ENVIRONMENTAL FACTORS INFLUENCING BODY WEIGHT IN GEORGIA SENIOR CENTERS

by

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(Under the Direction of Mary Ann Johnson)

ABSTRACT

Obesity prevalence among older Americans is currently estimated at 37 percent (Salihu et al 2009). Modifying the food environment may have economic and psychological advantages when used as a complement to other programs in order to reach populations with limited resources (Swinburn et al 1999). This research study examined the influence of environmental factors on obesity among adults aged 60 and older participating in Older Americans Act Nutrition Programs in Georgia senior centers. The aim of this study was to develop a questionnaire for evaluating obesogenic factors in senior centers and pilot test the questionnaire in four Georgia senior centers. It was hypothesized that the questionnaire would accurately identify environmental factors relating to obesity, including food available in addition to congregate meals, absence of physical activities or exercise equipment, food policies that promote excess food consumption, and lack of access to nutritional counseling.

This study used a cross sectional analysis of environmental factors and adiposity indicators in four Georgia senior centers. Height, weight, waist circumference, and associated demographic and health information were collected from participants aged 60 and older (mean age = 75 years, 25% male, 75% female, 55% white, 42% black, 2% Hispanic/Latino, and 1% Asian). Environmental factors were assessed using a questionnaire administered to senior center staff to assess center policies and procedures; certain environmental factors were assessed multiple times to determine short term variation in the environment (e.g., cafeteria crowding). No significant differences in BMI, waist circumference, or obesity were detected among the centers. The questionnaire detected differences in food service characteristics, some nutrition related policies and practices, and staffing that may be related to

differences in participant demographics, diabetes prevalence, and food insecurity among the centers. These results suggest that further refinement and testing of the environmental analysis questionnaire will be necessary in order to accurately identify environmental factors related to obesity in senior centers.

INDEX WORDS: Older Americans Act Nutrition Program, Food Environment, BMI, Waist Circumference, Obesity, Aging, Congregate Meals, Senior Centers

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CHAPTER 1

INTRODUCTION

Overweight and obesity prevalence is over 30% among adults aged 60 and older according to data from the 2005-2006 National Health and Nutrition Examination Survey (NHANES) (CDC 2007b). Population trends indicate that this is the fastest growing segment of the American population and older adults will comprise approximately 20% of the total population by the year 2030 (US Census 2008a). Over 1.4 million adults aged 60 and older live in Georgia, representing 14.8% of the population (DHHS 2008). In 2008, the Older Americans Act Nutrition Program provided congregate meals to over 14,000 adults in Georgia senior centers (DHHS 2008). Penn et al (2009) estimated obesity prevalence in this population at 38.5% using a convenience sample of 759 adults aged 60 and over participating in congregate meal programs in Georgia. These demographic data indicate that reducing the prevalence of overweight and obesity among older adults is a key issue in order to improve the overall health and functional status of the aging population both in Georgia and nationwide.

Obesity is a chronic condition that results from interaction between the genotype and the environment (NHLBI 1998). The environment introduces opportunities and barriers for healthy eating and physical activity (Feng et al 2010). Senior centers have the potential to create healthy food environments and improve health outcomes for older adults, but the high prevalence of obesity in this population suggests that senior center food environments may have the opposite effect and potentially may be promoting sedentary lifestyles and access to low nutrient, energy dense foods. Swinburn et al (1999) define obesogenic environments as those "which increasingly promote a high energy intake and sedentary behaviors." Conversely, this study considers healthful environments as those which promote healthy eating behaviors and physical activities. Modifying the food environment may have positive benefits for older adults who lack knowledge or financial resources to change their eating behaviors and physical activity habits on their own.

Due to the high prevalence of obesity among older adult congregate meal participants, the purpose of this study was to evaluate the food environment in Georgia senior centers using a questionnaire to measure proposed factors influencing body weight among older adult participants. The questionnaire was developed based on ecological systems models, the ANGELO framework, and several existing tools that have been used to evaluate the school food environment, including the School Health Policies and Programs Study questionnaires, the School Nutrition Dietary Assessment Study, and the Nutrition Environmental Measures Study in Restaurants (CDC 2006; Saelens et al 2007; Sallis and Owen 2002; Swinburn et al 1999; USDA 2004). The two part questionnaire was drafted and pilot tested in four Northeast Georgia senior centers; two centers were thought to have more healthful environments and two centers were thought to have less healthful, or obesogenic, environments. A convenience sample of 125 older adults participating in the Older Americans Act Nutrition Program at the centers were interviewed for demographic data and chronic health conditions (adapted from the 2005-2008 Behavior Risk Factor Surveillance Surveys (CDC 2005; CDC 2006a; CDC 2007b; CDC 2008), weight-related disability (Clune et al 2010), and food insecurity (NSI 1992). Anthropometric data were collected, including height, weight, and waist circumference.

This study was the first step in creating a questionnaire to evaluate environmental factors related to body weight in senior centers. The important contribution of this pilot study is that it provides abundant information regarding senior center food environments, policies, and practices as well as guidance for further development of a questionnaire to evaluate senior center food environments.

Chapter 2 provides a review of the literature regarding obesity prevalence and food insecurity among older adults, the Older Americans Act Nutrition Program, and existing theories and models describing food environments and eating behavior.

Chapter 3 is a manuscript to be submitted to the Journal of Nutrition in Gerontology and Geriatrics. It includes the methods, results, and discussion of the key findings from the survey of the food environment in Georgia senior centers.

Chapter 4 provides a summary of the key findings from the survey, as well as recommendations for future research and development of environmental analysis questionnaires for older adults in senior centers.

CHAPTER 2

LITERATURE REVIEW

Introduction

This review summarizes the literature related to the assessment and prevalence of obesity, comorbidities related to obesity, eating behavior, and food insecurity in older adults. Topics include the Older Americans Act Nutrition Program, conceptual models for the food environment, and social theories relating to eating behaviors and physical activity. A gap in the literature was identified that involved the lack of assessment tools or conceptual models for older adults participating in Older Americans Act programs at senior centers. It is important to assess the food environment in these settings to improve health outcomes for older adults receiving nutrition and wellness services through these programs.

Obesity assessment and prevalence

The National Heart, Lung and Blood Institute's guidelines for assessing obesity use two criteria: body mass index and waist circumference (DHHS 2000). A person may be considered obese by meeting the criteria for obesity in either category. BMI is calculated using height and weight and expressed by weight in kilograms divided by height in meters squared. A BMI of < 18.5 kg/m^2 is considered underweight, 18.5-24.9 kg/m^2 is normal weight, 25.0-29.9 kg/m^2 is overweight, and ≥ 30.0 kg/m^2 is obese. BMI is correlated with body fat, but does not measure body composition. Waist circumference is the second measure used in assessing obesity because it reflects abdominal adiposity or central obesity, which is an independent risk factor for diabetes, hypertension, and cardiovascular disease. In men, a waist circumference of ≥ 40 inches (102 cm) indicates central obesity. In women, a waist circumference of $\geq$ 35 inches (88 cm) indicates central obesity. Obesity is usually diagnosed using BMI, but waist circumference is a better independent predictor of disease risk. Due to decreased lean body mass and increased fat mass with age as well as height losses due to spinal compression, traditional BMI scoring may underestimate adiposity in older adults (Houston et al 2009).

Obesity is a chronic disease that results from interactions between genotype and environment (NHLBI 1998). Generally, obesity is not caused by a single factor, but rather multiple factors or behaviors that contribute to caloric imbalance. Treatment of obesity in older adults has been cause for some concern, as voluntary weight reduction could mask involuntary weight loss due to underlying catabolic disease. However, clinical recommendations advise that age alone should not preclude prescribed weight management. Special care should be taken to minimize potential for nutritional deficiencies in older adults who are attempting weight loss.

Key nutrients of concern for older adults utilizing a hypocaloric diet for weight loss include protein, vitamin D, vitamin B12, fiber, and fluid (Houston et al 2009). As reviewed by Houston et al (2009), approximately 40% of older adults 70 and older do not meet the Recommended Dietary Allowance of protein. Vitamin D and vitamin B12 deficiencies are also associated with advanced age and should be monitored in hypocaloric diets. The net dietary goal should be a caloric reduction of 500-750 kcal/day to yield a weight loss of about one pound per week while still maintaining adequate macronutrient and micronutrient intakes.

National Health and Nutrition Examination Survey (NHANES) 2005-2006 data indicates that over 30% of men and women aged 60 and older are overweight or obese (CDC 2007b). This number is more than double the Healthy People 2010 target prevalence of 15% or less. Perhaps more alarming when considered in conjunction with population trends for older adults are the statistics for the 40-56 year old population that indicate 40% of men and 41.1% of women are obese. Weight loss programs consisting of dietary advice and physical activity appear to have modest effects on older adults, but limited scientific research has been performed in this age group and even less has been performed on adults over age 70 (Witham and Avenell 2010). Primary prevention, including health promotion and nutrition education programs, are cost effective relative to disease treatment, but 95% of health care expenditures for older adults are associated with chronic disease treatment (Kamp et al 2010).

Obesity and comorbidities

Obesity is associated with numerous chronic illnesses, including type 2 diabetes, cancer, cardiovascular disease, stroke, and hypertension (Salihu et al 2009). Salihu et al (2009) note that healthcare costs for Medicare participants are increased by 35% when a person is obese as opposed to being normal weight. Older adults are more likely to experience disability and decreased functional disability as a result of being overweight or obese. A study analyzing 1999-2004 NHANES data found that both BMI and waist circumference are independently associated with functional disabilities among adults aged 60 and older (Chen and Guo 2008). This study examined the association of BMI and waist circumference with functional limitations in five domains; instrumental activities of daily living (IADL), activities of daily living (ADL), leisure and social activities, lower extremity mobility, and general physical activity. The researchers found that increased BMI and waist circumference in women were positively associated with functional limitations in all five domains. They also suggested that waist circumference may be a stronger predictor of functional limitations in women than BMI. Obese individuals have a twofold increase in likelihood of developing chronic pain when compared to normal weight individuals (Salihu et al 2009). This figure increases dramatically when BMI is greater than 35 when the risk of chronic pain is four times as high, with pain commonly occurring in the legs, feet, back, neck, and shoulders. A study by Penn et al (2009) found that participants with a high risk waist circumference had significantly lower total scores on the Short Physical Performance Battery (SPPB) than those with low risk waist circumference which denotes that they have relatively poor physical function. In addition, these participants scored lower on the chair sit-and-reach portion of the SPPB, indicating decreased flexibility in those with a high risk waist circumference measurement.

Obesity has a vast and detrimental impact on the cardiovascular system (Lavie et al 2009). Adipocytes produced by body fat contribute to an overall inflammatory state in obesity. Obese individuals also have higher levels of inflammatory markers such as leptin, C-reactive protein, and tumor necrosis factor α (TNF-α). These markers are associated with increased risk of insulin resistance, obesity, and cardiovascular events. The function of the cardiovascular system is also altered by excess body fat.

Obese individuals tend to have greater blood volume and cardiac output, increasing the overall workload of the heart. Stroke volume and heart rate are elevated compared to non-obese individuals. This increased workload can lead to several precursors to heart failure, including left ventricular chamber dilation, left ventricular hypertrophy, concentric remodeling, concentric left ventricular hypertrophy, and left atrial enlargement. These changes in structure may explain previous findings in the Framingham Heart Study data that sudden cardiac death was almost 40 times higher in obese populations as compared to matched, non-obese populations.

Lavie et al (2009) note that for every single point increase in BMI, risk for ischemic stroke increased by 4% while risk for hemorrhagic stroke increased by 6%. This is likely due to increased prevalence of hypertension, increased atrial fibrillation, and proinflammatory state in obese individuals.

Adverse effects of excess body weight are not limited to physical health. In conjunction with associated comorbidities including diabetes and hypertension, obesity increases risk for cognitive decline and Alzheimer's disease in older adults (Salihu et al 2009). Gustafson et al (2003) reported that in women aged 70 and over, every 1.0 increase in BMI increases risk of developing Alzheimer's disease by 36%. In an 18 year cohort study of 392 Swedish men and women, they found that increased body weight was associated with Alzheimer's disease in women. Women who developed Alzheimer's disease over the course of the study had a mean BMI 3.6 points higher at age 70 than women who did not develop Alzheimer's disease. This relationship was not seen in men.

Older Americans Act Nutrition Program

The cost of obesity in the United States has been estimated at 147 billion dollars yearly, much of which is paid by taxpayer funded Medicaid and Medicare programs (Finkelstein and Strombotne 2010). This will become a critical issue as the population of older adults increases in the United States. Adults aged 65 and older are among the fastest growing segments of the population and are projected to comprise 20% of the total US population by the year 2030 (US Census Bureau 2008). Penn et al (2009) note that over 25,000 older adults participate in Georgia's Older Americans Act (OAA) programs each year, potentially providing an avenue to improve health outcomes in this population. OAA programs

provide a variety of services for older adults, including personal care, home delivered and congregate meals, case management, transportation, nutrition counseling and education, and adult daycare services (DHHS 2008). Adults aged 60 and older access these services through senior centers and community settings.

In 2008, home delivered meals and congregate meals comprised the largest number of participants in Georgia OAA programs with over 14,000 individuals accessing each of these services which are funded by Title III of the Older Americans Act(DHHS 2008). Nationally, 94.2 million congregate meals were served to over 1.6 million eligible participants in fiscal year 2008 (DHHS 2009a). These meals are served in senior centers and other community settings. In fiscal year 2009, the national funding for congregate meal programs alone was over 434 million dollars. Meals served under Title III funding are required to meet minimum nutritional standards of one third of the daily adult Dietary Reference Intakes for macronutrients, vitamins, and minerals per meal. However, OAA programs serve less than a third of older adults who need them (Kamp et al 2010). Demographic data indicates that congregate meal program participants are more likely to live alone, have minority status, and be overweight when compared to non-participants. Although Kamp et al (2010) notes that about 20% of all older Americans experience some level of food insecurity, official statistics from USDA are that about 8.9% of older adults were food insecure in 2008 (Nord et al 2009). Food insecurity in older adults is associated with loss of independence and functional limitations, furthering complicating their ability to consume an adequate and healthful diet (Kamp et al 2010).

