, BRFSS, 2006) and self-reported overall health was assessed with, "How would you rate your overall health?" (poor = 0, fair = 1, good = 2, very good = 3, and excellent = 4, dichotomized to poor and fair = 0,

good, very good or excellent = 1, adapted from the Behavioral Risk Factor Surveillance System, (BRFSS, 2006).

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

which was categorized into a two category measure (USDA-2) that assessed food security status (FS = 0 to 1, and FI = 2 to 6) (USDA, 2008).

Statistical Analysis

Questionnaires and consent forms were sent to the University of Georgia for analysis (SAS, Version 9.1, SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means, standard deviations, and Spearman correlation coefficients were calculated. Bivariate associations of DSM behaviors with demographic factors, self-reported health, frequency of emotional support, and food security were assessed using Spearman correlations and chi-squared analyses. Logistic regression analyses were used to identify the independent variables associated with high performance of the DSM behaviors. Linear and stepwise regression analyses were also used to identify the independent variables associated with the number of days that participants completed DSM behaviors and total number of DSM behaviors performed at a high level. Variables included in the models were demographics, self-reported health, emotional support, and food security. $P \leq 0.05$ was considered statistically significant.

Results

Characteristics of older adults with diabetes participating in Georgia senior centers are listed in **Table 3.1**. Participants had a mean age of 73.2 years, were mostly female (78.3%), and were almost equally white (50.8%) and black (49.2%). Slightly less than half of participants (48.7%) obtained a high school diploma or more. The majority of participants rated their overall health as fair or poor (55.9%), always or usually received the social and emotional support that they needed (75.8%), and 24.7% were categorized as food insecure. **Table 3.2** compares the characteristics of included and excluded participants. There was no significant difference between those included (n=240) and those excluded (n=15) from the sample. Performance levels

of the diabetes self-management (DSM) behaviors are listed in **Table 3.3**, and were categorized as high performance (performing the behavior ≥ 5 days of the past week) or low performance (< 5 days). The mean days of performance by participants were higher for medically-related DSM behaviors (testing BG, taking medications, and checking feet) than for lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and participating in at least 30 minutes of moderate PA). Taking medications had the highest frequency of high performance (97.5%) while spacing carbohydrates had the lowest frequency of high performance (42.08%). Few participants reported using tobacco (6.3%). A low percentage of participants (11.3%) reported performing all of the DSM behaviors at a high level.

The bivariate relationships of performance level of DSM behaviors and demographic, reported health, support, and food security are presented in **Table 3.4** and **Appendix D**. Those who were older and had less education were more likely to follow a healthy diet 5 or more days of the past week. Higher emotional support was significantly related to higher performance of spacing carbohydrates. Those aged 70 to 79 and those having better self-reported health were more likely to have a high performance level of physical activity. Older age was also significantly associated with higher medication compliance. Having more education was significantly associated with a higher performance level of checking feet. Gender, race, and food security were not significantly associated with any of the behaviors. There was a tendency for food insecurity to be associated with a lower performance level of physical activity ($p = 0.07$), and it was also weakly associated with a lower performance of spacing carbohydrates ($p = 0.11$). No characteristic was significantly associated with performing all of the DSM behaviors at a high level, however higher self-rated health trended to be associated with high performance of all

DSM behaviors ($p = 0.09$). Performing at least four DSM behaviors at a high level was significantly associated with more emotional support.

Spearman correlations for performance levels of DSM behaviors and demographics, reported health, emotional support, and food security are shown in **Table 3.5**. Number of days following a healthy diet significantly increased with age. There were no significant correlations with spacing carbohydrates. Self-reported health was positively correlated with more days of physical activity, while greater food insecurity was negatively correlated. The only significant correlation with more frequent BG testing was emotional support, which showed that days of testing BG went down with less frequent emotional support. Age was positively correlated with taking medications, and negatively correlated, along with food insecurity, with days of checking feet. Checking feet increased with years of education. Higher self-reported health was positively correlated with using tobacco. The number of DSM behaviors performed at a high level increased with higher self-reported health, more frequent support, and higher food security. Gender and race were not significantly correlated with performing DSM behaviors.

Multivariate regression analyses were conducted to identify predictors of DSM behavior performance levels. Logistic regression models are shown in **Table 3.6**. Older age was significantly associated with a high level of performance (≥5 days of the week) for following a healthy diet. More social and emotional support was significantly associated with five or more days of spacing carbohydrates. There were no significant predictors of high performance of moderate physical activity or taking medications. Social and emotional support was associated with testing blood glucose, with reports of never, rarely, or sometimes receiving social and emotional support being associated with a low performance level of testing blood glucose. Having a high school diploma was positively associated with high a performance level of checking feet, while avoiding tobacco use was significantly associated with being female and

reporting worse health. Support was also significantly associated with the number of DSM behaviors being performed at a high level; always or usually receiving support was associated with performing at least four DSM behaviors at a high level. Linear regression models **(Appendix E)** and forward stepwise regression models yielded similar results (A**ppendix F**). **Figure 3.2** shows a comparison of the mean number of DSM behaviors being performed at a high level across four food security categories. There was a significant difference in the mean number of high level behaviors between those who were most food secure and those who were least food secure with those who were most food secure performing a higher number of behaviors than those who were the least food secure.

Discussion

An important finding of this study was that performance levels of DSM behaviors were higher in this sample than in other samples of adults with diabetes, with the exception of checking feet (Katon et al., 2010; Glasgow et al., 1992; Rosland et al., 2008; Speer et al., 2008; Redmond et al., 2006). This study was a secondary analysis of a subset of data from the 2007-2008 Live Health Georgia (LHG) pre-test. As previously described, the LHG – Seniors Taking Charge project was a statewide community intervention implemented in Georgia senior centers under the OAANP in three fiscal years (FY 2006, 2007, 2008) with the goal of better disease prevention and management. Nutrition, health, and wellness programs included lessons on improving diabetes self-management (materials for the interventions can be found at http://www.livewellagewell. info/study/materials.htm). Participants that were included in this study may have attended the two previous interventions and received instruction on DSM. Years of research have consistently shown that diabetes-specific education is effective in improving health outcomes (Brown, 1999; Williams & Zeldman, 2002). Diabetes self-management

education (DSME) promotes DSM behaviors and practices (Strine et al., 2005), and this has been demonstrated in senior center participants in Georgia who showed significant improvements in their DSM following the interventions (Speer et al., 2008; Redmond et al., 2006). In this sample, education was not consistently associated with performance levels of DSM behaviors, and so it may be the diabetes-specific education provided in the previous intervention years that is associated with the higher reports of DSM within this group.

Social and emotional support has been consistently shown to predict and increase DSM behaviors (Nicklett & Liang, 2009; Rosland et al., 2008; Whittemore et al., 2005) and glycemic control (Eriksson & Rosenqvist, 1993; Kaplan & Hartwell, 1987; Whittemore et al., 2005; Nakahara et al., 2006). Receiving more social and emotional support was strongly associated with performing more than four DSM behaviors at a high level. Over 75% of participants reported always or usually receiving the support that they need. Participating in the senior center may help provide some of the support that the older adults receive. Participants may receive support from directors, nutrition educators, and socialization with other participants who have diabetes. Social and emotional support was associated with higher performances levels for following a healthy diet and testing blood glucose. Diabetes-specific support has been strongly associated with adherence to a diabetic regimen in older adults, and that greater support for a given component was highly positively associated with adhering to that component (Nicklett & Liang, 2009). This suggests that although the majority of participants always or usually receive the support they need, the support they are receiving may not be specific to certain DSM behaviors.

Another finding in this study was that each DSM behavior had a different set of predictors, reinforcing that DSM is a complex regimen of varied behaviors. In logistic

regression models, older age was significantly associated with more days of following a healthy diet. Social networks tend to shrink as people get older. The younger old (ages 60-69) may have social networks that extend outside of the senior center, more so than the older adults, and they may spend more time outside of the senior center. This would mean that the younger old were receiving the congregate meals provided at the senior center less frequently than the older groups. Meals funded by state and federal funds under the OAANP must meet the 2005 Dietary Guidelines for Americans per state and federal regulations (Georgia Department of Human Resources & Division of Aging Services, 2002). More frequent reception of congregate meals may account for more days of following a healthy diet in the older groups. The association with age may also be modified by length of time since diagnosis, signifying that those who have had diabetes longer are better at managing their diabetes including following a healthy diet (Goodall & Halford, 1991; Chiu & Wray, 2010). Higher self-reported health was weakly associated with a higher performance of moderate physical activity. Those that reported better health may feel better and therefore be more likely to participate in physical activity than those that reported worse health (Banerjee et al., 2010; CDC, 2006). Reporting a high performance level of medication compliance was not significantly associated with any of the predictors. More than 97% of this sample reported medication compliance on 5 or more days within the past week. Within the groups ages 70-79 years and ≥80 years, <1% and 0% reported taking medications less than 5 days, respectively. Such disproportionate medication compliance made it difficult to assess predictors. Performance levels for checking feet were higher among those that were black and had more years of education. African Americans may be more likely than whites to care for their older family members within their homes, suggested by lower rates of nursing home placement among blacks, and so other family members may assist with checking feet (Akamigbo

& Wolinsky, 2007). Those with more education may better understand the ramifications of not checking their feet and so may be more likely to do so.