The OAA Nutrition Program (OAANP) provides additional nutrition services beyond congregate and home delivered meal programs (Kamp et al 2010). Other agencies besides AoA and DHHS provide food and nutrition to older adults. For example, USDA supports the Supplemental Nutrition Assistance Program (SNAP) that provides monthly food benefits for people whose income is no greater than 130% of the federal poverty rate. This benefit is available for US citizens of all ages, but older Americans have been historically underrepresented in their participation in the SNAP. Older adults also tend to be the ones receiving lower benefits in the program; the minimum monthly benefit is $14 and 5% of total SNAP

recipients collect this amount. However, 89% of that proportion consists of older adults. Thus, few older adults are participating in SNAP and those who are may still be in greater need of assistance. Perhaps not surprisingly, the belief that the benefit is too small in relation to the application process is a major barrier to enrollment for older adults who are eligible for the program. Other nutrition programs targeting older adults include the Commodity Supplemental Food Program and Senior Farmers' Market Nutrition Program. Both of these programs provide limited access to food as they are not designated to be provided on a regular basis, but rather provide commodity foods and fruits and vegetables when available in local areas.

Older adults and food insecurity

Due to a longer life expectancy, the population of older Americans is weighted towards women with about 22.4 million compared to 16.5 million men (DHHS 2009b). This disparity in the population is important to consider because the median income of older men is $25,503 per year whereas older women have a median income of only $14,559. The elderly poverty rate is about 5% higher in women than in men, placing them at increased risk for food insecurity and malnutrition. The majority of the older adult population report Social Security as a major source of income; over one third of older adults rely on Social Security as their primary income. Adults reaching age 65 have a current mean life expectancy of about 83 years, leaving an additional 18.6 years in which to improve health outcomes and increase quality of life for this rapidly increasing segment of the population. Population growth, medical expenditures, and financial vulnerability of older adults make addressing health issues for this group a priority. The cost of healthy food has become disproportionately expensive in comparison to less healthy oils, sweets, and sodas in the past thirty years (Finkelstein and Strombotne 2010). The cost of fresh fruits and vegetables has risen by 190%, fish by 100%, and dairy by 82% while fats and oils have increased by only 70% in comparison. Sweets and sodas have increased by only 66% and 32%, respectively. This poses a challenge to an older adult who is living on a tight budget as they are forced to choose between the more expensive yet nutrient rich, lower energy food and cheaper low nutrient, energy dense alternatives which are rich in fats and sugar. The disparity in price between healthy foods and less healthy foods contributes

to what is known as the "food insecurity-obesity paradox," which is a high prevalence of obesity amongst people who are also food insecure (Brewer et al 2010). Although a person is overweight or obese, they may be food insecure or suffer from malnutrition. In 2008, over 12% of Georgians 65 and older were living below the federal poverty rate (DHHS 2008). The prevalence of household food insecurity in Georgia from 2006 – 2008 was 14.2%, significantly higher than the nationwide average of 12.2% (Nord et al 2009).

Food insecurity impacts 8.1% of households with an older adult and 8.8% of older adults living alone in the US (Nord et al 2009). A recent study of OAANP participants in Georgia senior centers reported prevalence of food insecurity as 18.7%, over twice the national prevalence (Brewer et al 2010). Some characteristics of older adults at greatest risk for food insecurity have been identified, including age of 60 or older, income at or below the poverty line, less than a high school level education, racial and ethnic minorities including African American or Hispanic, renting home, divorced or separated, and living with a grandchild or grandchildren (Ziliak et al 2008; Ziliak and Gunderson 2009). Over 1.89 million adults over aged 65 live in a home with grandchildren, making food insecurity a serious concern for older adults who are likely to prioritize the grandchild's nutritional status over their own (Ziliak et al 2008; Ziliak and Gunderson 2009). In those who are food insecure, both under-nutrition and malnutrition present concerns (Kamp et al 2010). Factors that influence nutritional status in older adults include their functional abilities, medication use, and food security status.

Changes in population demographics may impact future food insecurity in older adults. As the number of older adults is expected to increase significantly in the next 20 years, minority populations are expected to comprise greater total percentages of the population (US Census Bureau 2008). Currently, 19.6% of adults over age 65 are racial or ethnic minorities (DHHS 2008). Hispanics aged 65+ represent only 7.3% of the total Hispanic population in the United States. Thus, the Hispanic population is currently younger than other demographic groups. As the population of Hispanic Americans ages, this will likely cause a shift in the demographics of older Americans with increasing numbers of minorities represented, especially Hispanic Americans. In 2008, 7.6% of white older adults were poor compared to

20% of African Americans and 19.3% of Hispanics, indicating that these groups have increased risk of food insecurity.

Food environment and eating behavior

According to Feng et al (2010), "the built environment affects energy balance by presenting opportunities or barriers for physical activity and adherence to dietary recommendations." Modifying the food environment may have economic and psychological advantages when used as a complement to other programs, as well as increased efficacy in difficult to reach populations, including low income or low literacy populations who may not have the individual resources to enact change (Swinburn et al 1999). Over half of all Title III program clients in Georgia live below the federal poverty level (DHHS 2008). This suggests that modifying the senior center environment may improve body weight outcomes for those congregate meal participants who lack access to information, technical knowledge, or financial means to overcome barriers on their own. Low income older adults may perceive lower self efficacy in improving their health outcomes. Senior centers have the potential to improve health outcomes for older adults, but may be impairing outcomes by providing easy access to unhealthy opportunities such as sedentary activities and low nutrient, energy dense foods. Conversely, centers have the ability to encourage active lifestyles and appropriate caloric intake by creating an environment with a variety of options for physical activity and healthy food choices. As older adult populations increase, it is important to examine whether congregate meal programs and other OAA services delivered via senior centers are providing a maximum benefit to participants or if participants are spending time in an environment that promotes unhealthy lifestyle choices. Swinburn et al (1999) define obesogenic environments as those "which increasingly promote a high energy intake and sedentary behaviors." Tools for assessing obesogenic environments have been developed for schools and community settings, but were not found for senior centers. Thus, this proposed research project will fill in the gaps in our knowledge about the food environment in community senior centers through the innovative modification and application of previous research to examine the unique environmental factors influencing body weight in older adults.

Body weight, food choices, and physical activity are influenced by numerous individual factors including level of cognition, biological factors, demographic characteristics, and behavior (Story et al 2008). These individual factors intertwine with personality to impact eating behaviors by determining individual motivations and linking behavior with positive or negative outcomes. Several behavioral factors have been shown to influence body weight, including sedentary lifestyle and physical inactivity, consumption of energy dense foods, low consumption of fruits and vegetables, and consumption of soft drinks (Elinder and Jansson 2009). In turn, individual behaviors are influenced by social and environmental factors, including policies such as nutrition guidelines, availability of various types of foods in work or home environments, cost of food relative to economic status of the individual, and the eating behavior of peers. Fox et al (2009) examined the relationship between the school environment and BMI in elementary, middle, and high school students. Results for this study varied among school settings. Elementary schools serving fried potato products and desserts more than once per week were associated with increased risk for obesity. Middle schools with vending machines offering low nutrient, energy dense foods were associated with increased risk for obesity. Students participating in school meals may experience similar issues as older adults participating in congregate meal programs, including limited food availability in the school or senior center, social and cultural conditions in group settings, and limited financial status (Fox et al 2009; Giskes et al 2007). Individual, social, and physical environmental characteristics all shape and influence food consumption and eating behaviors (Story et al 2008).

Vending machines represent an important component of the food environment. High calorie and high fat foods are frequently found in vending machines, increasing access to calorically sweetened beverages and contributing to an obesogenic environment (DeJoy et al 2008). Altering the contents or price points of items offered in vending machines may be a low cost intervention measure for creating a more healthful food environment. The presence or absence of vending machines may be particularly important in food insecure populations, such as some low income older adults.

People living in rural areas may be at increased risk for obesity due to perceived barriers to activity (Boehmer et al 2006). Obesity and inactivity are associated with fear of crime and traffic safety in obese rural residents. This study did not find significant association between perceived access to fruits and vegetables and body weight; however, geospatial analysis of distance to nearest supermarkets found that people living further than a 30 minute walk to a supermarket were 1.8 times more likely to be obese than those living less than a 10 minute walk to a supermarket. Obese survey respondents were less likely to agree that their communities were well maintained or had interesting things to do. This information indicates that obesogenicity of rural environments is certain to be influenced both by individual perceptions of the environment as well as physical characteristics of the area. Approximately 19% of older adults live in non-metropolitan areas (DHHS 2008). Distance from shopping centers and recreational areas as well as perceptions about crime and safety may place rural older adults at increased risk for obesity or inactivity.

Development of conceptual models

Development of frameworks and models for obesity and the food environment are guided by social theories. A seminal theory guiding health related behaviors is Rosenstock's Health Belief Model (Rosenstock 1966). Rosenstock posed that likeliness to make efforts to prevent or detect disease was reliant on perceived susceptibility to the condition, perceived severity of the condition, perceived barriers to adopting the new behavior, and perceived benefits to adopting the new behavior. In the context of this theory, this would entail the individual's perception of healthy eating and physical activity. Rosenstock bases the Health Belief Model upon two variables: psychological readiness to act and belief that adopting the new behavior is beneficial in reducing his or her risk of disease. This model was developed to describe the individual's likelihood of participating in single events or making a single choice (i.e., taking flu shot or taking the stairs instead of the elevator) and did not explicitly include self efficacy within the model (Glanz et al 2002). Later models have placed greater emphasis on the concept of self efficacy in health behavior and decision making (Rosenstock et al 1988).

The Theory of Reasoned Action describes three variables that will guide action with major focus given to individual motivation (Glanz et al 2002). This theory states that behavioral intention is comprised of personal attitude and subjective norms regarding the behavior (Fishbein and Ajzen 1975). This was a divergence from the school of thought at the time when considerable research was showing weak linkage between attitude and behavior outcomes (Glanz et al 2002). Subjective norms include the influence of peers in making a decision (Fishbein and Ajzen 1975). The behavioral intention is the relative strength of intention in completing a behavior, such as exercise or smoking cessation. For older adults in senior centers, the subjective norms component of this model could be important in influencing behavior. Factors such as signage promoting healthy eating and group participation in physical activities will likely have a positive influence on attitudes towards healthy behaviors and, in turn, action towards those behaviors. Conversely, if these elements are not present or if there are obesogenic elements such as excess food present, the person will be likely to have a decreased strength of intention in performing healthy behaviors. A person's normative beliefs will be positive when they believe that important people, such as family, friends, or spouse, approve of them performing the behavior and they are highly motivated to comply or meet those expectations (Glanz et al 2002). Normative beliefs will be negative and a person will be unlikely to perform the behavior when they believe that important people disapprove or are indifferent to them performing the behavior or if they are unmotivated to meet those expectations.

Ajzen amended the Theory of Reasoned Action and introduced the Theory of Planned Behavior (1991). Ajzen added perceived behavioral control to the variables proposed to guide action in the Theory of Reasoned Action. Perceived behavioral control was defined as "perception of the ease or difficulty of performing the behavior of interest (Ajzen 1991)." A key element of this theory is that it is dependant on the individual having high volitional control, or "situations in which individuals can exercise a large degree of control over the behavior (Glanz et al 2002)." This addition of perceived behavioral control and volitional control as elements of action reflects the importance of the psychological component of change as well as the need for an individual to have easy access to making healthy food choices in their direct food environment. The Theory of Planned Behavior may be more accurate than the Theory of Reasoned

Action in predicting behaviors in older adults who have functional limitations or limited financial resources that result in less volitional control over their eating and exercise behaviors. Without environmental factors promoting appropriate dietary patterns and physical activity, behavioral control will be low and behavioral intention may decrease.

Bandera described similar effects of self efficacy in the Social Cognitive Theory (1989). The Social Cognitive Theory also posits that self awareness and self efficacy are key components in learning and action. In contrast to the Theory of Reasoned Action and the Theory of Planned Behavior, the Social Cognitive Theory places greater emphasis on the psychology of the individual rather than the surrounding environment. The individual's learning is influenced by the environment, behavior, and cognition. Learning from the behavior of others is a major component of the Social Cognitive Theory. A person can observe the positive or negative behavior of their peers and choose to avoid mistakes or improve on their own behavior.

The Social Cognitive Theory has some commonalities with ecological models of health behavior because it considers the environment as a major influence of behavior. Ecological models are those which seek to describe the interactions between organisms and their environments, including physical and sociocultural traits (Sallis and Owen 2002). These models are particularly relevant to the emerging science of the food environment because emphasis is placed on the environmental domain and interventions utilizing the environment. Stokols took a social ecology approach to health promotion by arguing that "health promotion interventions should alter the environmental factors that facilitate or hinder positive health behaviors" (Sallis and Owen 2002).

Key principles of the ecological approach are that health behaviors are influence by multilevel factors, including intrapersonal, sociocultural, political, and physical factors (Sallis and Owen 2002). Within the environmental domain, there are multiple direct and indirect influencers of behavior. The environmental domain may include climate, design of the built environment and streetscape, food access, and access to information and technology. Because ecological models incorporate many spheres of influence, models should be specific to a particular behavior or outcome, such as obesity. Ecological

models assume that a multilevel intervention will be more effective than a single level intervention in achieving behavior change. This could include creating wellness policies in an organization, providing or improving access to physical activity programs, and creating peer-led walking groups with the ultimate goal of increasing physical activity in a senior center population. Multilevel interventions will require collaboration between groups and assessment at each level. Finally, Sallis and Owen (2002) list dynamic political influence as the final tenet to be considered in an ecological model. Laws and policies impact health behavior. The best way to enact healthy behaviors is to collaborate with groups in various sectors. For example, in a senior center environment, this could involve local hospitals, public health departments, recreation and leisure services, and cooperative extension, to name a few.