The prevalence of food insecurity (FI) was higher (24.7%) among these participants compared to national averages. Using the entire sample of older adults in Georgia senior centers and the same USDA-2 measure to assess FI as was used in this study, Catlett (2009) found that the prevalence of FI was nearly three times that of the nationally representative sample of older adults in 2007, 19.8% vs. 6.5% (Catlett, 2009; Nord et al., 2008). The prevalence of FI in this sample of older adults with diabetes was similarly higher than a nationally representative sample of adults (≥ 20 years of age) with diabetes, 24.7% vs. 6% (Nelson et al., 2001). In spite of its high prevalence in this sample, FI was not significantly associated with any of the individual DSM behaviors. Food insufficiency has been associated with higher physician utilization among adults with diabetes which may indicate more negative health outcomes (Nelson et al., 2001). Receiving food stamps, using food banks or food pantries, and receiving congregate meals at the senior center may decrease the effect of FI on DSM behaviors, especially following a healthy diet and spacing carbohydrates. There was a weak association between food insecurity and lower performance of spacing carbohydrates. A further examination of the number of DSM behaviors performed at a high level across four categories of FS – high FS, marginal FS, low FS, and very low FS – showed that only those participants in the very low FS category had a significantly lower performance of behaviors compared to those with high FS. FI may not significantly affect the performance of DSM behaviors until it is severe enough to be classified as the lowest of the FS categories.

Consistent with other studies (Ruggiero et al., 1997; Rosland et al., 2008; Goodall & Halford, 1991), in general, performance levels for medically-related DSM behaviors (testing BG,

taking medications, and checking feet) were higher than for lifestyle-related DSM behaviors (following a healthy diet, spacing carbohydrates, and participating in at least 30 minutes of moderate PA). Lifestyle-related behaviors tend to be more difficult in their execution or take more time than medically-related behaviors. Self-efficacy has been associated with better adherence to a diabetes regimen and better glycemic control in several studies (Nakahara et al., 2006), and should be assessed in future research of DSM within this sample along with other psychological factors.

There are some limitations to this study. Participants were attending senior centers that provide congregate meals; however, we did not collect information on their frequency of receiving congregate meals. This could have impacted the participants' interpretation of consumption of a healthy diet. Another limitation of the study was the potential for differences in the approaches to data collection among wellness coordinators and educators at different sites. This was addressed through training of wellness coordinators and educators, site visits, email, and telephone support by UGA staff to provide additional information about data collection.

Self-reporting of responses by participants is a concern, but the primary outcome variables of the DSM behaviors were adapted from validated questionnaire and interviewers were trained on how to administer the questionnaire. Self-reported DSM has been used in several studies, and self-report of DSM has been found to significantly correlate to HbA1c, an objective diabetes control measurement (Heisler et al., 2003). Regression models accounted for very small percentages of the variability of the outcome variables. This suggests that there are other factors other than the ones in this study that are associated with DSM in this population. More studies are needed to assess other possible predictors of DSM.

Lastly, generalizations of the findings of this study may be applicable only to congregate meal participants in Georgia. The use of a convenience sample may have led to a sample population that does not accurately represent the population of Georgia's older adult senior center participants. However, the findings of this study would be valuable to health professionals working with older adults, caregivers and families of older adults who help older adults maintain health-related quality of life, various programs designed to promote the health of community-dwelling older adults, and older adults with diabetes themselves who must advocate for their own medical care.

In summary, participants reported higher performance levels for most DSM behaviors compared to other studies. They performed medically-related behaviors more frequently than life-style related behaviors. A key finding was that receiving more social and emotional support was strongly associated with performing more DSM behaviors at a high level, and appeared to contribute to the performance of the more complex life-style related behaviors. Future studies should assess the influence psychological factors such as self-efficacy, DSM education or DSM knowledge, and various avenues of support on performance of DSM behaviors in older adults. Senior centers and interventions such as the Live Healthy Georgia intervention have the potential to play a significant role in higher performance levels of DSM behaviors and prevention of long term complications among this vulnerable population.

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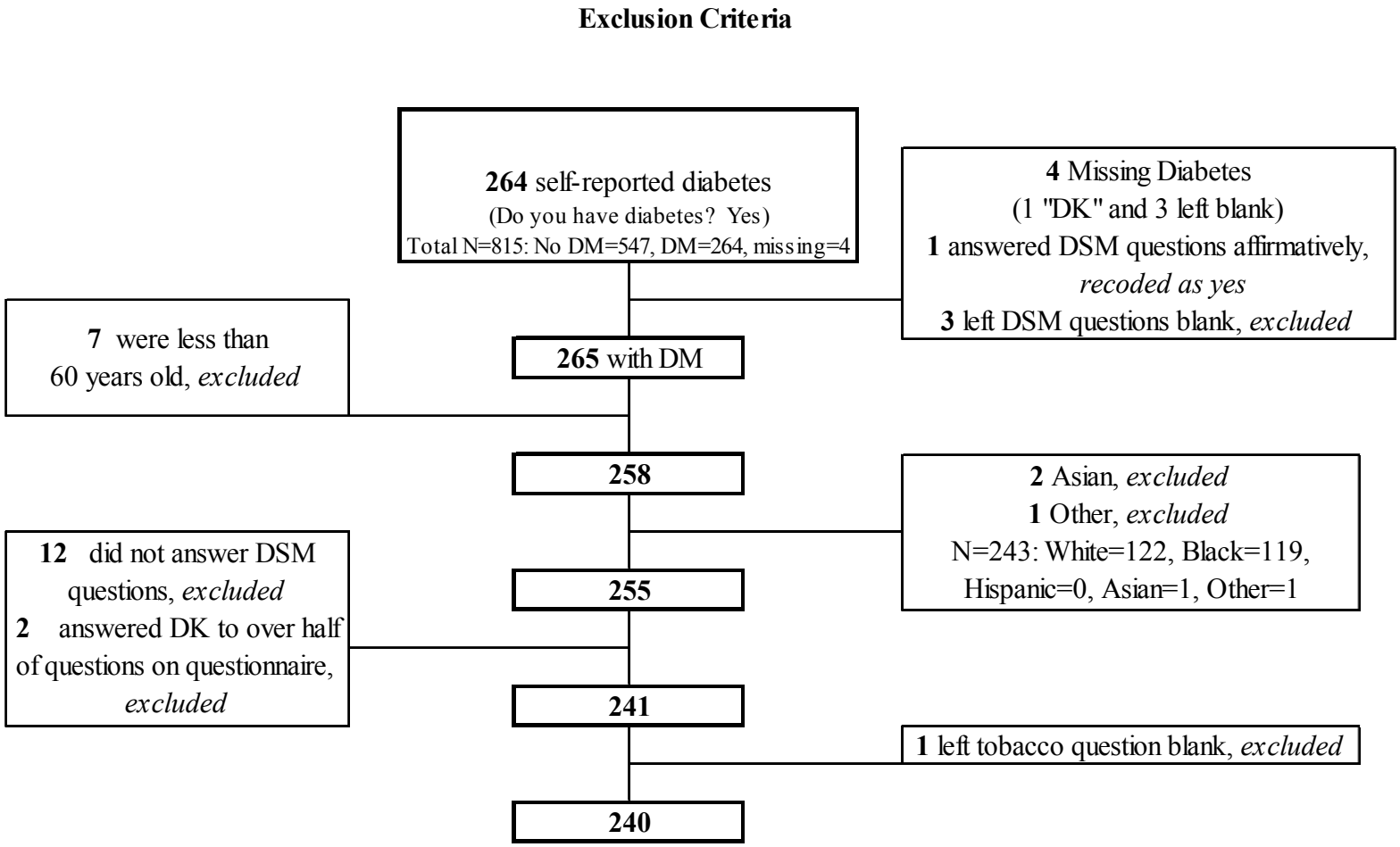

Figure 3.1 Exclusion Criteria For Older Adults with Diabetes Attending Georgia Senior Centers, 2007

TABLE 3.1 Characteristics of Older Adults with Diabetes in Georgia Senior Centers, 2007.

	n	Mean (SD) Median (95% CI) or %[2]
Age	240	73.2 (7.3) 73.0 (72.1-73.9)
60-69 years	84	35.0
70-79 years	105	43.8
≥80 years	51	21.3
Gender	240	
Male	52	21.7
Female	188	78.3
Race	240	
White	122	50.8
Black	118	49.2
Education	236	10.5 (3.2) 11.0 (10.6-11.4)
No HS[1] diploma (≤11 yrs)	121	51.3
HS diploma or more (≥12 yrs)	115	48.7
How would you rate your overall health?	240	
Poor	21	8.8
Fair	113	47.1
Good	94	39.2
Very good	7	2.9
Excellent	5	2.1
How often do you get the social and emotional support that you need?	236	
Always	119	50.4
Usually	60	25.4
Sometimes	35	14.8
Rarely	10	4.2
Never	12	5.1
Food security status	235	
Food secure[3]	177	75.3
Food insecure[4]	58	24.7