Few conceptual models exist to specifically examine links between environment and obesity. The International Association for the Study of Obesity (1999) developed a causal web to describe the levels of food environment that impact body weight by influencing energy expenditure and intake. The causal web describes weight influencing factors from the international level, such as market globalization, to the home/school/work level, which includes presence of family and access to leisure activities. The senior center environment could be considered to be a mixture of elements between the home/school/work level and the community level because seniors have reduced autonomy in senior centers compared to the home setting, but may be influenced by social norms with regards to food and physical activity. The senior center may be analogous to a work setting for a retired older adult. Distal levels of influence such as food production and economy have a substantial effect on what an individual consumes, but proximal influencers such as social norms and food access play a stronger role in determining food choices and outcomes (Story et al 2008). In a review study by Story et al (2008), it was reported that fruit and vegetable intakes increased if they were available in the home, even if the individual had a low taste preference for these items. This suggests that presence of healthful food may, to some degree, trump preference for that food. Similarly, they reported that an intervention study which delivered non-caloric beverages to children's homes found that the children drank fewer sugar sweetened beverages than the control group, suggesting that availability of alternatives is enough to cause a change in eating behavior.

A second conceptual model by Swinburn et al (1999) approaches the obesity epidemic using an ecological systems model in which obesity is the result of interactions between biological, behavioral, and environmental factors. This study uses a 2 X 4 grid to classify obesogenic environments at micro and macro levels. The ANGELO (analysis grid for environments linked to obesity) framework breaks down environmental factors into four categories that either enable or act as barriers to achieving a healthy body weight: physical, economic, political, and sociocultural. Both of these models provide background for developing an analysis tool for obesogenic environments in senior centers, as well as information for considering multiple levels of influence on the senior center environment that may impact participants, such as allocation of funding and location in the community. The senior center setting may serve as a natural jumping off point for obesity interventions because of their dual functions to provide nutrition to older adults as well as socialization. Multi-level interventions are those which approach from numerous angles to address a problem (Brownson et al 2005). The senior center provides access to an individual who is interacting with others in a social environment with overarching policies and governance, thus representing three potential levels of intervention; individual access to information, social environment and support, and physical environment or center policy. Analyzing environmental factors at multiple levels will assist in best describing the types of environments that exist in Georgia senior centers and how they might be modified to support healthy outcomes for older adults.

Existing analytical tools for environmental assessment

Analyzing the food environment and its potential relationship with obesity is a relatively recent practice that has developed over the past decade. McKinnon et al (2009) conducted a systematic review of the available peer reviewed literature relating to measurement of the food environment and obesity. This review found 137 studies dating from 1990 – 2007. The number of studies measuring the food environment has steadily risen in recent years with 70% being published in 2002 or later. Measurement tools were categorized into instruments and methodologies. Instruments were considered to be forms completed by trained researchers or study subjects. Further sub categorization of instruments included checklists, market baskets, inventories, and interviews or questionnaires.

Checklist and market basket instruments both use a pre-determined list of foods that are thought to be representative of the overall diet whereas an inventory records all foods that are present in the environment (McKinnon 2009). Interviews and questionnaires consist of pre-determined questions about the food environment and may be administered to a subject or self reported. McKinnon et al (2009) categorized sales analysis, menu analysis, nutrient analysis, and geographic analysis as forms of methodologies. These approaches analyze available numerical data such as sales figures, caloric and nutrient content of menus, and geospatial information to assess food availability. Geographic analysis uses three measures of accessibility: diversity, proximity, and variety. This was the most frequently used measure of the food environment and was utilized to measure macro level food environments. Micro level food environments are more commonly assessed using instruments, sales analysis, or menu analysis. A major concern identified in this review is that only a small percentage (13.1) of the articles tested for reliability or validity.

Lytle (2009) states that the vastness of the task of correlating environmental factors with obesity combined with the relative infancy of research in this area poses a number of questions to be asked when developing a measurement tool. First, psychometric properties, including reliability, validity, variance, and utility across populations and health outcomes, should be evaluated. The factors most strongly relating to obesity or disease risk should be boiled down to those with the strongest relationships to minimize watering down of data. Researchers should consider the interactions between physical, social, and individual influences on food choice as well as how the environment exists within broader models and theories (Lytle 2009; Elinder and Jansson 2009).

A variety of approaches are available for assessing quality of the food environment in various settings. Self report tools are conducting by interviewing an individual about their environment (DeJoy et al 2008). These may be in person or over the phone, but do not need to occur within the environment that is being studied. These methods evaluate the individual's own perception of the environment. Conversely, observational tools are those which directly and objectively evaluate the environment at hand without consideration of individual perception. Following the definition of obesogenic environments as

those which promote high energy intake and low physical activity (Swinburn et al 1999), evaluation of these environments may include factors influencing energy intake, physical activity, or both.

The Healthy Eating Index-2005 (HEI-2005) consists of a 12 component, 100 point scale used to summarize diet quality (Reedy et al 2010). Dietary components are based on the 2005 Dietary Guidelines for Americans and MyPyramid. The components of this tool include total fruit, whole fruit, total vegetables, dark green and orange vegetables and/or legumes, total grains, whole grains, milk, meat and beans, oils, saturated fat, sodium, and calories from solid fats, alcohol, and added sugar. Each component has a rubric for scoring minimum points if an item is not adequately present, such as no whole fruit available, or present to excess, such as saturated fat greater than 15% of energy. An item may receive maximum points by meeting the appropriate proportion of dietary needs, such as greater than 1.3 cups of milk per 1000 kcal, or not exceeding limits, such as less than 0.7 grams of sodium per 1000 kcal.

The advantage of using the HEI-2005 is that it can be applied across macro and micro level food environments (Reedy et al 2010). Although it was developed as a measure for evaluating diet quality, the researchers promote this as a tool that could be used by workers in hospitals, restaurants, or nursing homes to evaluate the quality of their menus and food environment. This tool measures overall adherence of menus or food availability to dietary guidelines. Because it is a very specific scale, day to day changes in menus or item substitutions could result in score variations. This tool would be best utilized as a snapshot look at the food environment in a location where the food availability did not vary greatly, or to be administered multiple times to get an overall feel for diet quality over time. The HEI-2005 does not take into consideration non-dietary factors of the food environment.

DeJoy et al (2008) developed the Environmental Assessment Tool (EAT) to assist in evaluating efficacy of workplace obesity prevention initiatives. EAT is composed of two sections utilizing both self report and observational methods. The purpose of the EAT is to assess baseline characteristics and monitor changes over time in workplace support for healthy eating and weight management. The 105 item, 100 point dichotomous questionnaire has several subscales to break the environment out into specific areas, including physical activity, nutrition/weight management, and organizational

characteristics and support. The physical activity arena includes factors such as signage promoting physical activity, on site fitness centers or other opportunities for physical activity, and facility characteristics which promote commuting by bicycle, such as showers and changing rooms. The nutrition/weight management arena is primarily food service characteristics, vending, and signage promoting healthy weight management. The organizational characteristics and support section evaluates health related policies, rules, and health promotion programs within the organization. The EAT was found to have high levels of validity and inter-rater reliability. However, a limitation of this tool is that it was custom developed for use in a specific organization. Thus, it could be used as a jumping off point for developing further research tools, but those tools would need to be developed, tested, and validated in the appropriate setting. The need for site-appropriate evaluation tools presents a challenge to evaluating food environments.

Brownson et al (2004) studied this issue of administering environmental analysis tools across multiple environments in order to evaluate social and physical variables influencing physical activity. The San Diego instrument, or Neighborhood Environment Walkability Survey, the South Carolina instrument, and the St. Louis instrument were tested nationally for reliability. The results of this study found that the highest reliability existed in questions that attempted measurement of physical characteristics, while there was low reliability in questions related to the social environment (i.e., safety, security) or with temporal characteristics (i.e., availability of parking). Rural areas may present a challenge with regards to reliability of self reported data. Data on obesogenic characteristics of rural environments is underrepresented in this area of research (Boehmer et al 2006).

A 2002 Australian study on physical activity and environmental influence concluded that accessibility of recreational facilities determined their use (Giles-Corti and Donovan 2002). However, access alone was not enough to increase recreation in the community. Environmental adaptations should be accompanied by other strategies to increase their utilization, such as campaigns or programs promoting use and availability. This paper used data from the Study on Environmental and Individual Determinants

of Physical Activity (SEID) which examined individual, social, and physical environmental factors influencing exercise and participation in recreational activities.

Rationale for proposed study of the food environment and obesity in congregate meal participants

While a well-developed theory or mechanism for describing the relationship of the food environment with obesity does not yet exist, categorizing environmental factors as physical, economic, political, and sociocultural is widely accepted in current research (Ball et al 2006; Story et al 2009). Heterogeneity of the body of research on food environments makes it challenging to link studies and draw conclusions on methodologies and mechanisms (Feng et al 2010). Using well studied and accepted parameters from previous models and frameworks will help link this novel study on older adults in senior centers to the growing body of evidence on obesity and environmental factors.

Obesity is a widespread health issue that is associated with increased risk for numerous chronic diseases. However, behavioral interventions have had limited success in addressing obesity and environmental modifications may improve obesity rates in populations with limited resources to enact behavioral changes (Swinburn et al 1999). The majority of research in this area has been limited to the school environment and food establishment density in neighborhoods (Dinour et al 2007; Feng et al 2010). This study will address the unique needs of the growing older adult population by targeting groups participating in modifiable community environments.

The overall hypothesis for this study is that physical, economic, political, and sociocultural factors influence body weight in older adults participating in senior center programs. The overall hypothesis will be tested in men and women of all races and ethnicities aged 60 and older participating in Older Americans Act programs in four Northeast Georgia senior centers in 2010, including Athens-Clarke County, Jackson County, Greene County, and Walton County. The specific aims are:

Specific Aim 1. Develop a questionnaire to identify factors influencing body weight of older adults in Georgia senior centers. It is hypothesized that this questionnaire will accurately identify factors that may influence body weight of older adults.

Specific Aim 2. Use the questionnaire to evaluate senior center food environments and collect BMI and waist circumference data from participants in the summer of 2010, and analyze and present the results in the fall of 2010. Based on previous observations in senior centers, it is hypothesized that environmental obesogenic factors in senior centers will include food available in addition to congregate meals, absence of physical activities or exercise equipment, food policies that promote excess food consumption, and lack of access to nutritional counseling.

CHAPTER 3

ENVIRONMENTAL FACTORS INFLUENCING BODY WEIGHT IN GEORGIA SENIOR CENTERS[1]

[1]O'Shea E.D., Johnson M.A., Hausman D.B., Lee J.S. To be submitted to the Journal of Nutrition in Gerontology and Geriatrics.

Abstract

The purpose of this study was to develop an environmental analysis questionnaire to assess the food environment for obesogenic (promoting obesity) or healthful (promoting healthy weight) characteristics in senior centers providing congregate meal programs through the Older Americans Act Nutrition Program. A two part analysis questionnaire was drafted and pilot tested in four Northeast Georgia senior centers hypothesized to have differences in participant adiposity indicators including obesity and waist circumference. Participants were a convenience sample of 125 older adults (mean age = 75 years, 25% male, 75% female, 55% white, 42% black, 2% Hispanic/Latino, and 1% Asian) receiving congregate meals through the senior centers. The questionnaire was based on the ecological framework described by Swinburn et al (1999) which categorizes environmental influences into physical, economic, sociocultural, and political factors. The centers were assessed for various factors, including food available in addition to congregate meals, absence of physical activities or exercise equipment, food policies that promote excess food consumption, and lack of access to nutritional counseling. In contrast with the hypothesis, the counties did not differ in their prevalence of obesity or mean waist circumference. However, the questionnaire detected differences in food service characteristics, individual nutrition related policies and practices, and staffing that may be related to differences in participant demographics, diabetes prevalence, and food insecurity among the centers. These results suggest that further refinement and testing of the environmental analysis questionnaire will be necessary in order to accurately identify environmental factors related to body weight in senior centers.

Introduction

Salihu et al (2009) estimate the prevalence of obesity among adults over 60 is about 37% and note that healthcare costs for Medicare participants are increased by 35% when a person is obese as opposed to being normal weight. This will become a critical issue as the population of older adults increases in the United States (US Census Bureau 2008). In 2008, home delivered meals and congregate meals comprised the largest number of participants in Georgia OAA programs with over 14,000 individuals accessing each of these services which are funded by Title III of the Older Americans Act (DHHS 2008). Modifying the food environment may have economic and psychological advantages when used as a complement to other programs, as well as increased efficacy in difficult to reach populations, including low income or low literacy populations who may not have the individual resources to enact change (Swinburn et al 1999). Swinburn et al (1999) define obesogenic environments as those "which increasingly promote a high energy intake and sedentary behaviors."

Several psychological theories to explain health related behaviors can be applied to older adults in senior centers. The Health Belief Model states that the likelihood that an individual will take action to prevent or detect disease is dependent upon perceived susceptibility to the condition, perceived severity of the condition, perceived barriers to adopting the new behavior, and perceived benefits to adopting the new behavior (Rosenstock 1966). In addition to knowledge and education on health related issues, other concepts that have been previously described as major factors in health seeking behaviors include subjective norms, positive or negative peer influence, volitional control, self efficacy, and the ability of the environment to promote or act as a barrier to the behavior (Ajzen 1991; Bandera 1989; Fishbein and Ajzen 1975; Glanz et al 2002; Sallis and Owen 2002).

Tools for assessing obesogenic environments have been developed for schools and community settings, but were not found for senior centers. Thus, this study will fill in the gaps in our knowledge about the food environment in community senior centers through the innovative modification and application of previous research to examine the unique environmental factors influencing body weight in

older adults. We propose that both obesogenic and healthful factors, those which promote healthy eating behaviors and physical activities, exist in Georgia senior centers.

Given the high prevalence of obesity among older adults in Georgia, we conducted a study to develop and pilot test a questionnaire to evaluate the food environment in senior centers. Based on social and environmental theories and previous conceptual frameworks, a two part questionnaire was drafted and tested in four Northeast Georgia senior centers providing Older Americans Act Nutrition Programs. Older adult participants at each center (N = 125) were administered a questionnaire by trained staff members. Health conditions and comorbidities were self reported. Anthropometric data, including height, weight, and waist circumference, were measured.

The research question is "What factors in Georgia senior centers may contribute to an obesogenic environment?" The overall hypothesis is that physical, economic, political, and sociocultural factors influence body weight in older adults participating in senior center programs. The overall hypothesis was be tested in men and women of all races and ethnicities aged 60 and older participating in Older Americans Act programs in four Northeast Georgia senior centers in 2010, including Athens-Clarke County, Oconee County, Green County, and Walton County. The specific aims are:

The first specific aim is to develop a questionnaire to identify factors influencing body weight of older adults in Georgia senior centers. It is hypothesized that this questionnaire will accurately identify factors that may influence body weight of older adults.

The second specific aim is to use the questionnaire to evaluate senior center food environments and collect BMI and waist circumference data from participants at four senior centers in Northeast Georgia. Based on previous observations in senior centers, it is hypothesized that environmental obesogenic factors in senior centers will include food available in addition to congregate meals, absence of physical activities or exercise equipment, food policies that promote excess food consumption, and lack of access to nutritional counseling.

Methods

Sample

This study used a cross sectional design to evaluate senior center environments and compare them to adiposity indicators of older adult participants. Questionnaires and procedures were approved by the Institutional Review Boards on Human Subjects of the University of Georgia, the Georgia Department of Human Resources, and the Athens Community Council on Aging. Participants were a convenience sample of adults aged 60 and older recruited from four senior centers in the summer of 2010. Senior centers were selected based on the support of the senior center director and interest of the participants. All participants were enrolled in Older Americans Act programs and all received congregate meals. Procedures were explained and the consent forms were read to participants, and written informed consent was obtained from participants. People were excluded if the interviewer determined that the individual may be unable to understand the informed consent and/or answer questions. These recruitment procedures yielded 125 older adult participants (mean age = 75 years, 25% male, 75% female, 55% white, 42% black, 2% Hispanic/Latino, and 1% Asian).

Age, gender, and place of residence were recorded. The research team read questions to the participants and recorded their answers. Participants' information was self-reported and included demographics and chronic health conditions, including diabetes, hypertension (adapted from the 2005-2008 Behavior Risk Factor Surveillance Surveys (CDC 2005; CDC 2006a; CDC 2007b; CDC 2008), weight-related disability (Clune et al 2010), and food insecurity (NSI 1992). Presence of diabetes was determined with the question, "Do you have diabetes?" Presence of hypertension was determined with the question, "Do you have high blood pressure?" Presence of weight related disability was determined with the question, "Does your current weight affect your ability to do daily activities such as walk, do housework, shop, etc?" Response categories were "yes" or "no."

Food security was assessed using a series of questions, including "Do you always have enough money to buy the food that you need?", "In the past month, have you received food from a food pantry or food bank?", and "Do you currently receive food stamps?" Participants were also asked five questions

that have been shown to be reliable indicators of a person's economic status without asking their income (Fillenbaum 1984). These included, "Are your assets and financial resources sufficient to meet emergencies?", "Are your expenses so heavy that you cannot meet the payments, or can you barely meet payments, or are payments no problem to you?", "Please tell me how well you think you are doing financial as compared to other people your age – better, about the same, or worse?", and "At the present time, do you feel that you will have enough for your needs in the future?"

Anthropometric data, including body weight, height, and waist circumference, were measured by trained graduate students and staff. Body weight was either: a) on a scale, with clothes and without shoes (74% of participants), b) on a scale, with clothes and shoes (18% of participants), and/or c) self reported (8% of participants). BMI was calculated (BMI = (weight (pounds)/height (inches)^2) x 703). Weight classifications defined by the National Institutes of Health National Heart, Lung, and Blood Institute *Clinical Guidelines for the Identification ,Evaluation, and Treatment of Overweight and Obesity* were used (NIH 1998). Obesity was defined as a BMI of 30 kg/m^2 or greater. Overweight was defined as a BMI of 25-29.9 kg/m^2. Normal weight was defined as a BMI of 18.5 – 24.9 kg/m^2. Height was assessed by: a) measurement with a stadiometer without shoes on (72% of participants), or b) measurement with a stadiometer with shoes on (23% of participants), and/or c) self reported (5% of participants).

We defined a high risk waist circumference as greater than 40 inches in men and greater than 35 inches in women according to the National Institutes of Health guidelines (DHHS 2000). Waist circumference was measured according to NIH guidelines either: a) using a tape measure under the clothes (27% of participants), b) using a tape measure over light clothes (66% of participants), or c) using a tape measure over heavy clothes (7% of participants).

Environmental Analysis Questionnaire Development

The questionnaire was developed using the ANGELO (analysis grid for environments linked to obesity) framework described by Swinburn et al (1999). The key aspects of this ecological framework describing the influence of the environment on obesity are that factors are divided into physical, economic, sociocultural, and political categories that may act as enablers or barriers to maintaining a

healthy body weight. These factors may influence the individual on a macro or micro level and vary in their ability to be modified. Using this framework, we drafted a two part analysis questionnaire that would be comprised of an interview with a senior center staff member and four observational assessments of the senior center environment.

The questions were each assigned to one of the four categories in the ANGELO framework; physical (what is available in terms of nutrition and physical activity related resources, information, signage and foods available); economic (cost influence on nutrition and physical activity related issues, such as funding received for programs); political or policy (what are the senior center rules or policies regarding nutrition and physical activity related issues); and sociocultural (social norms surrounding nutrition and physical activity related issues in the center). All of these domains may influence the food environment in the microenvironmental setting of the senior center. Each question is worth from zero (indicating a healthful influence) to one point (indicating an obesogenic influence). Subscores were calculated for questions that fell into related categories, such as transportation, information dissemination, and food substitutions. The interview would have a single score worth a total of 95 possible points. The mean score of the four observational assessments would comprise the observational score with a total of 20 possible points. The total combined possible score is 115 points, with higher scores indicating a more obesogenic environment and lower scores indicating a more healthful environment.

The interview component of the analysis was modified from existing questionnaires, including the School Health Policies and Programs Study questionnaires and the School Nutrition Dietary Assessment Study III (CDC 2006; USDA 2004). The questions in this interview pertain to the food service program at the center, accessibility of additional foods and beverages, physical activity, food policies, funding, and nutritional counseling and education opportunities. The aim of this questionnaire is to provide an overall assessment of the senior center environment at an institutional level and provide information about potential policies and economic influences on body weight.

We adapted and utilized questions from previously validated assessment questionnaires as well as incorporated novel questions to develop the observational portion of the questionnaire. The Nutrition

Environment Measures Survey in Restaurants (NEMS-R) was designed for use in restaurants, but contained questions which also pertained to the senior center environment, including, "Is nutrition information for the day's meal available?," "Is signage promoting healthy habits displayed?," and lists of healthy foods and beverages offered with a meal service (Saelens et al 2007). A vending machine audit was adapted from the School Nutrition Dietary Assessment Study III (USDA 2004). This audit was used to record the presence, number, and content, if applicable, of vending machines in the center. The aim of the observational component of the questionnaire is to reflect what is actually occurring in the centers on a day to day basis and provide information about potential physical and sociocultural influences on body weight.

Staff Interview

Interviews were conducted with one senior center director or manager at each center. Interviews were scheduled at the convenience of the interviewee. The staff member was administered the multiple choice and short answer questionnaire with questions pertaining to the food environment in the center that were adapting from previous studies, such as "How many congregate meal participants do you typically serve daily?", "How do you make nutrient content information available to participants?", and "Does your center have enough space to seat all participants during each meal period?" (CDC 2006; USDA 2004). Participants were read a list of answers and asked to select the answer that best described their center. Any additional pertinent information was recorded.

Observational Assessment

An unscheduled observational assessment was performed four times in each center. The assessments were conducted between 9:15 am and 11:00 am. Most centers served lunch at 11:30 am, so this captured the time period between the participants' arrival and the congregate meal. Two trained graduate students conducted the assessments concurrently, but blind to the other's assessment. The assessment from the main investigator was used for all analyses, except those analyses related to reliability. The amount of seating available and number of participants present was recorded. The center environment was assessed for nutrition related signage, physical activity related signage, menus,

televisions, and exercise equipment. We recorded how many participants were engaged in physical activity, eating, drinking water, or drinking non-water beverages. The daily meal was also assessed for beverages, presence of fruit without added sugar, non-fried vegetables without sauce, whole grain bread, baked potato chips, and other items, such as condiments, available for the meal. If vending machines were present, an audit of their contents was performed.

Statistical Analyses

Data were analyzed with the Statistical Analysis System (SAS, Version 9.2, SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means, and standard deviations were calculated for data within each county. Chi-square analyses were used to examine differences among the four counties for dichotomous health and environmental variables. One way analysis of variance (ANOVA) was used to detect differences in continuous variables among the four counties. $P \leq .05$ was considered statistically significant.

Results

The four counties in this study have a wide range of population demographics and economic characteristics (Table 3.1). Clarke County has the largest population at 116,342 people. This county is also the most racially diverse with 69.6% of the population being white, 25.6% black, 9.3% Hispanic/Latino, 3.2% Asian, 0.2% American Indian or Alaskan Native, and 0.1% Pacific Islander. All four counties are predominantly white. Clarke County has the greatest number of households and a population density of 838.8 persons per square mile. In contrast, Greene County is the least populous county in the study with 15,742 residents living in the county at a population density of 37.1 persons per square mile.

Walton County has the highest median household income in the study while Greene has the highest per capita income. Poverty levels in the four counties range from 12.1% of people living below the poverty level in Jackson County to 30.8% in Clarke County. The percentage of persons aged 65+ in the counties ranges from 8.7% in Clarke County to 20.0% in Greene County.

Information about staff characteristics, feedback and collaborators for the CMP and other nutrition-related activities was obtained from one individual (usually the senior center director or manager) and varied widely among the four senior centers (Table 3.2). Jackson County reported 6 full time staff members, 5 part time staff members, and 150 volunteers who assisted with nutrition related programs in the past fiscal year. Greene County reported four full time staff members, one part time staff member, and 60 volunteers. Clarke County reported two full time staff members, two part time staff members, and seven volunteers. The West Walton senior center employs four part time staff members. The staffing numbers of these centers include only those staff members who are employed by and paid for by the senior center budget. These figures do not include seniors employed through Title V of the Older Americans Act program that are not paid by the senior center. Also, counties varied in how they reported their staffing; for example, Greene included staff for both congregate meals and home delivered meals, while the Clarke County staff member interviewed was not responsible for the home delivered meal program and did not provide staff for this service. Thus, estimates of staff efforts for the CMP may not be directly comparable among the four counties.

Staff most actively engaged in distributing information about the CMP to current and prospective program participants and participating in nutrition education activities in the center (Table 3.2). Only 50% of centers reported that a staff member had led a nutrition related educational session at the center in the past year. Feedback on the CMP was collected using surveys in 50% of the centers. None of the centers reporting using a suggestion box, bulletin board, or advisory council to solicit feedback from CMP participants on the meal program.

Clarke and Jackson Counties collaborated with the greatest variety of outside partners to provide resources and services to participants (Table 3.2). All centers worked with a local college or university (because the University of Georgia has a contract to provide nutrition services in these counties) and 75% of centers worked with local businesses. Cooperative extension and local health departments were only involved with the senior center in one county.

In the past 12 months, 75% of centers reported receiving staff development training in menu planning and healthy food preparation methods (Table 3.2). Of four centers, only one reported having staff development training on cultural diversity in menu planning. None of the centers had received staff training on creating healthy food environments. Regarding the individual interviewed, two were the senior center director and two were the senior center manager. The amount of time this individual had held their position ranged from less than one year to over 20 years. Their education level ranged from some college to completion of a graduate degree.

The food service characteristics of the four counties differed markedly (Table 3.3). Jackson and West Walton used their kitchens to produce meals on-site designed to be in accordance with the meal plans provided by the Area Agency on Aging (AAA). They both reported that like items would sometimes be substituted if they did not have an item listed in the meal plan provided by AAA. Both of these sites had full complements of kitchen equipment and reported that the AAA had the primary responsibility for deciding which foods to order for the center. Clarke and Greene Counties had kitchens with most major equipment available, but utilized a contractor to provide fully prepared meals made according to the specifications provided by AAA. These sites reported receiving fully plated meals and did not complete any assembly of food items. They occasionally would do other preparation of drinks or special snacks, but did not otherwise do any day to day food preparation on site. Both Clarke and Greene County operated in accordance with the standard meal menu provided by an AAA-approved food service contractor; however, while Greene County reported that the primary responsibility for deciding which foods to order was held by AAA, Clarke County considered the primary responsibility to be with senior center staff.

The mean number of daily CMP participants as reported by the counties was 41 (Table 3.4). Jackson County had the greatest number of participants at about 60 daily, which is a considerably larger number than the other three counties who all served about 35 older adults each day. The mean meal length was 48 minutes. All centers noted that they had no formal meal length, but based their meal length time on when staff would need to begin cleaning up after the meal or when the first bus of participants

leaving the center would depart. Jackson and West Walton operated at approximately 50-75% of their seating capacity daily while Clarke and Greene were at 75-100% of their seating capacity. All of the centers reported having adequate seating for their program.