[1] *HS, high school*

[2] *Percentages may not add up to exactly 100 due to rounding*

[3] *Food secure: consistent, dependable access to enough food for active, healthy living (raw score of 0 or 1 on the modified Six-Item Short Form Food Security Survey Module)*

[4] *Food insecure: access to adequate food is limited by a lack of money and other resources (raw score of 2-6 on the modified Six-Item Short Form Food Security Survey Module)*

TABLE 3.2 Characteristics of Participants Included and Excluded From the Analytic Sample.[1,2,3]

	n	Included % (n)	Excluded % (n)	P-value
Age				NS
60-69 years	87	35.0 (84)	20.0 (3)	
70-79 years	114	43.8 (105)	60.0 (9)	
≥80 years	54	21.3 (51)	20.0 (3)	
Gender				NS
Male	54	21.7 (52)	13.3 (2)	
Female	201	78.3 (188)	86.7 (13)	
Race				NS
White	127	50.8 (122)	33.3 (5)	
Black	128	49.2 (118)	66.7 (10)	
Education				NS
No HS diploma (≤11 yrs)	131	51.3 (121)	76.9 (10)	
HS diploma or more (≥12 yrs)	118	48.7 (115)	23.1 (3)	
How would you rate your overall health?				NS
Excellent/Very good/Good	113	44.2 (106)	46.7 (7)	
Fair/Poor	142	55.8 (134)	53.3 (8)	
How often do you get the social and emotional support that you need?				NS
Always/Usually	189	75.9 (179)	71.4 (10)	
Sometimes/Rarely/Never	61	24.2 (57)	28.6 (4)	
Food security status				NS
Food secure[4]	186	75.3 (177)	60.0 (9)	
Food insecure[5]	64	24.7 (58)	40.0 (6)	

[1] *Abbreviations: HS, high school; NS, not significant*

[2] *Percentages may not add up to exactly 100 due to rounding*

[3] *Sample size ranges from 235-240 for participants included and 13-15 for participants excluded due to missing responses*

[4] *Food secure: consistent, dependable access to enough food for active, healthy living (raw score of 0 or 1 on the modified Six-Item Short Form Food Security Survey Module)*

[5] *Food Insecure: access to adequate food is limited by a lack of money and other resources (raw score of 2-6 on the modified Six-Item Short Form Food Security Survey Module)*

TABLE 3.3 Level of Performance of DSM Behaviors Among Senior Center Participants in Georgia, 2007, N=240.[1,3]

	n (%)	Number of Days[4] Mean (SD) Median (95% CI)
Healthy diet		4.85 (2.46) 5.0 (4.7-5.3)
High[2]	159 (66.3)	
Low	81 (33.8)	
Spacing carbohydrates		3.36 (3.09) 3.0 (2.6-3.4)
High	101 (42.1)	
Low	139 (57.9)	
Moderate PA ≥30 min		3.93 (2.63) 4.0 (3.7-4.3)
High	109 (45.4)	
Low	131 (54.6)	
Testing BG		5.46 (2.49) 7.0 (6.7-7.3)
High	176 (73.3)	
Low	64 (26.7)	
Taking medications		6.87 (0.81) 7.0 (6.9-7.1)
High	234 (97.5)	
Low	6 (2.5)	
Checking feet		4.98 (2.87) 7.0 (6.7-7.3)
High	156 (65.0)	
Low	84 (35.0)	
Tobacco use		
No	225 (93.75)	
Yes	15 (6.25)	
	n (%)	**Number of behaviors[6] Mean (SD) Median (95% CI)**
All DSM behaviors[5]		3.9 (1.31) 4.0 (3.8-4.2)
Yes	27 (11.3)	
No	213 (88.8)	

[1] *Abbreviations: DSM, Diabetes Self-Management*

[2] *High (high level of performance of the DSM behavior, performed behavior ≥5 days within the past week); Low (low level of performance of DSM behavior, performed behavior <5 days within the past week*

[3] *Percentages may not add up to exactly 100 due to rounding*

[4] *Mean number of days the behavior was performed*

[5] *Performance of All the DSM behaviors, excluding tobacco, at a High Level*

[6] *Number of DSM behaviors performed at a high level*

TABLE 3.4 Diabetes Self-Management (DSM) Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security.[1,2,3]

		Healthy diet			Spacing carbohydrates			Mod. PA 30 min		
	n	Low	High	p	Low	High	p	Low	High	p
Age (n = 240)				0.02			NS			0.03
60-69 years	84	46.9 (38)	28.9 (46)		33.1 (46)	37.6 (38)		40.5 (53)	28.4 (31)	
70-79 years	105	37.0 (30)	47.2 (75)		46.0 (64)	40.6 (41)		35.9 (47)	53.2 (58)	
≥80 years	51	16.1 (13)	23.9 (38)		20.9 (29)	21.8 (22)		23.7 (31)	18.4 (20)	
Gender (n = 240)				NS			NS			NS
Male	52	23.5 (19)	20.8 (33)		23.0 (32)	19.8 (20)		22.9 (30)	20.2 (22)	
Female	188	76.5 (62)	79.3 (126)		77.0 (107)	80.2 (81)		77.1 (101)	79.8 (87)	
Race (n = 240)				NS			NS			0.15
White	122	50.6 (41)	50.9 (81)		51.1 (71)	50.1 (51)		46.6 (61)	56.0 (61)	
Black	118	49.4 (40)	49.1 (78)		48.9 (68)	50.0 (50)		53.4 (70)	44.0 (48)	
Education (n = 236)				0.04			NS			NS
No HS diploma (≤11 yrs)	121	41.8 (33)	56.1 (88)		53.3 (72)	48.5 (49)		53.5 (69)	48.6 (52)	
HS diploma or more (≥12 yrs)	115	58.2 (46)	44.0 (69)		46.7 (63)	51.5 (52)		46.5 (60)	51.4 (55)	
How would you rate your overall health? (n = 240)				0.11			NS			0.04
Fair/Poor	134	63.0 (51)	52.2 (83)		56.8 (79)	54.5 (55)		61.8 (81)	48.6 (53)	
Excellent/Very good/ Good	106	37.0 (30)	47.8 (76)		43.2 (60)	45.5 (46)		38.2 (50)	51.4 (56)	
How often do you get the social and emotional support that you need? (n = 236)				NS			0.04			NS
Sometimes/Rarely/Never	57	29.1 (23)	21.7 (34)		29.0 (40)	17.4 (17)		26.9 (35)	20.8 (22)	
Always/Usually	179	70.9 (56)	78.3 (123)		71.0 (98)	82.7 (81)		73.1 (95)	79.3 (84)	
Food security status (n = 235)				NS			0.11			0.07
Food secure[4]	177	73.4 (58)	76.3 (119)		71.5 (98)	80.6 (79)		70.8 (92)	81.0 (85)	
Food insecure[5]	58	26.6 (21)	23.7 (37)		28.5 (39)	19.4 (19)		29.2 (38)	19.0 (20)	

TABLE 3.4 Diabetes Self-Management (DSM) Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security (continued).

		Testing blood glucose			Taking medications			Checking feet		
	n	Low	High	p	Low	High	p	Low	High	p
Age (n = 240)				NS			0.04			0.06
60-69 years	84	35.9 (23)	34.7 (61)		83.3 (5)	33.8 (79)		32.1 (27)	36.5 (57)	
70-79 years	105	42.2 (27)	44.3 (78)		16.7 (1)	44.4 (104)		38.1 (32)	46.8 (73)	
≥80 years	51	21.9 (14)	21.0 (37)		0.0 (0)	21.8 (51)		29.8 (25)	16.7 (26)	
Gender (n = 240)				NS			NS			NS
Male	52	23.4 (15)	21.0 (37)		16.7 (1)	21.8 (51)		25.0 (21)	19.9 (31)	
Female	188	76.6 (49)	79.0 (139)		83.3 (5)	78.2 (183)		75.0 (63)	80.1 (125)	
Race (n = 240)				NS			NS			NS
White	122	57.8 (37)	48.3 (85)		50.0 (3)	50.9 (119)		54.8 (46)	48.7 (76)	
Black	118	42.2 (27)	51.7 (91)		50.0 (3)	49.2 (115)		45.2 (38)	51.3 (80)	
Education (n = 236)				0.09			0.09			0.01
No HS diploma (≤11 yrs)	121	60.3 (38)	48.0 (83)		16.7 (1)	52.2 (120)		62.2 (51)	45.5 (70)	
HS diploma or more (≥12 yrs)	115	39.7 (25)	52.0 (90)		83.3 (5)	47.8 (110)		37.8 (31)	54.6 (84)	
How would you rate your overall health? (n = 240)				NS			0.05			NS
Fair/Poor	134	60.9 (39)	54.0 (95)		16.7 (1)	56.8 (133)		59.5 (50)	53.9 (84)	
Excellent/Very good/ Good	106	39.1 (25)	46.0 (81)		83.3 (5)	43.2 (101)		40.5 (34)	46.2 (72)	
How often do you get the social and emotional support that you need? (n = 236)				0.10			0.06			NS
Sometimes/Rarely/Never	57	31.8 (20)	21.4 (37)		60.0 (3)	23.4 (54)		25.0 (21)	23.7 (36)	
Always/Usually	179	68.3 (43)	78.6 (136)		40.0 (2)	76.6 (177)		75.0 (63)	76.3 (116)	
Food security status (n = 235)				NS			NS			NS
Food secure	177	78.7 (48)	74.1 (129)		66.7 (4)	75.6 (173)		70.7 (58)	77.8 (119)	
Food insecure	58	21.3 (13)	25.9 (45)		33.3 (2)	24.5 (56)		29.3 (24)	22.2 (34)	

TABLE 3.4 Diabetes Self-Management (DSM) Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security (continued).