Dietary accommodations for participants with special dietary needs were limited in the senior centers (Table 3.4). Jackson County substituted components of the meal if necessary; the example given was that diabetic participants were given fresh fruit or an item with artificial sweetener in lieu of sugar sweetened dessert items. They also stated that they would substitute other components of a meal if necessary, but it has not occurred yet. Greene County substituted entire meals for participants with a food allergy by keeping frozen meals, which are typically provided to home delivered meal program participants that live in distant areas of the county, on hand. West Walton and Clarke did not have any accommodations available for special dietary needs that were not met by the standard menu. 100% of the centers informed participants about the meals by posting information in the center (Table 3.4). Jackson and Clarke also provided menus or flyers for participants to take home with meal information listed. Greene County provided a menu copy upon request of participants. No centers made nutrition information available via website and none provided any kind of nutritional analysis (e.g., carbohydrates or calories).

Greene County had the greatest diversity of ways that participants access the center, with pedestrians arriving on foot, driving themselves, being driven by others, using public transit, or taking a senior center transport vehicle (Table 3.4). All of the centers had participants who arrived by a personal vehicle driven by themselves or others. West Walton had the least diversity of ways that participants accessed the center, with no participants walking, taking public transit, or using a senior center transport vehicle; this center was not located on a bus route and did not have staff available to drive the transport vehicle. West Walton was the only senior center that did not offer transportation to program participants. Clarke and Greene Counties had one person each who walked to the center and Greene was not accessible to pedestrians by sidewalk. Clarke County was the only center that was located within half a mile of major residential and commercial centers and had sidewalks connecting the center to these areas. Most

(75%) of the centers were located more than one mile from residential or commercial areas. Both Jackson and Greene Counties provided transportation services on an as-needed basis. Greene County's transportation services were provided by the public transit system which is available for all county residents on an as-needed basis.

Senior center policies regarding outside food were relatively uniform among the four centers (Table 3.5). All centers allowed participants to bring food for personal consumption and 75% of the centers allowed participants to bring food to share. Greene County did not allow this practice, citing food safety concerns. Clarke County was the only center that did not accept food donations to the CMP, although they allowed participants to bring food to share if it was packaged in a shelf stable container and unopened. The other centers reported accepting food donations of unopened, dated items from sources such as local grocery stores, churches, and other local businesses. West Walton received fresh produce from gardeners, such as tomatoes, to use in the CMP. All of the centers reported that they bought inexpensive food items from the Northeast Georgia Food Bank, but these were not considered donations because these were purchased. Donations were typically used as snacks or bingo prizes. Clarke and Greene Counties received food donations less than monthly, while Jackson received donations on a weekly basis, mostly in the form of bingo prizes donated by local businesses.

Most (75%) of senior centers did not have a wellness policy addressing nutrition and physical activity. Clarke County was the only center that reported having a wellness policy and a health advisory council that addresses issues and concerns related to nutrition and physical activity. The senior centers all utilized multiple methods to let participants know about the resources and services related to the CMP and other wellness related services provided by the center. All centers used flyers and verbal communication. Most (75%) of centers posted information in the center, on a website, or used an alternative method of advertising their services. Other methods that they used included newspaper articles, handouts from visiting speakers, newsletters, and an email listserv.

All senior center management knew how to access a registered dietitian (RD) in their community (Table 3.6). Most centers had nutritional counseling or educational opportunities available on a monthly

basis and other medical counseling opportunities on a weekly basis. Other assistive services, such as Medicaid eligibility counseling, were available on a less than monthly basis at 75% of the centers. None of the centers charged a fee for any counseling or educational services. All of the centers had some small scale exercise equipment available for participants to use for free and 75% reported having access to exercise equipment or space within their center. West Walton also had space available outside of the center that the participants could use for no fee.

The greatest variety in funding sources was in Jackson and Greene Counties with four funding types (Table 3.6). Most (75%) centers reported receiving state and federal funding for their programs. Jackson and Greene Counties received funding for nutrition education, home delivered meals, physical activity education, and physical activity equipment. Clarke reported funding for the fewest programs explored in this study, only receiving money for congregate meals; however, the staff person must not have realized that their parent organization (the Athens Community Council on Aging (ACCA) receives state and federal funding for their programs that is allocated to the senior center.

Means from four observations on four different days showed that water and 1% or non-fat milk were offered with meal service at all four centers 100% of the time (Table 3.7). None of the centers offered 100% fruit juice or reduced calorie beverages. Fruit without added sugars was offered from 25% to 75% of the time. Jackson and West Walton Counties differed significantly from Clarke and Green Counties in their offering of whole wheat bread. Jackson and West Walton Counties never served whole wheat bread during the four observations, while Clarke County and Greene County served whole wheat bread 100% of the time. Baked chips were never offered in any of the centers. Jackson and Clarke Counties had the most signage relating to physical activity and nutrition.

Means from four days of observation showed significant differences in seating capacities in each of the centers (Table 3.8). Jackson County had the highest mean seating capacity with 60 total seats. West Walton, Clarke, and Greene followed with 50, 40, and 56, respectively. The centers did not differ significantly as far as number of participants present in the center or number of participants eating food. West Walton differed significantly from Jackson and Greene Counties in the percentage of participants

drinking non-water beverage with a mean of 30% of participants drinking a non-water beverage. Jackson had a significantly larger number and percentage of participants drinking water compared to the other three counties.

Three of the senior centers had exercise equipment visible and available on each visit (Table 3.8). Participants were observed using exercise equipment at Jackson and West Walton Counties, but the difference was not enough to be significant compared to Clarke and Greene Counties where no equipment use was observed. Clarke County was the only center with a vending machine present.

Summary scores for obesogenic environments were calculated for the total observation points and interview points as well as key sections of the interview (Table 3.9). Mean observation scores ranged from 10 – 14 out of a possible 20; West Walton County had a significantly higher obesogenic environment score than Jackson and Greene counties. Because there was only one staff interview in each county, statistics could not be calculated for the summary score; however, the counties could be ordered from least to most obesogenic as Jackson (38), Greene (42), Clarke (48), and West Walton (64).

The characteristics of the senior center participants that were interviewed on-site reflected the county demographics in terms of race/ethnicity in Jackson and West Walton Counties (Table 3.10). However, Clarke and Greene Counties had a larger proportion of black participants than expected based on the county statistics. The counties also differed significantly in terms of the education level of the participants. In Greene County, 40.7% of participants had an eighth grade education or less whereas in West Walton, only 7.4% of participants had an eighth grade level education or less. Although the counties differed in several respects in the characteristics of their county demographics and their senior centers (Tables 1-9), there were no significant differences in the mean BMI, waist circumference, prevalence of obesity, hypertension, or weight related disability in the participants of the senior centers (Table 3.10, Figure 3.1). However, there were significant differences among counties in questions relating to food security as well as trend for diabetes to be higher in one county. Clarke County had the highest prevalence of diabetes (54.5%, P = .06), while Jackson, Greene and Walton Counties had a prevalence of 34.2%, 25.9% and 25.9%, respectively. Food insecurity was lower in West Walton and

Jackson Counties (11.1% and 15.8%, respectively) compared to 25.8% in Clarke County and 56.0% in Greene County ($P < .001$). Greene County participants recorded the highest percentage of people who did not always have enough money to purchase the food that they need (56.0%, $P < .001$), the highest percentage of people who had received food from a food pantry or food bank in the past month (84.6%, $P < .001$), and the highest percentage of people receiving food stamps (37.0%, $P = .03$). Jackson and Clarke County participants were the least likely to report not always having enough money to buy the food that they need.

Kappa values for data in the observational assessment ranged from .62-1.0. The lowest agreement was found in questions 11 ($K = .62$) and 14 ($K = .63$). These values reflect disagreement between raters on one and two occasions, respectively. These two questions address food/beverage availability in the center and whether participants were performing any physical activities at the time of the assessmentThe low number of repeats in this pilot study could magnify the effect of disagreement between raters. Cohen's kappa test showed perfect inter-rater reliability of 1.0 in 75% of the observational questions, indicating that the majority of the questions have high reliability even at this small study size.

Discussion

This pilot study was a first step in designing a questionnaire to assess factors that might be related to obesity among senior center participants. Four counties were chosen to pilot test the questionnaire and striking differences were detected among them in terms of participant demographics, diabetes prevalence, and food insecurity. The centers also differed in their food service characteristics, individual nutrition related policies and practices, and staffing. Unless otherwise indicated, the comparisons discussed in this section are not statistically significant.

In contrast with the hypothesis, the counties did not differ in their prevalence of obesity or mean waist circumference. However, compared to the other counties, Clarke emerged with the highest prevalence of diabetes ($P = .06$), along with several characteristics possibly associated with an obesogenic environment, including demographics; vending machines; CMP feedback; and staff engagement related to

nutrition activities. Thus, the first part of this discussion will focus on improving the questionnaire regarding these obesity-related factors, as well as making recommendations for counties, such as Clarke County, to improve their environment. This pilot study served to provide an interesting case study for each of these four county senior centers and the populations they serve. The next part of the discussion will also review the four conceptual areas hypothesized to contribute to an obesogenic environment. The last part of the discussion will discuss study strengths and limitations, as well as recommendations for future research.

Jackson County

Jackson County emerged with the lowest, or most leanogenic, observational and interview scores (Table 3.9). They were also consistently among the lowest in each summary score category, with the exception of organizational collaboration and participant transportation/access to senior center. Jackson County had the largest staff reported, with six full time staff members, five part time staff members, and approximately 150 volunteers associated with nutrition related programs in the past fiscal year (Table 3.2). Jackson County participants reported the lowest prevalence of weight related disability (10.5%) (Table 3.10). They were the least likely to report receiving food from a food pantry or food bank in the past month (2.6%) or receiving food stamp benefits (7.9%). This information appears to be consistent with county demographic data indicating a median household income of $51, 239, the second highest median household income among the four counties. Jackson County had the lowest percentage of male participants (18.4%). Although the sample size of male participants in this county was low (n = 7), 100% had high risk waist circumference measurements of greater than 40 inches (high risk) (Table 3.10). None of the male participants were in the normal weight BMI category (Table 3.10). In contrast, Jackson had the greatest percentage of women with low risk waist circumference measurements (29.0%). Jackson County had the greatest variety of exercise equipment available for participants, including treadmills, elliptical trainers, recumbent bicycles, and weight training machines in addition to smaller items like hand weights. Moreover, participants were observed using the exercise equipment on several occasions (Table 3.8). Jackson County was temporarily located in a different county building at the time of the

observational assessments due to renovations on the senior center building; however, the temporary facility provided adequate space for the senior center programs in comparison to the senior center building and did not appear to cause any additional crowding or impact center programs. The temporary facility had sufficient seating for CMP participants as well as an exercise room, craft room, and overflow seating. The observational assessments performed in Jackson County were completed on a Tuesday, two Wednesdays, and a Thursday; according to center staff, Tuesdays and Thursdays were the busiest days for the center, with Monday and Friday being the least busy, so this should have captured an accurate representation of the center on two normal days and two busy days.

West Walton County

West Walton County scored the highest, or most obesogenic, on both the observational and interview scores (Table 3.9). They scored above the mean in all summary score categories except for kitchen and exercise equipment availability. This county differed from the others in that it was the only center that reported having no full time staff members or volunteers associated with CMP or HDM services (Table 3.2). This limitation impacted the services they were able to provide to older adults, including lack of transportation services. West Walton had the lowest presence of nutrition and physical activity-related signage (Table 3.7). During observational assessments, additional food and/or beverages were available on 100% of the assessments (Table 3.8). Some of these foods included coffee, sweet tea, Krispy Kreme® doughnuts, muffins, apple pie, and cookies. Consistent with these observations, participants in West Walton County were significantly more likely to be consuming a non-water beverage ($P < .01$). The observational assessments performed in West Walton County were completed on a Tuesday, Wednesday, Thursday, and Friday, so these assessments should have captured a broad range of activity throughout the week in this center.

Clarke County

Clarke County participants had the highest prevalence of diabetes ($P = .06$) and were the most likely to report weight related disability (21.1%) (Table 3.10). Prevalence of diabetes in this group is over twice the national average of 23.1% among adults aged 60 and older (CDC 2007a). Two potential

reasons for this high prevalence of diabetes in Clarke County include that this center had the highest minority population as well as a large proportion of respondents that indicated some degree of food insecurity, both of which may be associated with increased risk for diabetes (CDC 2007a; Lee et al 2010). Clarke County had the second highest percentage of participants reporting that they did not always have enough money to buy food (25.8%), had received food from a food pantry or food bank in the past month (51.5%), and were receiving food stamps (21.2%). Clarke County participants differed significantly from the other counties in terms of race, with 18.2% white and 78.8% black participants. This was unexpected given county demographics indicating the population is 25.6% black (Table 3.1). In addition to demographic characteristics, there were several unique environmental factors in Clarke County that are possibly associated with an obesogenic environment, including the presence of vending machines, limited modes of CMP feedback from participants, and low staff engagement in nutrition related activities. Clarke County was the only center to report having a center policy related to nutrition and wellness as well as an advisory council to address issues and concerns related to nutrition and physical activity. Their center wellness policy was to have four to five health related programs per month for CMP participants. The center was in the process of developing an advisory council to address wellness issues. The observational assessments in Clarke County were completed on non-consecutive weekdays, including a Monday, Tuesday, Wednesday, and Friday. This center tended to be busy throughout the week and completing the assessments on most weekdays should have captured a broad array of activity within the center.

Greene County

Greene County's profile stood out from other counties in terms of having the lowest population, highest percentage of black residents, greatest percentage of adults over age 65, and lowest population density (Table 3.1). Greene County had the second lowest, or most healthful, observational and interview scores and scored well in summary scores for nutrition information dissemination, participant transportation access to center, exercise equipment, and staff engagement (Table 3.9). This center scored poorly in the CMP feedback, collaboration, and staff development categories. Participant demographics

appeared to reveal a trend of food insecurity in this county (Table 3.10). Greene County participants were the most likely to report not having enough money to buy food (56.0%, $P < .001$), receiving food from a food pantry or food bank in the past month (84.6%, $P < .0001$), and receiving food stamps (37.0%, $P = .03$). Similar to Clarke County, black participants were represented more heavily in this county (74.1%) than would be expected based on county demographic data (38.4%). Greene County was the most rural of the four counties in terms of persons per square mile (37.1) and reported having 60 volunteers who have assisted with nutrition related programs in the past fiscal year. This center may face a unique challenge in delivering daily meals to over 50 HDM participants throughout the county. Collaboration may also be impaired by its rural location as Greene County reported collaborations only with a local college or university (University of Georgia) and local businesses. Center staff reported that Tuesdays and Thursdays are the busiest days of the week with the most participants present. Observational assessments were performed on one Monday and three Thursdays in this center, so it is possible that the observations reflected a more crowded environment than is typical of the average day.

Physical environment

West Walton and Jackson Counties were both centers who used an on-site kitchen to fully prepare congregate meals. The only significant difference in the foods offered with meal service (fruit without added sugar, non-fried vegetables without toppings, whole wheat bread, and baked potato chips) were in whole wheat bread; whole wheat bread was offered with meal service in 100% of the observations in Clarke and Greene Counties, both centers purchased prepared meals from contractors, while it was offered in 0% of the observations of Jackson and West Walton Counties. This may support the categorization of on-site meal preparation as an obesogenic characteristic. Meals purchased from contractors are prepared according to a quarterly schedule with the same menu each month that is approved by the contractor's RD as well as the AAA wellness coordinator, also a registered dietitian. Although counties cooking on site reported that they generally adhere to the menu, they also reported that substitutions for certain items were made if necessary. Ability to alter menus and recipes is likely to

mean decreased adherence to the RD-approved menu when compared to counties who purchase meals prepared off-site by approved contractors; however, further research is needed to document this.

All of the centers reported staff participation in distributing CMP information to current and prospective participants (Table 3.2). Most (75%) of centers also had staff engaging in nutrition education activities, although this number dwindled to 50% when it came to leading nutrition education activities. Feedback mechanisms for the CMP participants were limited and varied among centers, with all of them reporting an "other" response. Examples of "other" ways that centers solicited feedback from participants on the CMP included verbal/word of mouth communication and visits from food service contractors. Surveys were the most popular way to receive CMP feedback (50% of centers).

Centers reported meal lengths to be from 30 to 60 minutes (Table 3.4). No center reported having a set meal time, but rather these times reflect when staff need to begin cleaning up for the afternoon or when the first bus leaves to bring participants home after lunch. Clarke County was the only center with vending machines present. Although the exact amount of profits received yearly from these machines was unknown, the money goes to the site council and helps to pay for off-site trips for the participants.

Participant access and transport to the centers was varied (Table 3.4). All of the centers had participants who drove themselves or were driven by others to the center. Most (75%) had a senior center vehicle to transport people to and from the center. Most (75%) were not accessible by public transit. Of the two centers who reported participants that arrive on foot, it should be noted that it was one individual at each center rather than a common occurrence. These are notable exceptions because 75% of the centers reported not being accessible by sidewalk to residential or commercial centers within half a mile, making it difficult for an older adult who wished to walk to the center to do so. This may be indicative of an obesogenic environment because increased spatial proximity decreases access to food choices and the likelihood of engaging in physical activity (i.e., walking) (Glanz et al 2005). This could be an important factor for older adults with chronic illness or functional limitations.

Political and economic environment

Centers all reported collaborating with local colleges/universities (specifically, the University of Georgia) on food service or nutrition related activities (Table 3.2). Working with local businesses, such as home health agencies, was also popular (75% of centers). However, only 25% of centers collaborated with their local health department or cooperative extension agent. These may be untapped resources for the senior centers, or they work with them on non-nutrition or non-meal related activities. In future interviews, it would be useful to establish if they are collaborating with partners on other activities. It also may be that there is some confusion as to whether the staff were thinking only about meals, during which local health departments and cooperative extension would not participate, versus health promotion and wellness activities in which local health departments and cooperative extension would be great collaborators.

Staff development topics varied among centers, with most (75%) having received training on menu planning and healthy food preparation methods in the past year (Table 3.2). Only one county reported receiving training on cultural diversity in menu planning and none received any training on creating a healthy food environment. Due to the variance of responses from counties which are all located in the same AAA region, in the future it would be useful to collect data on what agency or organization provided the staff development or training that included information about obesity in the participants and the notion of obesogenic environments.

Most (75%) of the centers had no guiding wellness policy or advisory council addressing health and wellness issues in the center (Table 3.5). All of the centers allowed participants to bring in personal food items and most (75%) allowed communal food to share and/or food donations. Frequency of food donation acceptance was higher in the centers that cooked on-site than those who purchased prepared meals from contractors and this may be because donated items were utilized in the CMP. All of the centers offered off-site trips that included a meal on a less than monthly or monthly basis. Wellness policies and field trips could be developed in the future that promoted healthy eating and consideration for the high prevalence of diabetes and obesity in the participants.

Most centers (75%) received state and federal funding (Table 3.6). Funding types were varied, with half of the centers reporting funding for each nutrition education, HDM, physical activity education, and physical activity equipment. Funding could be sought from these and other sources that supported a healthy environment, such as for discounted fitness center memberships, on-site exercise classes specifically targeting CMP participants, or visiting speakers addressing nutrition and wellness topics for older adults with physical limitations.

Sociocultural environment

All of the centers used flyers and word of mouth communication to disseminate information about classes, activities, and special events at the center (Table 3.5). Jackson, Clarke, and Greene Counties also posted information in the center, online, and used "other" methods to distribute information. Jackson County distributed handouts from visiting speakers. Clarke County had an abundance of methods for distributing information, including a monthly printed newsletter, an email listserv, and communicating with local churches to spread information about upcoming events. The manager at Greene County worked with the local newspaper to produce a monthly column highlighting recent and upcoming events at the senior center along with photos. The diverse methods employed by Clarke and Greene County are likely to raise the awareness of local seniors as well as the surrounding community about resources and services available at the senior center, and could serve as ways to promote the various nutrition and wellness programs they provide.

All centers reported knowing how to access an RD in the community, but having access to an RD less than monthly. "Other medical counseling opportunities" were frequently reported as visiting nurses from a hospital or home health agencies to perform blood pressure checks. Georgia Cares was an organization that 75% of the centers reported as providing assistive services, such as Medicare counseling, on a less than monthly basis. None of the centers charged fees for these assistive services.

All of the centers reported having access to small scale exercise equipment within the center and 75% reported having enough space for exercise (Table 3.6). Clarke County was the only center that charges fees for exercise programs; however, this center is unique in that it has programs targeted towards

the CMP participant base as well as community members. Older adults in the community can utilize a variety of classes at the senior center, including line dancing, ballroom dancing, yoga, tai chi, and Zumba. These programs are provided on a fee-for-service basis, but there are also exercise groups that are at no cost to the participant, such as a morning walking group that meets once per week. Clarke County also noted the difficulty in providing exercise classes for CMP participants, most of whom arrive shortly before lunch and leave shortly after on the senior center vehicle. This makes it difficult for the CMP participants to attend classes which may overlap with lunch or occur later in the afternoon, but the center was organizing a Zumba class for the CMP participants at the time of the interview. Clearly making exercise programs more accessible to CMP participants is important for Clarke County; both financial and time-related factors need to be considered.

Questionnaire refinement and improvement

The questionnaire appeared to measure several aspects of the senior center environment quite well, but some areas need improvement, such as the interview questions related to staff, volunteers, and funding sources. The centers differed in their organizational structures and not all staff members interviewed were responsible for both CMP and HDM administration. As a result, there was a wide variation in number of volunteers reported for nutrition related programs. Jackson, West Walton, and Greene Counties all administered HDM programs and reported from 0 to 150 volunteers associated with meal programs in the last fiscal year; however, Clarke County's HDM program is administered through the Athens Community Council on Aging, which is located in the same building, and therefore their volunteer count of seven did not include anyone associated with the HDM program.

A second issue with regards to data collection and organizational structure is that the centers varied in how services such as transportation were budgeted. Jackson County reported receiving direct funding for senior center transportation services. Clarke County's transportation was funded through the Athens Community Council on Aging. Clarke County's organizational structure was unique in that the senior center is closely tied with the Athens Community Council on Aging, which provides many services to CMP and other community participants. The structuring of these programs in Clarke County meant

that the senior center was not directly providing or funding all services to CMP participants; rather, the services were routed through the ACCA, resulting in some differences in reporting program funding in the questionnaire. Greene County worked with county public transit to provide transportation for the senior center; this county's services were available on an as-needed basis to county residents regardless of age. West Walton County had a senior center vehicle available, but did not currently have funding to pay for a staff member to operate the vehicle and was not currently providing transportation services. The differences in these systems made accounting for funding sources difficult. Each county had a different way of providing resources due to their organizational structure. In future studies, it may be useful to ask if certain services are made available to participants and, if so, by whom.

Perception of access to an RD, other medical professionals, and other assistive services may impact the reporting of availability of these services. For example, one center reported having nutritional counseling opportunities less than monthly even though a nutrition education session is provided to that center by the University of Georgia on a monthly basis. The questionnaire's accuracy in capturing this type of information could be improved by using senior center calendars, newsletters, or other publications to prompt interviewees or verify information stated in the interview.

Comparison of the interview and observational portions of the questionnaire illuminated some differences between reported and actual environmental characteristics. Counties appeared to overestimate mean daily CMP participants (Tables 4, 8). Jackson County reported serving 60 CMP participants in the staff interview, but the observed mean was only 37 (SD = 11). West Walton, Clarke, and Greene Counties reported serving about 34, 35, and 35 participants each day, respectively, but the mean observed participants were only 25 (SD = 3), 25 (SD = 1), and 27 (SD = 8). Jackson and West Walton Counties reported operating at 50-75% of their seating capacity and this was confirmed by the observational assessment (Tables 4, 8). Clarke and Greene Counties reported operating at 76% to 100% of seating capacity, while the observational assessment means were 64% (SD = 5) and 50 (SD = 15), respectively. Thus, the observational assessment appeared to work well for confirming or refuting quantitative information reported in the staff interview.

Questions 15 and 16 in future interview questionnaires should be clarified. Question 15 was intended to refer to detailed nutrient content information, such as calories or carbohydrate content. Question 16 was intended to refer to menu or meal information that is distributed to participants. In future versions, question 16 should refer to the menu rather than to nutrient content. Additionally, in future observational questionnaires, it would be useful to record whether the meal that is being served matches with the RD-approved menu for the facility.

Developing a scoring system for the questionnaire was a challenge in this study. Each item scored on the questionnaire was considered to be either an obesogenic or healthful influence; however, it was sometimes difficult to describe a characteristic as consistently obesogenic or healthful. Previous descriptive studies of obesogenic environments have suggested paying particular concern to those aspects of the food environment that are modifiable (Swinburn et al 1999). An example of this is food service programs that cook on-site. An on-site cooking program has the potential to deviate from the AAA RD-approved menu resulting in inadequate meals or excess fat, sodium, or calories and in this study was categorized as obesogenic. An on-site cooking program is also more modifiable than a program that orders ready-made meals and could provide fresh meals that meet the nutrition requirements and are palatable to older adults. This is something that centers could modify more easily than certain other aspects, such as the center's proximity and accessibility to residential and commercial centers. This pilot study provided necessary background information on the food environment in senior centers that will help to develop a scoring system in future studies. Factors that should be considered for future scoring include modifiability of the characteristic, magnitude to which it impacts CMP participants, and previous research supporting characterization as obesogenic or healthful.

The menu item questions adapted from the NEMS-R study were limited in their ability to describe the menu offerings at senior centers (Saelens et al 2007). In future studies, it would be useful to assess adherence to the AAA issued daily menu pattern using existing resources (UGA 2005). The 2005 Menu Analysis Guidelines assess whether the menu contains two servings of bread or bread alternate, three servings of fruit and vegetables, one serving of milk or milk alternative, one serving of whole

grains, one serving of meat or meat alternative, and one serving of fat (pattern is subject to change depending on state and national dietary guidelines). These guidelines would allow for more variation on the menu within a healthy dietary pattern and might more accurately assess the healthfulness of the menu component of the questionnaire.

Strengths and limitations

The limitations of this study were its cross sectional design and small sample size of older adult participants (n = 125) and senior centers (n = 4). Possibly due to this small sample size, we were not able to detect any significant differences among senior centers in terms of mean participant BMI or waist circumference or the prevalence of obesity. Without significant differences among centers, we cannot determine how accurately the questionnaire will assess obesogenicity of the senior center food environment. Future studies are needed to test the questionnaire in centers with significant differences in participant adiposity indicators, including BMI and waist circumference, in order to establish the accuracy of the questionnaire.

Staff who provide programs in senior centers on a monthly basis expected that two centers would have a higher prevalence of obesity, higher mean BMI, and larger mean waist circumference among participants (obesogenic centers, Clarke and Greene) than the two other centers (healthful centers, Jackson and West Walton). There are several possible reasons for this misconception. Jackson and West Walton are wealthier counties compared to Clarke and Greene, so it's possible that participants in these wealthier counties are more comfortable financially and are able to afford clothing that is well fitted to their current body weight. Clarke and Green have significantly more black CMP participants ($P < .0001$) (Table 3.10); this may have led staff to assume that there would be a higher prevalence of obesity, because the risk for overweight and obesity is higher for minority groups (NIH 2008). It is also possible that the more obese participants declined to enroll in the study, which included measures of adiposity; however, data are not available concerning the weight status of participants who did not enroll in the study.