		Tobacco use			All DSMb's			# of high level DSMb's		
	n	Yes	No	p	No	Yes	p	<4	≥4	p
Age (n = 240)				NS			NS			NS
60-69 years	84	46.7 (7)	34.2 (77)		36.2 (77)	25.9 (7)		41.4 (36)	31.4 (48)	
70-79 years	105	40.0 (6)	44.0 (99)		41.8 (89)	59.3 (16)		39.1 (34)	46.4 (71)	
≥80 years	51	13.3 (2)	21.8 (49)		22.1 (47)	14.8 (4)		19.5 (17)	22.2 (34)	
Gender (n = 240)				NS			NS			NS
Male	52	33.3 (5)	20.9 (47)		23.0 (49)	11.1 (3)		23.0 (20)	20.9 (32)	
Female	188	66.7 (10)	79.1 (178)		77.0 (164)	88.9 (24)		77.0 (67)	79.1 (121)	
Race (n = 240)				NS			NS			NS
White	122	33.3 (5)	52.0 (117)		51.2 (109)	48.2 (13)		49.4 (43)	51.6 (79)	
Black	118	66.7 (10)	48.0 (108)		48.8 (104)	51.9 (14)		50.6 (44)	48.4 (74)	
Education (n = 236)				NS			NS			NS
No HS diploma (≤11 yrs)	121	53.3 (8)	51.1 (113)		52.2 (109)	44.4 (12)		55.3 (47)	49.0 (74)	
HS diploma or more (≥12 yrs)	115	46.7 (7)	48.9 (108)		47.9 (100)	55.6 (15)		44.7 (38)	51.0 (77)	
How would you rate your overall health? (n = 240)				0.02			0.09			0.08
Fair/Poor	134	26.7 (4)	57.8 (130)		57.8 (123)	40.7 (11)		63.2 (55)	51.6 (79)	
Excellent/Very good/ Good	106	73.3 (11)	42.2 (95)		42.3 (90)	59.3 (16)		36.8 (32)	48.4 (74)	
How often do you get the social and emotional support that you need? (n = 236)				NS			NS			0.02
Sometimes/Rarely/Never	57	13.3 (2)	24.9 (55)		24.6 (52)	20.0 (5)		32.9 (28)	19.2 (29)	
Always/Usually	179	86.7 (13)	75.1 (166)		75.4 (159)	80.0 (20)		67.1 (57)	80.8 (122)	
Food security status (n = 235)				NS			NS			0.11
Food secure	177	66.7 (10)	75.9 (167)		74.2 (155)	84.6 (22)		69.4 (59)	78.7 (118)	
Food insecure	58	33.3 (5)	24.1 (53)		25.8 (54)	15.4 (4)		30.6 (26)	21.3 (32)	

[1] Data are % (n); Percentages are expressed as % of each category of participants who had a high or low level of performance of DSM behaviors, Percentages may not add up to exactly 100 due to rounding

[2] $p < 0.05$ was considered significant; $0.05 \leq p < 0.1$ was considered a trend; $0.1 \leq p < 0.15$ was considered a weak trend; NS, not significant

[3] High (High level of performance of DSM behavior, performed behavior ≥5 days within the past week); Low (Low level of performance of DSM behavior, performed behavior <5 days within the past week); HS, high school; Mod. PA ≥ 30 min; days of the last week individuals participated in at least 30 minutes of moderate physical activity; DSMb's, Diabetes Self-Management behaviors; # of High Level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk); All DSMb's, frequency of those performing all of the DSM behaviors at a high level versus those not performing all the behaviors

[4] Food Secure: consistent, dependable access to enough food for active, healthy living (raw score of 0 or 1 on the modified Six-Item Short Form Food Security Survey Module)

[5] Food Insecure: access to adequate food is limited by a lack of money and other resources (raw score of 2-6 on the modified Six-Item Short Form Food Security Survey Module)

Table 3.5 Spearman Correlations Among Performance Level of DSM Behaviors and Demographics, Self-Reported Health, Emotional Support, and Food Security.[1,2,3]

		Healthy diet		Spacing carbohydrates		Moderate PA ≥30 min		Testing blood glucose	
	n	rho	p value	rho	p value	rho	p value	rho	p value
Age (Years)	240	0.17	0.0095	-	NS	-	NS	-	NS
Gender (Male = 0, Female = 1)	240	-	NS	-	NS	-	NS	-	NS
Race (White = 1, African American = 2)	240	-	NS	-	NS	-	NS	-	NS
Education (Years completed)	236	-	NS	-	NS	-	NS	-	NS
Self-reported health (Poor = 0, Excellent = 4)	240	0.10	0.1091	-	NS	0.17	0.0075	-	NS
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)	236	-0.13	0.0519	-	NS	-	NS	-0.12	0.0711
Food security[4] (Range = 0 to 6)	235	-	NS	-	NS	-0.14	0.0369	-	NS

Table 3.5 Spearman Correlations Among Performance Level of DSM Behaviors and Demographics, Self-Reported Health, Emotional Support, and Food Security (continued).

		Taking medications		Checking feet		Tobacco use		# of high level DSMb's	
	n	rho	p value	rho	p value	rho	p value	rho	p value
Age (Years)	240	0.18	0.0041	-0.13	0.0422	-	NS		NS
Gender (Male = 0, Female = 1)	240	-	NS	-	NS	-	NS		NS
Race (White = 1, African American = 2)	240	-	NS	-	NS	-	NS		NS
Education (Years completed)	236	-0.10	0.1338	0.21	0.0012	-	NS		NS
Self-reported health (Poor = 0, Excellent = 4)	240	-	NS	-	NS	0.14	0.0349	0.11	0.1004
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)	236	-	NS	-	NS	-	NS	-0.17	0.0102
Food security (Range = 0 to 6)	235	-	NS	-0.12	0.0677	-	NS	-0.17	0.0107

[1] *Abbreviations: DSM, Diabetes Self-Management; DSMb's, Diabetes Self-Management Behaviors; Mod. PA ≥ 30 min; days of the last week individuals participated in at least 30 minutes of moderate physical activity; # of High Level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk)*

[2] *$p < 0.05$ was considered significant; $0.05 \leq p < 0.10$ was considered a trend; $0.10 \leq p < 0.15$ was considered a weak trend*

[3] *Performance of DSM behaviors were recorded as number of days of the past week the behavior was performed*

[4] *Food Security: raw score from 0-6, higher number indicates higher food INsecurity*

Table 3.6 Logistic Regression Analysis of Predictors of Performance of DSM Behaviors.[1,2,3,4]

	Healthy diet		**Spacing carbohydrates**		**Moderate PA ≥ 30 min**		**Testing blood glucose**	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	-0.41 ± 0.77	NS	-1.06 ± 0.75	NS	-0.52 ± 0.73	NS	-0.73 ± 0.81	NS
Age (60-69 = 1, 70-79 = 2, 80+ = 3)	0.42 ± 0.21	0.0455	-0.18 ± 0.20	NS	0.09 ± 0.20	NS	0.03 ± 0.22	NS
Gender (Male = 0, Female = 1)	0.09 ± 0.37	NS	0.20 ± 0.36	NS	0.22 ± 0.35	NS	-0.11 ± 0.40	NS
Race (White = 1, Black = 2)	0.04 ± 0.30	NS	0.27 ± 0.29	NS	-0.32 ± 0.29	NS	0.54 ± 0.33	0.1013
Education (≤11 years = 0, ≥12 years = 1)	-0.49 ± 0.29	0.0980	0.30 ± 0.28	NS	0.26 ± 0.28	NS	0.58 ± 0.32	0.0718
Self-reported health (Poor/Fair = 0, Good/Very good/Excellent = 1)	0.45 ± 0.31	0.1451	-0.08 ± 0.28	NS	0.45 ± 0.28	0.1115	0.17 ± 0.33	NS
How often do you get the social and emotional support that you need? (Never/Rarely/Sometimes = 0, Usually/Always = 1)	0.32 ± 0.34	NS	0.70 ± 0.35	0.0451	0.22 ± 0.33	NS	0.84 ± 0.36	0.0188
Food security (Food secure = 0, Food insecure = 1)	0.14 ± 0.36	NS	-0.56 ± 0.35	0.1128	-0.33 ± 0.35	NS	0.27 ± 0.40	NS

Table 3.6 Logistic Regression Analysis of Predictors of Performance of DSM Behaviors (continued).

	Taking medications		**Checking feet**		**Avoids tobacco use** (No=0, Yes=1)		**# of high level DSMb's** (<4, ≥4)	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	12.66 ± 262.90	NS	-0.19 ± 0.75	NS	4.51 ± 1.66	0.0065	-0.83 ± 0.75	NS
Age (60-69 = 1, 70-79 = 2, 80+ = 3)	11.17 ± 109.90	NS	-0.28 ± 0.20	NS	0.29 ± 0.41	NS	0.17 ± 0.20	NS
Gender (Male = 0, Female = 1)	10.94 ± 195.00	NS	0.25 ± 0.36	NS	1.39 ± 0.65	0.0338	0.09 ± 0.36	NS
Race (White = 1, Black = 2)	0.07 ± 1.18	NS	0.51 ± 0.30	0.0928	-0.93 ± 0.61	0.1301	0.14 ± 0.30	NS
Education (≤11 years = 0, >12 years = 1)	-0.74 ± 1.26	NS	0.63 ± 0.30	0.0326	0.13 ± 0.59	NS	0.38 ± 0.30	NS
Self-reported health (Poor/Fair = 0, Good/Very good/Excellent = 1)	-11.73 ± 137.90	NS	0.02 ± 0.30	NS	-1.57 ± 0.65	0.0152	0.31 ± 0.30	NS
How often do you get the social and emotional support that you need? (Never/Rarely/Sometimes = 0, Usually/Always = 1)	1.59 ± 1.11	NS	0.26 ± 0.34	NS	-1.11 ± 0.81	NS	0.77 ± 0.33	0.0197
Food security (Food secure = 0, Food insecure = 1)	0.35 ± 1.35	NS	-0.48 ± 0.36	NS	-0.69 ± 0.65	NS	-0.25 ± 0.35	NS

[1] *N = 227*

[2] *Abbreviations: DSM, Diabetes self-management; Mod PA ≥ 30 min, days of the last week individuals participated in at least 30 minutes of moderate physical activity; # of high level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk)*

[3] *Performance of DSM behaviors were recorded as number of days of the past week the behavior was performed, and then dichotomized into high performance (≥5days/wk) and low performance (<5 days/wk)*

[4] *$p < 0.05$ was considered significant; $0.05 \leq p < 0.10$ was considered a trend; $0.10 \leq p < 0.15$ was considered a weak trend, NS, not significant; parameter estimates & SE's were not listed for variables that had a p value ≥ 0.15*

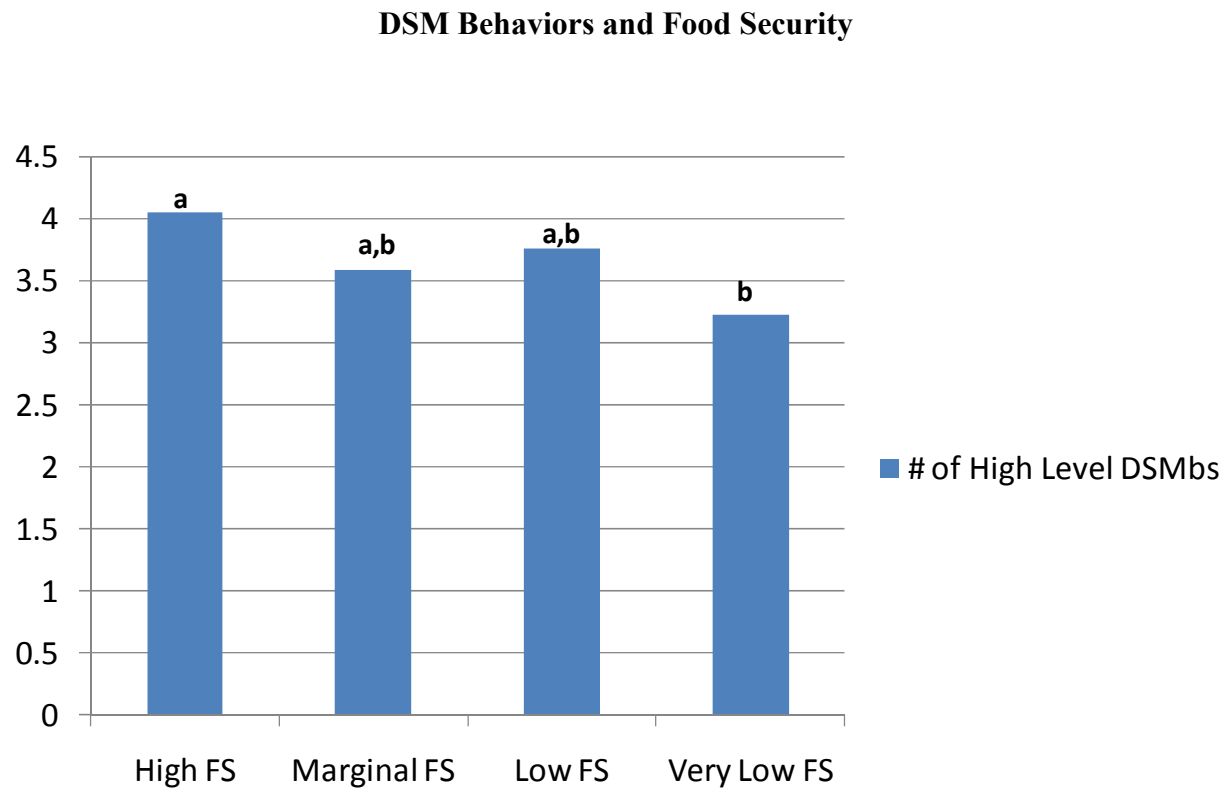

Figure 3.2 Number of High Level Diabetes Self-Management Behaviors (DSMb) Performed by Participants in Different Food Security (FS) Categories.[1,2]

[1]*Vertical bars indicate the mean number of high level DSMbs performed by participants and are categorized by FS categories.*
[2]*FS categories with different letters indicate a significant difference, P<0.05 was considered statistically significant.*

CHAPTER 4

CONCLUSION

The primary goal of this study was to assess performance of DSM behaviors in 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 DSM behaviors. The first hypothesis was that older adults with diabetes would have a higher level of performance of medically-related DSM behaviors than lifestyle-related DSM behaviors, and that less than 15% of the older adults with diabetes were performing all of the six diabetes self-management behaviors combined at a high level. The second specific aim of this study was to determine the predictors of diabetes self-management in older adults in Georgia senior centers. The second hypothesis of this study was that high self-reported health, high emotional support, high education, and older age would be positively associated with performance of DSM behaviors, while food insecurity, African American race/ethnicity, and male gender would be negatively associated.

This study supports that the medically-related behaviors were performed at higher levels than lifestyle-related behaviors, which is consistent with literature (Ruggiero et al., 1997; Rosland et al., 2008; Goodall & Halford, 1991). This may be because of the complexity and time it takes to perform lifestyle-related behaviors compared to medically-related behaviors. Although it was not a specific aim of this study, an important finding of this study was that performance levels of DSM behaviors were higher in this sample than in other samples of adults with diabetes, with the exception of checking feet (Katon et al., 2010; Glasgow et al., 1992;

Rosland et al., 2008; Speer et al., 2008; Redmond et al., 2006). Participation in senior centers may provide the social and emotional support that is important for keeping up with DSM. Senior centers may also influence DSM by providing resources such as DSM education.

Different factors were associated with each DSM behavior, supporting the principle that DSM is a complex regimen of behaviors. Older age was associated with higher performances of following a healthy diet and taking medications. Years of education were associated with checking feet. Gender was not significantly associated with DSM behaviors, while race was associated checking feet. Social and emotional support was associated with testing blood glucose and total number of DSM behaviors. More studies, including longitudinal studies, are needed to determine predictors of individual DSM behaviors in this population. Because of the complexity of the group of behaviors that make up DSM, it may be less likely to determine predictors for DSM as a whole.