This study succeeded in providing a wealth of information about the food environment in each of these four centers and the differences that exist among senior centers in terms of physical, sociocultural, economic, and political factors that may influence body weight among center participants. From the data collected in this pilot study, future studies should focus on clarifying the questions so as to receive accurate answers from senior center management, further distinguish between CMP and general nutrition or wellness related programs, and incorporate qualitative data collection where necessary to improve our knowledge of the senior center food environment.

Acknowledgements

We thank the older adults for this participation in this study as well as the staff members of Jackson, West Walton, Clarke, and Green County senior centers for their cooperation.

Table 3.1. County profile

County	Jackson	Walton	Clarke	Greene
Population (2009 estimate) [1]	63,544	87,311	116,342	15,743
Persons 65+ (2009) [1], %	13.1	12.1	8.7	20.0
White[1], %	89.4	81.6	69.6	60.2
Black[1], %	7.7	16.0	25.6	38.4
American Indian or Alaskan Native[1], %	0.1	0.2	0.2	0.3
Asian[1], %	1.8	1.2	3.2	0.4
Native Hawaiian or Pacific Islander[1], %	--	--	0.1	0.1
2+ races[1], %	1.0	1.0	1.4	0.6
Hispanic/Latino, %	5.2	3.3	9.3	4.0
White, non-Hispanic[1], %	84.4	78.5	60.9	57.0
Households[1] (2000)	15,057	21,307	39,706	5,477
Persons per household[1] (2000)	2.71	2.82	2.35	2.59
Households with one or more persons 65+ [2] (2008 estimate), %	22.0	21.2	6.6	--[3]
Median household income[1] (2008)	51,239	54,479	36,254	39,211
Per capita income[1] (1999)	17,808	19,470	17,123	23,389
Persons below poverty level[1] (2008), %	12.1	12.4	30.8	19.0
Persons 65+ below poverty level [2] (2008 estimate), %	15.3	11.0	10.4	--[3]
Persons per square mile[1] (2000)	121.6	184.5	838.8	37.1
Metropolitan area[1]	None	Atlanta-Sandy Springs-Marietta Metro Area	Athens-Clarke County Metro Area	None

[1](US Census 2010)
[2](US Census 2008b)
[3]Data not available for this county

Table 3.2. Staff characteristics, feedback and collaborators for the CMP and related activities (from staff interview)[1, 2]

	Jackson	West Walton	Clarke	Greene	Summary
(40) FT staff	6	0	2	4	Mean = 3
(41) PT staff	5	4	2	1	Mean = 3
(42) Volunteers	150	0	7	60	Mean = 54
Staff participation					
(43a) CMP information	Y	Y	Y	Y	100% Y
(43b) Nutrition education	Y	Y	N	Y	75% Y
(43c) Nutrition education leadership	Y	N	N	Y	50%Y
(43d) Other	N	N	N	Y	25% Y
(43e) No participation	N	N	N	N	0% Y
CMP feedback					
(44a) Survey	Y	N	N	Y	50% Y
(44b) Suggestion box	Y	N	N	N	25% Y
(44c) Bulletin board	N	N	N	N	0% Y
(44d) Web page	N	N	N	N	0% Y
(44e) Advisory council	N	N	N	N	0% Y
(44f) Other	Y	Y	Y	Y	100% Y
(44g) None	N	N	N	N	0% Y
Collaboration					
(45a) Cooperative extension	Y	N	N	N	25% Y
(45b) LHD	Y	N	N	N	25% Y
(45c) Hospital	Y	N	Y	N	50% Y
(45d) Social service agency	N	N	Y	N	25% Y
(45e) Health org	N	Y	Y	N	50% Y
(45f) Food commodities	N	N	Y	N	25% Y
(45g) College or university	Y	Y	Y	Y	100% Y
(45h) Local business	N	Y	Y	Y	75% Y
Staff					

	Jackson	West Walton	Clarke	Greene	Summary
development					
(46a) Menu planning	Y	N	Y	Y	75% Y
(46b) Cultural diversity	Y	N	N	N	25% Y
(46c) Dietary guidelines	Y	N	Y	N	50% Y
(46d) Ordering	N	Y	Y	N	50% Y
(46e) Healthy preparation methods	Y	N	Y	Y	75% Y
(46f) Healthy food environment	N	N	N	N	0% Y
Management (individual interviewed)					
Position title	Director	Director	Manager	Manager	
(47) Years in current position	20	7	1	5	Mean = 8
(48) Education level	Some college	Some college	Graduate	High school	50% some college

[1]Question number in parentheses
[2]Abbreviations: CMP = congregate meal program, FT = full time, LHD = local health department, N = no, PT = part time, Y = yes

Table 3.3. Food service characteristics (from staff interview)[1, 2]

	Jackson	**West Walton**	**Clarke**	**Greene**	**Summary**
(1) Kitchen type	On-site, full preparation of meals	On-site, full preparation of meals	On-site, receives fully prepared meals	On-site, receives fully prepared meals	50% full prep
Kitchen equipment					
(2a) Refrigerator	Y	Y	Y	Y	100% Y
(2b) Sinks	Y	Y	Y	Y	100% Y
(2c) Oven	Y	Y	N	Y	75% Y
(2d) Range	Y	Y	Y	Y	100% Y
(2e) Microwave	Y	Y	Y	Y	100% Y
(2f) Other	Y	Y	Y	N	75% Y
(3) Receives plated meals	N	N	Y	Y	50% Y
(4) Receives chilled/frozen items	N	Y	Y	N	50% Y
(5) Completes assembly of foods	Y	Y	N	N	50% Y
(6) Other preparation	N	N	Y	Y	50% Y
(7) Ordering decisions	AAA	AAA	Senior center staff	AAA	75% AAA

[1]Question number in parentheses
[2]Abbreviations: AAA = Area Agency on Aging, N = no, Y = yes

Table 3.4. Physical environment (from staff interview)[1, 2]

	Jackson	West Walton	Clarke	Greene	Summary
(8) Daily CMP participants	60	34	35	35	Mean = 41
(9) Meal length , minutes	55	30	45	60	Mean = 48
(10) Cafeteria capacity occupied, %	50-75%	50-75%	76-100%	76-100%	Mean = ~75%
(11) Vending machines	N	N	Y	N	25% Y
(12) Vending profits	N/A	N/A	Senior center	N/A	75% N/A
Dietary accommodations					
(14a) Substitute meal components	Y	N	N	N	25% Y
(14b) Substitute whole meal	N	N	N	Y	25% Y
(14c) Post notices	N	N	N	N	0% Y
(14d) Separate eating area	N	N	N	N	0% Y
(14e) Other	Y	N	N	N	25% Y
(14f) None	N	Y	Y	N	50% Y
Meal information					
(15) Nutrient content available	N	N	N	N	0% Y
(16a) Menu/flyer	Y	N	Y	N	50% Y
(16b) Post information in center	Y	Y	Y	Y	100% Y
(16c) Post information online	N	N	N	N	0% Y
(16d) Other	N	N	N	Y	25% Y
(17) Adequate seating available	Y	Y	Y	Y	100% Y
Access and transport					
(18a) On foot	N	N	Y	Y	50% Y
(18b) Drive self	Y	Y	Y	Y	100% Y
(18c) Driven by others	Y	Y	Y	Y	100% Y
(18d) Public transit	N	N	N	Y	25% Y
(18e) Senior center vehicle	Y	N	Y	Y	75% Y
(19) Transportation service frequency	As needed	Less than daily	Single trip per day	As needed	50% as needed
(20) Pedestrian	Not	Not	Within ½ mile to	Not	75% not

	Jackson	West Walton	Clarke	Greene	Summary
access	accessible	accessible	residential/commercial centers	accessible	accessible

[1]Question number in parentheses
[2]Abbreviations: CMP = congregate meal program, N = no, Y = yes

Table 3.5. Senior center policies (from staff interview)[1,2]

	Jackson	West Walton	Clarke	Greene	Summary
(21) Wellness policy	None	None	Center policy	None	25% Center policy
(22) Health advisory council	N	N	Y	N	25% Y
(23) Personal food allowed	Y	Y	Y	Y	100% Y
(24) Communal food allowed	Y	Y	Y	N	75% Y
(25) Food donation acceptance	Y	Y	N	Y	75% Y
(26) Food donation frequency	Weekly	Monthly	Less than monthly	Less than monthly	50% less than monthly
(27) Off site meal trips	Less than monthly	Monthly	Less than monthly	Monthly	50% monthly
Dissemination of resource and service information (e.g., classes, activities, programs, special events)					
(28a) Flyers	Y	Y	Y	Y	100% Y
(28b) Post info in center	Y	N	Y	Y	75% Y
(28c) Post info online	Y	N	Y	Y	75% Y
(28d) Word of mouth/verbal	Y	Y	Y	Y	100% Y
(28e) Other	Y	N	Y	Y	75% Y

[1]Question number in parentheses
[2]Abbreviations: N= no, Y = yes

Table 3.6. Center resources (from staff interview)[1,2]

	Jackson	West Walton	Clarke	Greene	Summary
(29) Access to RD	Y	Y	Y	Y	100% Y
(30) RD availability	Monthly	Never	Less than monthly	Less than monthly	50% less than monthly
(31) Nutritional counseling opportunities	Less than monthly	Monthly	Monthly	Monthly	75% monthly
(32) Other medical counseling opportunities	Weekly	Monthly	Weekly	Weekly	75% weekly
(33) Frequency of other assistive services	Less than monthly	Never	Less than monthly	Less than monthly	75% less than monthly
(34) Fee for service	N	N	N	N	0% Y
(35a) Exercise access within center	Y	Y	Y	N	75% Y
(35b) Exercise access outside of center	N	Y	N	N	25% Y
(35c) Small scale equipment available	Y	Y	Y	Y	100% Y
(35d) No access to exercise equipment	N	N	N	N	0% Y
(36) Fee for exercise facility	N	N	Per use	N	25% per use
Funding sources					
(37a) City	N	DK	N	N	0% Y
(37b) County	Y	DK	N	N	25% Y
(37c) State	Y	DK	Y	Y	75% Y
(37d) Federal	Y	DK	Y	Y	75% Y
(37e) Non-profit organizations/outside agencies	N	DK	N	Y	25% Y
(37f) Private donations	Y	DK	N	Y	50% Y
Funding types					
(38a) Nutrition education	Y	DK	N	Y	50% Y
(38b) Congregate meals	Y	DK	Y	Y	75% Y
(38c) Home delivered meals	Y	DK	N	Y	50% Y
(38d) Physical activity education	Y	DK	N	Y	50% Y
(38e) Physical activity equipment	Y	DK	N	Y	50% Y
(38f) Caregiver education/support	N	DK	N	N	0% Y
(38g) Transportation	Y	DK	N	N	25% Y

	Jackson	West Walton	Clarke	Greene	Summary
(38h) Other	N	DK	N	Y	25% Y

[1] Question number in parentheses
[2]Abbreviations: DK = don't know, N = no, RD = Registered Dietitian, Y = yes

Table 3.7. Signage and equipment (from mean of four observations)[1]

	Jackson	West Walton	Clarke	Greene	Summary
Beverages offered					
(1a) Water	100%	100%	100%	100%	100% Y
(1b) Diet/reduced calorie beverage	0%	0%	0%	0%	0% Y
(1c) 100% fruit juice	0%	0%	0%	0%	0% Y
(1d) 1% or non-fat milk	100%	100%	100%	100%	100% Y
Foods offered with meal service					
(2a) Fruit without added sugar	25%	75%	50%	75%	56% P = .42
(2b) Non-fried vegetables (no sauce)	100%	50%	100%	75%	81% P = .21
(2c) Whole grain bread	0%	0%	100%	100%	50% P < .001
(2d) Baked potato chips	0%	0%	0%	0%	0%
(2e) Other	100%	0%	75%	100%	68.75% P = .21
Nutrition signage					
(8) Physical activity signage	100% abundant	100% none	75% abundant	100% none	50% Abundant
(9) Nutrition signage	100% abundant	100% none	100% abundant	50% none	57% abundant
(10) Additional food/beverage available	100% Y	100% Y	75% Y	50% Y	81% Y

[1]Question number in parentheses

Table 3.8. Physical environment (from mean of four observations)[1,2]

	Jackson	West Walton	Clarke	Greene	Summary
Total seats	67±0[a]	50±2[c]	40±2[d]	56±1[b]	P < .0001
(4) Participants present	36±11	25±3	25±1	27±8	P = .18
% capacity	54±17	51±8	64±5	50±15	P = .36
(5) Participants eating					
N	5±4	2±3	2±2	2±1	P = .38
%	7±5	4±6	5±4	4±3	P = .74
(6) Participants drinking non-water beverage					
N	3±3[b]	15±4[a]	8±5[b]	7±3[b]	P < .01
%	5±4[c]	30±9[a]	19±12[a, b]	12±6[b, c]	P < .01
(7) Participants drinking water					
N	14±3[a]	4±5[b]	3±1[b]	3±2[b]	P < .001
%	21±5[a]	8±10[b]	6±3[b]	4±3[b]	P < .01
Equipment and activity					
(11) TV location	Outside eating area	Eating area	No	Outside eating area	50% outside eating area
(11a) # of televisions	1±.5[b]	1±.5[b]	1±.5[b]	2±.5[a]	P < .01
(12) Exercise equipment	100% Y	100% Y	25% Y	100% Y	75% Y
% participants engaging in PA	6±7	2±4	0±0	0±0	P = .16
(14) Vending machines	0% Y	0% Y	100% Y	0% Y	25% Y

[1]Question number in parentheses

[2]Abbreviations: N = no, PA = physical activity, TV = television, Y = yes

Table 3.9. Summary scores[1]

	Jackson	West Walton	Clarke	Greene	Summary
Mean observation score (from four observations, range 0 to 20)	10±1.4[b]	14±1.8[a]	12±2.1[a, b]	11±1.1[b]	P = .03
Interview score (single observation, range 0 to 95)	38	64	48	42	Mean = 48
Subscores from the interview					
Kitchen equipment (range = 0 to 6)[2]	0	0	1	1	Mean = .5
Food substitution (range = 0 to 6)[3]	4	6	6	5	Mean = 5.2
Nutrition information dissemination (range = 0 to 5)[4]	2	3	2	2	Mean = 2.2
Participant transportation access to center (range = 0 to 5)[5]	2	3	1	0	Mean = 1.5
Service and resource information dissemination (range = 0 to 5)[6]	0	3	0	0	Mean = 0.8
Exercise equipment(range = 0 to 4)[7]	1	0	1	2	Mean = 1.0
Staff engagement (range = 0 to 4)[8]	1	2	3	0	Mean = 1.5
CMP feedback (range = 0 to 6)[9]	3	5	5	4	Mean = 4.2
Collaboration (range = 0 to 8)[10]	4	5	2	6	Mean = 4.2
Staff development (range = 0 to 6)[11]	2	5	2	4	Mean = 3.2

[1]Abbreviations: CMP = congregate meal program
[2]Zero points scored per piece of equipment available. One point scored per piece of equipment unavailable.
[3]Zero points scored per substitution method offered. One point scored per substitution method not offered.
[4]Zero points scored per dissemination method used. One point scored per dissemination method not used.
[5]Zero points scored per transport mode available. One point scored per transport mode not available.
[6]Zero points scored per dissemination method used. One point scored per dissemination method not used.
[7]Zero points scored per exercise/facility use option available. One point scored per exercise/facility use option not available.