This study contributes to a better understanding of DSM in vulnerable older adults. Diabetes is a serious problem especially in older adults. If diabetes is not managed, uncontrolled blood glucose can lead to blindness, kidney failure, amputations, heart disease, stroke, hypertension, nerve damage, repeated infections, slow wound healing, sexual dysfunctions, skin disorders, periodontal disease, pregnancy complications, disability, and premature death (Georgia Department of Human Resources, 2008). Older adults are more at risk for diabetes complications. The total economic cost of diabetes in 2007 was estimated to be $174 billion, of which a third ($58 billion) was attributed to diabetes-related complications (American Diabetes Association, 2008a). Many complications can be prevented with comprehensive management, and prevention leads to decreased health care costs. Those that participate in DSM behaviors accrue fewer total disease-related health care costs than those who do not participate in DSM

behaviors (Touchette & Shapiro, 2008). In 2007, adult Georgians with diabetes met only one national target (Healthy People 2010 Objective) for the recommended routine care for diabetes (Georgia Department of Human Resources, 2008). With the economic decline, older adults may be less likely to perform DSM behaviors. Senior centers and programs provided through senior centers, such as congregate meals, may help vulnerable older adults maintain their DSM during this hard economic time. This study provides valuable information to policy makers concerning future funding and program development needed to reduce the burden of diabetes among older adults. Along with other DSM behaviors, diet quality and quantity play major roles in preventing, delaying onset, and managing chronic diseases associated with aging, and escalating health care costs are largely related to chronic diseases in which nutrition intervention have proven effective (Kamp et al., 2010). Appropriate food and nutrition programs for older adults include adequately funded food assistance and meal programs, nutrition education, screening, assessment, counseling, therapy, monitoring, evaluation, and outcomes documentation to ensure more healthful aging. These programs help older adults with their complex diabetes management regimens, decreasing complications and more health care costs. It is the position of the American Dietetic Association, the American Society for Nutrition, and the Society for Nutrition Education that all older adults should have access to food and nutrition programs. The growing number of older adults, the health care focus on prevention, and the global economic situation accentuate the fundamental need for these programs (Kamp et al., 2010). These programs help older adults remain independent and in their community.

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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) **<u>If I have diabetes</u>**, 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 Consent Form to Participant	Printed Name of Staff	Date

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: 9-9-08

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

APPENDIX B

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	44

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

Read Questions to Participants and Circle their Answers

DIET AND PHYSICAL ACTIVITY		Line 1
28. How many fruits and vegetables should older people eat each day? (Circle the participant's response) 0 1 2 3 4 5 6 7 8 9 10 "5 a day" "5 or more a day" "7 to 10 a day" DK Missing		50-52
29. How many servings of fruits and 100% fruit juices do you usually have each day?	0 1 2 3 4 5 6 7	53
30. How many servings of vegetables do you usually eat each day?	0 1 2 3 4 5 6 7	54
31. On how many DAYS of the last WEEK (seven days) did you eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7	55
32. How many DAYS of the last WEEK (seven days) have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	56
33. How many DAYS of the last WEEK (seven days) did you participate in at least **30 minutes** of **moderate** physical activity? Examples of **moderate** activities are regular walking, housework, yard work, lawn mowing, painting, repairing, light carpentry, ballroom dancing, light sports, golf, or bicycling on level ground.	0 1 2 3 4 5 6 7	57
34. How many days of the week do you participate in any physical activity (light or moderate)?	0 1 2 3 4 5 6 7	58
35. About how many minutes of physical activity do you do on the days you are physically active?	____ minutes	59-61
36. How many DAYS of the last WEEK (seven days) did you participate in a specific **exercise session** other than what you do around the house or as a part of your daily activities *(e.g., chair exercises, yoga, aerobics, organized walking programs, using workout machines, etc.)*?	0 1 2 3 4 5 6 7	62

HOME FOOD SAFETY		
37. In the past month, did you **always** wash your hands with **warm water** and **soap** for **20 seconds** before eating food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 63
38. In the past month, did you **always** rinse fresh fruits and vegetables with cold running water before eating them??	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 64
39. In the past month, have you checked the temperature of your refrigerator?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 65
40. Do you cook, reheat or prepare meals in your home?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 66
41. Do you own a meat thermometer?	No (0) Yes	7 Don't know/ not

Read Questions to Participants and Circle their Answers			
	(1)	sure 9 Refused 67	
FALLS AND FRACTURES			
42. Have you had a fracture or broken bone after age 50?	No (0) Yes (1)		68
43. Have you fallen in the past year?	No (0) Yes (1)		69
44. Do you feel limited in your daily life by a fear of falling?	No (0) Yes (1)		70
45. Have you ever been told by a doctor or other health professional that you have osteoporosis?	No (0) Yes (1)		71
FOODS AND SUPPLEMENTS			Line 1
46. Do you get a stomachache, gas, or diarrhea after drinking milk?	No (0) Yes (1)		72
47. How many servings of milk products should most older people eat daily?	0 1 2 3 4 DK		73
48. How many whole grain servings should people eat each day?	0 1 2 3 4 DK		74

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

FOOD SECURITY

58. Do you always have enough money to buy the food you need?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 21
59. In the past month, have you received food from a food pantry or food bank?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 22
60. Do you currently receive food stamps?	No (0) Yes (1)	7 Don't know/ not sure

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

Get Checked Questions
(Adapted from **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	1) Within past month 2) Within past year	7 Don't know/not sure

professional, such as a doctor or nurse?	3) Within past 2 yrs 4) 2 or more years ago 5) Never	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*		53-54

write in participant's response)		
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 THOUGHT 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:

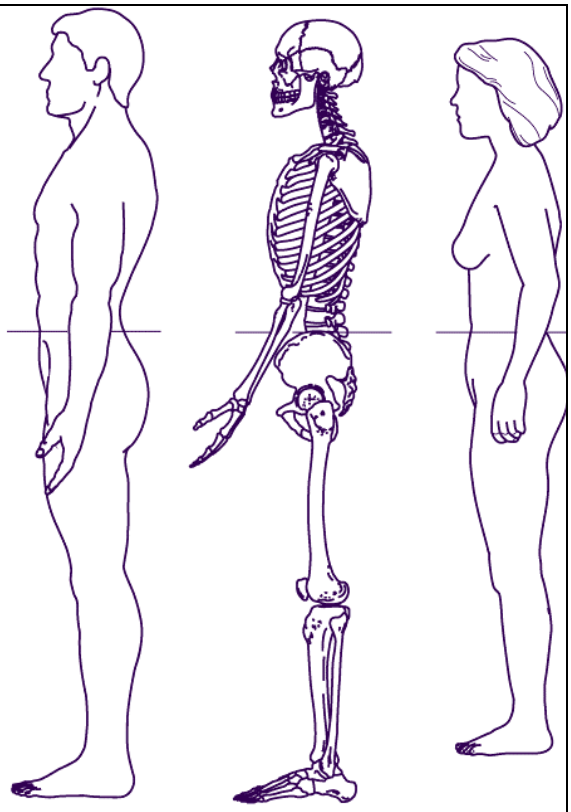
Instructions for Measuring Waist Circumference

<u>The measurement should be made under the clothes</u>.

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

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

	Physical Performance Test-Task Descriptions Equipment: Stopwatch, 8-Ft Tape Measure, Ruler, Folding Chair	**RECORD TIME IN SECONDS**	**LINE 4 UGA Staff can score with open coding**
ASB	**STANDING BALANCE:** **Time each item until >10.0 sec. OR until participant moves feet or reaches for support.** **1a) SEMI-TANDEM** (heel of one foot placed at mid-position of the other) *If can hold for 10 seconds, move to **1b)** *If can NOT hold for 10 seconds, move to **1c)** **1b) TANDEM** (heel to toe, one foot directly in front of the other) **1c) SIDE-BY-SIDE (**toes lined up evenly and feet touching)	**Time to the nearest 10th second:** **a)** ___ ___ . ___ > 10.0 sec. Go to **b)** < 10.0 sec. Go to **c)** **b)** ___ ___ . ___ **c)** ___ ___ . ___	1-4 5-8 9-12
ASB D	**DOMAIN SCORE:** If A= <10 & C= 0-9, score= 0 A= <10 & C= 10, score= 1 A= ≥10 & B= 0-2, score= 2 A= ≥10 & B= 3-9, score= 3 A= ≥10 & B= ≥10, score= 4	**SCORE: _____**	13
AFW	**8 FOOT WALK:** **Participant begins at standing position and will walk a straight distance of 8-feet, measured with tape on the floor.** **Instruct the participant to walk at normal gait using any assistive devices. If possible, have them begin walking a few feet before starting mark, and continue**	**Time to the nearest 10th second:** **1)** ___ ___ . ___ **2)** ___ ___ . ___ Use best (lowest) time	14-17

	walking a few feet past the 8-foot mark. Tester will start and stop watch at the distance marks. **Complete the walk twice.**	**Assistive device used?** NO (0) YES (1) Describe _____	18
AFWD	**DOMAIN SCORE:** 1= ≥5.7 2= 4.1-5.6 3= 3.2-4.0 4= ≤3.1	**SCORE: _____**	19
ACS	**CHAIR STANDS:** **Participant is asked to stand one time from a seated position in an armless, straight-backed chair (such as a folding metal chair) with their arms folded across their chest.** **If able, participant is asked to stand-up and sit-down 5 times as quickly as possible while being timed.** **If not able to perform, then the test is complete.**	**Time to the nearest 10th second:** **1)** ___ ___ . ___	20-23
ACSD	**DOMAIN SCORE:** 1= ≥16.7 2= 13.7-16.6 3= 11.2-13.6 4= ≤11.1	**SCORE: _____**	24
TDS	**TOTAL SCORE: Add all 3 domain scores (1-12)**	**TOTAL SCORE:__**	25-26
Coding: 8 = physically unable, 9=refused, 7=not applicable. Good function (score of 10 to 12); moderate function (score of 6 to 9); poor function (score of 0 to 5).			

THE END

APPENDIX C

POWER ANALYSIS

Adequate power is considered to be power = 0.80 and alpha = 0.05 and an online power calculator was used (DSS Research, (c) 2006). From ongoing and previous studies the projected sample size of OAANP participants with diabetes will be about 344. Assuming similar sample proportions of gender to those in previous years of LHG, a sample size of 344 is needed to show a 17 percentage point difference in those performing blood glucose checks (80% power, alpha = 0.05), the DSM behavior with the greatest variability (Toobert et al., 2000). For example, if there are 344 subjects with diabetes of which 82% are female (n=282), and 68% of the diabetic females perform daily blood glucose checks and 51% of the diabetic males perform blood glucose checks five or more days per week, then the sample has 80.6% power to detect this 17% difference between groups.

APPENDIX D

CHI-SQUARE ANALYSIS OF DIABETES SELF-MANAGEMENT (DSM) BEHAVIORS, DEMOGRAPHICS, SELF-REPORTED HEALTH, EMOTIONAL SUPPORT, AND FOOD SECURITY

Appendix D. Diabetes Self-Management (DSM) Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security.[1,2,3]

		Healthy diet			Spacing carbohydrates			Mod. PA 30 min		
	n	Low	High	p	Low	High	p	Low	High	p
Age (n = 240)				0.02			NS			0.03
60-69 years	84	45.2 (38)	54.8 (46)		54.8 (46)	45.2 (38)		63.1 (53)	36.9 (31)	
70-79 years	105	28.6 (30)	71.4 (75)		61.0 (64)	39.5 (41)		44.8 (47)	55.2 (58)	
≥80 years	51	25.5 (13)	74.5 (38)		56.9 (29)	43.1 (22)		60.8 (31)	39.2 (20)	
Gender (n = 240)				NS			NS			NS
Male	52	36.5 (19)	63.5 (33)		61.5 (32)	38.5 (20)		57.7 (30)	42.3 (22)	
Female	188	33.0 (62)	67.0 (126)		57.0 (107)	43.1 (81)		53.7 (101)	46.3 (87)	
Race (n = 240)				NS			NS			0.15
White	122	33.6 (41)	66.4 (81)		58.2 (71)	41.8 (51)		50.0 (61)	50.0 (61)	
Black	118	33.9 (40)	66.1 (78)		57.6 (68)	42.4 (50)		59.3 (70)	40.7 (48)	
Education (n = 236)				0.04			NS			NS
No HS diploma (≤11 yrs)	121	27.3 (33)	72.7 (88)		59.5 (72)	40.5 (49)		57.0 (69)	43.0 (52)	
HS diploma or more (≥12 yrs)	115	40.0 (46)	60.0 (69)		54.8 (63)	45.2 (52)		52.2 (60)	47.8 (55)	
How would you rate your overall health? (n = 240)				0.11			NS			0.04
Fair/Poor	134	38.1 (51)	61.9 (83)		59.0 (79)	41.0 (55)		60.5 (81)	39.6 (53)	
Excellent/Very good/ Good	106	28.3 (30)	71.7 (76)		56.6 (60)	43.4 (46)		47.2 (50)	52.8 (56)	
How often do you get the social and emotional support that you need? (n = 236)				NS			0.04			NS
Sometimes/Rarely/Never	57	40.4 (23)	59.7 (34)		70.2 (40)	29.8 (17)		61.4 (35)	38.6 (22)	
Always/Usually	179	31.3 (56)	68.7 (123)		54.8 (98)	45.3 (81)		53.1 (95)	46.9 (84)	
Food security status (n = 235)				NS			0.11			0.07
Food secure[4]	177	32.8 (58)	67.2 (119)		55.4 (98)	44.6 (79)		52.0 (92)	48.0 (85)	
Food insecure[5]	58	36.2 (21)	63.8 (37)		67.2 (39)	32.8 (19)		65.5 (38)	34.5 (20)	

Appendix D. Diabetes Self-Management Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security (continued).

		Testing blood glucose			Taking medications			Checking feet		
	n	Low	High	p	Low	High	p	Low	High	p
Age (n = 240)				NS			0.04			0.06
60-69 years	84	27.4 (23)	72.6 (61)		6.0 (5)	94.1 (79)		32.1 (27)	67.9 (57)	
70-79 years	105	25.7 (27)	74.3 (78)		1.0 (1)	99.1 (104)		30.5 (32)	69.5 (73)	
≥80 years	51	27.5 (14)	72.6 (37)		0.0 (0)	100.0 (51)		49.0 (25)	51.0 (26)	
Gender (n = 240)				NS			NS			NS
Male	52	28.9 (15)	71.2 (37)		1.9 (1)	98.1 (51)		40.4 (21)	59.6 (31)	
Female	188	26.1 (49)	73.9 (139)		2.7 (5)	97.3 (183)		33.5 (63)	66.5 (125)	
Race (n = 240)				NS			NS			NS
White	122	30.3 (37)	69.7 (85)		2.5 (3)	97.5 (119)		37.7 (46)	62.3 (76)	
Black	118	22.9 (27)	77.1 (91)		2.5 (3)	97.5 (115)		32.2 (38)	67.8 (80)	
Education (n = 236)				0.09			0.09			0.01
No HS diploma (≤11 yrs)	121	31.4 (38)	68.6 (83)		0.8 (1)	99.2 (120)		42.2 (51)	57.9 (70)	
HS diploma or more (≥12 yrs)	115	21.7 (25)	78.3 (90)		4.4 (5)	95.7 (110)		27.0 (31)	73.0 (84)	
How would you rate your overall health? (n = 240)				NS			0.05			NS
Fair/Poor	134	29.1 (39)	71.0 (95)		0.8 (1)	99.3 (133)		37.3 (50)	62.7 (84)	
Excellent/Very good/ Good	106	23.6 (25)	76.4 (81)		4.7 (5)	95.3 (101)		32.1 (34)	67.9 (72)	
How often do you get the social and emotional support that you need? (n = 236)				0.10			0.06			NS
Sometimes/Rarely/Never	57	35.1 (20)	64.9 (37)		5.3 (3)	94.7 (54)		36.8 (21)	63.2 (36)	
Always/Usually	179	24.0 (43)	76.0 (136)		1.1 (2)	98.9 (177)		35.2 (63)	64.8(116)	
Food security status (n = 235)				NS			NS			NS
Food secure	177	27.1 (48)	72.9 (129)		2.3 (4)	97.7 (173)		32.3 (58)	67.2 (119)	
Food insecure	58	22.4 (13)	77.6 (45)		3.5 (2)	96.6 (56)		41.4 (24)	58.6 (34)	

Appendix D. Diabetes Self-Management Behaviors, Demographics, Self-Reported Health, Emotional Support, and Food Security (continued).

		Tobacco use			All DSMb's			# of high level DSMb's		
	n	Yes	No	p	No	Yes	p	<4	≥4	p
Age (n = 240)				NS			NS			NS
60-69 years	84	8.3 (7)	91.7 (77)		91.7 (77)	8.3 (7)		42.9 (36)	57.1 (48)	
70-79 years	105	5.7 (6)	94.3 (99)		85.8 (89)	15.2 (16)		32.4 (34)	67.6 (71)	
≥80 years	51	3.9 (2)	96.1 (49)		92.2 (47)	7.8 (4)		33.3 (17)	66.7 (34)	
Gender (n = 240)				NS			NS			NS
Male	52	9.6 (5)	90.4 (47)		94.2 (49)	5.8 (3)		38.5 (20)	61.5 (32)	
Female	188	5.3 (10)	94.7 (178)		87.2 (164)	12.8 (24)		35.6 (67)	64.4(121)	
Race (n = 240)				NS			NS			NS
White	122	4.1 (5)	95.9 (117)		89.3 (109)	10.7 (13)		35.2 (43)	64.8 (79)	
Black	118	8.5 (10)	91.5 (108)		88.1 (104)	11.9 (14)		37.3 (44)	62.7 (74)	
Education (n = 236)				NS			NS			NS
No HS diploma (≤11 yrs)	121	6.6 (8)	93.4 (113)		90.1 (109)	9.9 (12)		38.8 (47)	61.2 (74)	
HS diploma or more (≥12 yrs)	115	6.1 (7)	93.9 (108)		87.0 (100)	13.0 (15)		33.0 (38)	67.0 (77)	
How would you rate your overall health? (n = 240)				0.02			0.09			0.08
Fair/Poor	134	3.0 (4)	97.0 (130)		91.8 (123)	8.2 (11)		41.0 (55)	59.0 (79)	
Excellent/Very good/ Good	106	10.4 (11)	89.6 (95)		84.9 (90)	15.1 (16)		30.2 (32)	69.8 (74)	
How often do you get the social and emotional support that you need? (n = 236)				NS			NS			0.02
Sometimes/Rarely/Never	57	3.5 (2)	96.5 (55)		91.2 (52)	8.8 (5)		49.1 (28)	50.9 (29)	
Always/Usually	179	7.3 (13)	92.7 (166)		88.8 (159)	11.2 (20)		31.8 (57)	68.2 (122)	
Food security status (n = 235)				NS			NS			0.11
Food secure	177	5.7 (10)	94.4 (167)		87.5 (155)	12.4 (22)		33.3 (59)	66.7 (118)	
Food insecure	58	8.6 (5)	91.4 (53)		93.1 (54)	6.9 (4)		44.8 (26)	55.2 (32)	

[1] *Data are % (n); Percentages are expressed as the % of each demographic category; The total row percentages may not add up to exactly 100 due to rounding*

[2] *$p < 0.05$ was considered significant; $0.05 \leq p < 0.1$ was considered a trend; $0.1 \leq p < 0.15$ was considered a weak trend; NS, not significant*

[3] *High (High level of performance of DSM behavior, performed behavior ≥5 days within the past week); Low (Low level of performance of DSM behavior, performed behavior <5 days within the past week); HS, high school; Mod. PA ≥ 30 min; days of the last week individuals participated in at least 30 minutes of moderate physical activity; DSMb's, Diabetes Self-Management behaviors; # of High Level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk); All DSMb's, frequency of those performing all of the DSM behaviors at a high level versus those not performing all the behaviors*

[4] *Food Secure: consistent, dependable access to enough food for active, healthy living (raw score of 0 or 1 on the modified Six-Item Short Form Food Security Survey Module)*

[5] *Food Insecure: access to adequate food is limited by a lack of money and other resources (raw score of 2-6 on the modified Six-Item Short Form Food Security Survey Module)*

APPENDIX E

LINEAR REGRESSION MODELS OF CHARACTERISTICS ASSOCIATED WITH PERFORMANCE OF DSM BEHAVIORS

Appendix E. Linear Regression Models of Characteristics Associated with Performance of DSM Behaviors.[1,2,3,4]

	Healthy diet		**Spacing carbohydrates**		**Moderate PA ≥ 30 min**		**Testing blood glucose**	
	R-square = 0.0455		R-square = 0.0218		R-square = 0.0414		R-square = 0.0256	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	0.65 ± 2.04	NS	4.02 ± 2.60	0.1237	4.84 ± 2.19	0.0283	5.38 ± 2.07	0.0100
Age (Years)	0.05 ± 0.02	0.0303	-0.02 ± 0.03	NS	-0.02 ± 0.02	NS	0.001 ± 0.02	NS
Gender (Male = 0, Female = 1)	0.27 ± 0.41	NS	0.22 ± 0.53	NS	0.33 ± 0.45	NS	-0.14 ± 0.42	NS
Race (White = 1, Black = 2)	0.31 ± 0.33	NS	0.48 ± 0.43	NS	-0.21 ± 0.36	NS	0.26 ± 0.34	NS
Education (Years completed)	0.01 ± 0.05	NS	0.06 ± 0.07	NS	-0.02 ± 0.06	NS	0.03 ± 0.05	NS
Self-reported health (Poor = 0, Excellent = 4)	0.15 ± 0.21	NS	-0.03 ± 0.27	NS	0.51 ± 0.23	0.0275	0.004 ± 0.22	NS
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)	-0.25 ± 0.15	0.1004	-0.25 ± 0.19	NS	-0.04 ± 0.16	NS	-0.34 ± 0.15	0.0266
Food security (Range = 0 to 6)	0.01 ± 0.11	NS	-0.11 ± 0.14	NS	-0.14 ± 0.12	NS	0.10 ± 0.11	NS

Appendix E. Linear Regression Models of Characteristics Associated with Performance of DSM Behaviors (continue

	Taking medications		**Checking feet**		**Tobacco use** (No=0, Yes=1)		**# of high level DSMb's** (0-6)	
	R-square = 0.0518		R-square = 0.1116		R-square = 0.0605		R-square = 0.0672	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	5.58 ± 0.66	<0.0001	5.16 ± 2.30	0.0258	0.29 ± 0.21	NS	3.18 ± 1.08	0.0036
Age (Years)	0.02 ± 0.007	0.0047	-0.05 ± 0.03	0.0793	-0.004±0.002	0.1113	0.003 ± 0.01	NS
Gender (Male = 0, Female = 1)	-0.07 ± 0.13	NS	0.41 ± 0.47	NS	-0.09 ± 0.04	0.0409	0.12 ± 0.22	NS
Race (White = 1, Black = 2)	-0.05 ± 0.11	NS	0.74 ± 0.38	0.0502	0.06 ± 0.03	0.0720	0.17 ± 0.18	NS
Education (Years completed)	-0.002 ± 0.02	NS	0.23 ± 0.06	0.0002	0.002 ± 0.005	NS	0.05 ± 0.03	0.0737
Self-reported health (Poor = 0, Excellent = 4)	-0.08 ± 0.07	NS	-0.16 ± 0.24	NS	0.04 ± 0.02	0.0470	0.09 ± 0.11	NS
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)	-0.009 ± 0.05	NS	-0.10 ± 0.17	NS	-0.03 ± 0.015	0.0379	-0.21 ± 0.08	0.0086
Food security (Range = 0 to 6)	0.03 ± 0.04	NS	-0.24 ± 0.13	0.0544	0.009 ± 0.01	NS	-0.08 ± 0.06	NS

[1] *N = 227*

[2] *Abbreviations: DSM, Diabetes self-management; Mod PA ≥ 30 min, days of the last week individuals participated in at least 30 minutes of moderate physical activity; # of high level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk)*

[3] *Performance of DSM behaviors were recorded as number of days of the past week the behavior was performed, and then dichotomized into high performance (≥5days/wk) and low performance (<5 days/wk)*

[4] *$p < 0.05$ was considered significant; $0.05 \leq p < 0.10$ was considered a trend; $0.10 \leq p < 0.15$ was considered a weak trend, NS, not significant; parameter estimates & SE's were not listed for variables that had a p value ≥ 0.15*

APPENDIX F

STEPWISE REGRESSION ANALYSIS OF PREDICTORS OF PERFORMANCE OF DSM BEHAVIORS

Appendix F. Stepwise Regression Analysis of Predictors of Performance of DSM Behaviors.[1,2,3,4]

	Healthy diet		**Spacing carbohydrates**		**Moderate PA ≥ 30 min**		**Testing blood glucose**	
	R-square = 0.0363		R-square =		R-square = 0.0292		R-square = 0.0180	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	1.88 ± 1.70	0.2693			3.09 ± 0.36	<0.0001	6.05 ± 0.32	<0.0001
Age (Years)	0.05 ± 0.02	0.0362						
Gender (Male = 0, Female = 1)								
Race (White = 1, Black = 2)								
Education (Years completed)								
Self-reported health (Poor = 0, Excellent = 4)					0.58 ± 0.22	0.0098		
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)	-0.24 ± 0.14	0.1033					-0.29 ± 0.14	0.0432
Food security (Range = 0 to 6)								

Appendix F. Stepwise Regression Analysis of Predictors of Performance of DSM Behaviors (continued).

	Taking medications		**Checking feet**		**Tobacco use** (No=0, Yes=1)		**# of high level DSMb's** (0-6)	
	R-square = 0.0463		R-square = 0.1049		R-square = 0.0575		R-square = 0.0583	
	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value	Parameter Estimate ± SE	p value
Intercept	5.49 ± 0.53	<0.0001	4.88 ± 2.20	0.0278	0.33 ± 0.19	0.0812	3.85 ± 0.32	<0.0001
Age (Years)	0.02 ± 0.007	0.0037	-0.04 ± 0.03	0.0871	-0.004 ± 0.002	0.0750		
Gender (Male = 0, Female = 1)					-0.08 ± 0.04	0.0540		
Race (White = 1, Black = 2)			0.78 ± 0.37	0.0367	0.06 ± 0.03	0.0579		
Education (Years completed)			0.23 ± 0.06	0.0001			0.05 ± 0.03	0.0680
Self-reported health (Poor = 0, Excellent = 4)	-0.10 ± 0.07	0.1456			0.04 ±0.02	0.0576		
How often do you get the social and emotional support that you need? (Always = 1, Never = 5)					-0.03 ± 0.01	0.0512	-0.21 ± 0.08	0.0076
Food security (Range = 0 to 6)			-0.23 ± 0.12	0.0584			-0.08 ± 0.06	0.1544

[1] *N = 227*

[2] *Abbreviations: DSM, Diabetes self-management; Mod PA ≥ 30 min, days of the last week individuals participated in at least 30 minutes of moderate physical activity; # of high level DSMb's, the number of diabetes self-management behaviors (0-6, measure excludes tobacco use) being performed at a high level (≥5days/wk)*

[3] *Performance of DSM behaviors were recorded as number of days of the past week the behavior was performed, and then dichotomized into high performance (≥5days/wk) and low performance (<5 days/wk)*

[4] *$p < 0.05$ was considered significant; $0.05 \leq p < 0.10$ was considered a trend; $0.10 \leq p < 0.15$ was considered a weak trend, NS, not significant; parameter estimates & SE's were not listed for variables that had a p value ≥ 0.15*