[8]Zero points scored per activity staff members have engaged in. One point scored per activity that staff members have not engaged in.
[9]Zero points scored per method used to collect CMP participant feedback. One point scored per method not used to collect feedback.
[10]Zero points scored per organizational collaboration. One point scored per non-collaboration.
[11]Zero points scored per staff development/training participation. One point per non-participation.

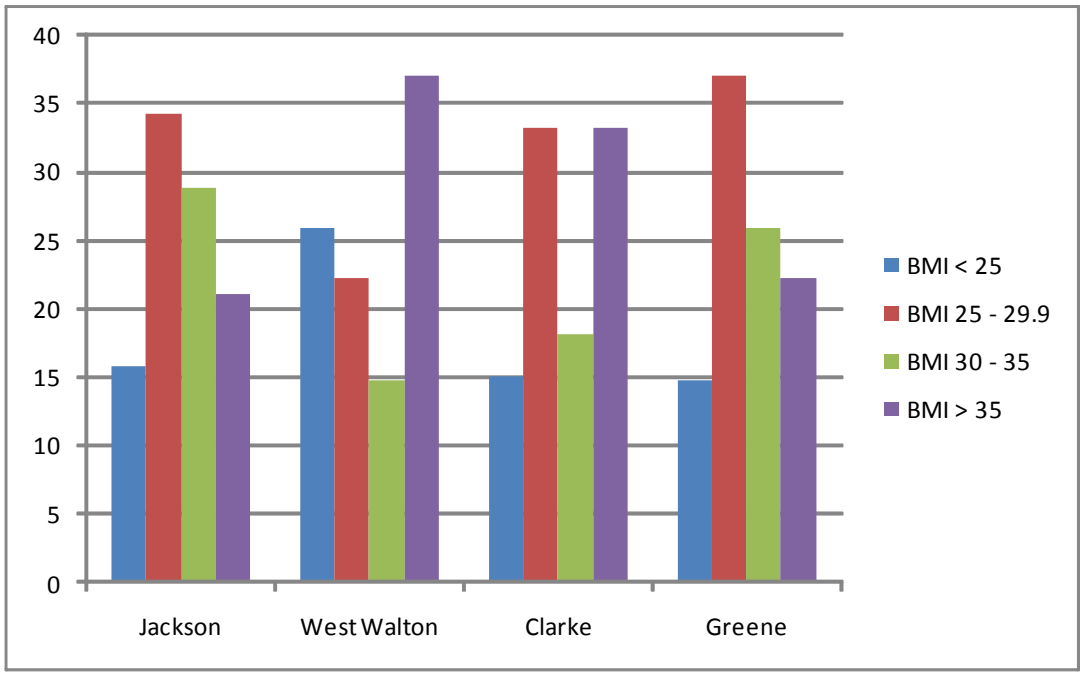
Table 3.10. Participant characteristics by county[1]

	Jackson (*n* = 38)	**West Walton (*n* = 27)**	**Clarke (*n* = 33)**	**Greene (*n* = 27)**	**P-value**
Age, y	75.5±8.2	75.5±7.5	73.7±8.2	74.0±6.3	P = .66
Range	63-91	63-90	60-93	62-87	
Gender, %					
Male	18.4	37.0	27.3	18.5	P = .29
Female	81.2	63.0	72.7	81.5	
Race/ethnicity, %[2]					P < .0001
White	81.6	92.6	18.2	25.9	P < .0001
Black	13.2	7.4	78.8	74.1	
Hispanic	5.3	0	0	0	
Asian	0	0	3.0	0	
Education, % < 8th grade	13.2	7.4	10.3	40.7	P < .01
BMI, kg/m^2					
< 25, %	15.8	25.9	15.1	14.8	P = .70
25 - < 30, %	34.2	22.2	33.3	37.0	
30 - < 35, %	28.9	14.8	18.2	25.9	
≥ 35 , %	21.0	37.0	33.3	22.2	
Range	18.5-56.0	21.4-41.0	20.8-40.7	18.9-54.5	
Mean±SD	30.4±6.7	31.0±6.2	31.3±6.0	31.0±7.6	P = .95
Waist circumference, inches					
Mean±SD	40.0±6.7	40.9±6.4	40.6±5.0	39.4±5.3	P = .79
Range	27.8-47.5	32.0-53.0	32.0-58.0	26.5-52.0	
High risk, %	76.3	74.1	75.8	74.1	P = .99
Male, low risk, %	0	40.0	44.4	20.0	P = .19
Male, high risk, %	100.0	60.0	55.6	80.0	
Female, low risk, %	29.0	17.7	16.7	27.3	P = .65
Female, high risk, %	71.0	82.3	83.3	72.7	
Chronic disease					
Diabetes, % yes	34.2	25.9	54.5	25.9	P = .06
Hypertension, % yes	68.4	74.1	69.7	77.8	P = .84
Weight related disability, % yes	10.5	14.8	21.1	15.4	P = .67
Food security					
Always have enough money for food, % no	15.8	11.1	25.8	56.0	P < .001

	Jackson (*n* = 38)	West Walton (*n* = 27)	Clarke (*n* = 33)	Greene (*n* = 27)	P-value
Received food from food bank or pantry in past month, % yes	2.6	14.8	51.5	84.6	P < .0001
Receiving food stamps, % yes	7.9	14.8	21.2	37.0	P = .03
Self perceived economic status					
Assets sufficient to meet emergencies, % no	31.6	15.4	29.0	41.7	P = .23
Enough for needs in the future, % no	26.5	20.0	30.0	44.0	P = .29
Financial status as compared to others their age, % worse	10.8	12.5	3.2	8.0	P = .61
Ability to make payments					
Unable to meet payments, % yes	0.0	3.7	0.0	4.0	P < .05
Barely meet payments, % yes	28.9	14.8	18.2	52.0	
Payments are no problem, % yes	71.1	81.5	81.8	44.0	
How well money takes care of needs					
Poorly	10.5	7.7	6.1	19.2	P = .28
Fairly well	42.1	50.0	54.6	38.5	
Very well	47.4	42.3	39.6	42.3	

[1]Abbreviations: BMI = body mass index, SD = standard deviation, y = years

[2]Only 3 of 125 participants were not black or white; therefore, the p-value represents only the black vs. white differences



[1]

Figure 3.1. Percentage BMI by county[1,2]

[1]Abbreviations: BMI = body mass index
[2]Percentages may not add up to 100 due to rounding

CHAPTER 4

CONCLUSION

The purpose of this study was to design and pilot test a questionnaire in order to evaluate the senior center food environment for obesogenic characteristics. This study used a cross sectional design to evaluate senior center food environments and compare them to adiposity indicators in CMP participants. In contrast with the hypothesis, the counties did not differ in their prevalence of obesity or mean waist circumference. However, there were differences among the centers in terms of participant demographics, diabetes prevalence, and food insecurity. The questionnaire uncovered differences in food service characteristics, individual nutrition related policies and practices, and staffing among the centers.

Questionnaire improvements and modifications

Some areas of the questionnaire need improvement based on this pilot test in four Georgia senior centers. A major concern is collecting data that is directly comparable for each center. Organizational structures varied among centers and this presented some difficulties in data collection. Future staff interviews should be more specific in several areas to ensure that the information is accurate. First, it is important to distinguish whether the information being collected is about CMP and HDM programs only, or if information is being collected about all nutrition and wellness programs. What constitutes a wellness program should be clearly defined and if programs falling under this heading are all relevant to measuring the food environment in senior centers. Areas that could fall under wellness programs include mental health, home safety, and chronic disease self management programs, but these are not necessarily relevant to the aim of this study. The purpose of this questionnaire is to assess the senior center food environment surrounding the CMP participants and how it may affect body weight. Although my interest was to collect data on nutrition and physical activity related programs that are available to CMP participants, I also received information on additional programs that are not necessarily available to the CMP participants because of scheduling, transportation, or other reasons. For this reason, it needs to be

explicitly stated prior to the interview that all the information being collected in the staff interview pertains to the CMP participants and programs available to them.

Further clarification is needed with regards to staff structure and program responsibility. It would be useful to include what OAA programs the senior center staff members are responsible for administering and if there are any relationships to other organizations that provide wellness programs or services to senior center participants. For example, the Clarke County center is located in the same building as the Bentley Center, an adult day services center, and the CMP participants can use the Nintendo Wii system at the Bentley Center to play games.

Similarly, budgeting for services varied among the centers and for this reason it would be useful to modify questions in order to ask if certain services are available for participants (e.g., transportation to senior center) rather than if the senior center received funding to provide those services. If a service is available, the interviewer can follow up by asking what organization is responsible for providing the service. I think funding is valuable information because it provides information on collaboration and organizational structures, but the way that it was worded in the questionnaire limited responses. Similarly, several centers had additional employees who worked at the center, but were paid for by other organizations (e.g., OAA Title V Community Senior Service Act program workers). These workers also play important roles in the senior centers, but were not captured by the interview assessment because they are not employed directly by the senior center.

An issue that arose in the testing of this tool was ensuring that complete information was received from the senior center staff member being interviewed. Occasionally a question would cause the staff member to amend an earlier response with additional information. If publications such as newsletters or event calendars are available, these materials would be useful in prompting staff members about the types of nutrition and wellness programs that we are interested in capturing during the interview.

The questionnaire's analysis of the sociocultural environment could be improved by asking CMP participants about their perception of the environment. This questionnaire did not incorporate qualitative information from the older adult participants on the social environment. Collecting information about

their perception of their peers' attitudes regarding healthy foods and physical activity could improve our knowledge of the sociocultural environment. Similarly, the leadership exhibited by senior center staff was also a sociocultural component of the food environment that was not captured by this questionnaire. I believe this was a major factor in the enthusiasm of the CMP participants and their receptivity to engaging in health related activities such as daily chair exercises. In future studies, I would ask the older adult participants to provide their perspective on the senior center staff's prioritization of nutrition and physical activity in the center by rating it as high, medium, or low. Collecting this type of information would enhance our understanding of the sociocultural environment by describing the subjective norms and normative beliefs of the participants as they are influenced by peers and center staff.

Challenges and opportunities in using school based questionnaires as a starting point for senior center questionnaires

While schools and senior centers may share some similarities, they are different organizations and environments. Applying a school based questionnaire to the senior center environment presented several challenges in how I considered differences between the governing structures and participants in meal programs. I discovered that there are many differences in school and senior center food environments that may impact food choices among participants. First, school environments tend to have an atmosphere of competitive foods, where students often have the option to choose between vending machines, a la carte items (e.g., French fries, pizza), and traditional school lunches (Fox et al 2009). Senior centers have a single lunch offering, leaving the CMP participants with no autonomy in food choice unless they choose not to eat what is offered. The price of school meals may be full, reduced, or free to eligible students. The meals at senior centers are free, but there are wait lists to enroll in the CMP program whereas reduced or free lunches are available to all students who demonstrate financial need. This is important with regards to the participants' comfort level in providing feedback about the meal program. Perhaps CMP participants with limited financial resources might fear that they are at risk for losing benefits or being dropped from the program if they complain to staff members about the program or food offered. Finally, there is strong advocacy in place for students in schools in the form of parental involvement. It is unclear

if such advocacy exists for the health of CMP participants. Table 4.1 outlines several potential organizational differences between schools and senior centers in terms of the four environmental domains explored in this study (physical, economic, sociocultural, and political/policy environments).

Immediate actions

The University of Georgia Department of Foods and Nutrition is under contract to provide nutrition education, physical activity, and health and wellness programs to Northeast Georgia senior centers. Thus, UGA faculty, staff, and graduate students working with the senior centers have the opportunity to be positive agents of change in improving the food environment for CMP participants. One idea is for UGA nutrition educators to discuss the idea of a food environment with the older adults and work with them to draft a wellness policy addressing nutrition and physical activity for their center. Senior center staff development/training topics were limited, so it would be useful to provide information on meal planning and healthy food environments to the staff, especially in the centers that fully prepare meals on site. Nutrition educators currently do a short physical activity program with the nutrition education program. Because physical activity equipment is somewhat limited in the center, perhaps they could demonstrate exercises that incorporate available equipment, such as hand weights. This would provide the older adults both with the knowledge of how to safely use the equipment as well as make them aware that it is available for them to use.

Conclusion

In conclusion, this study suggests that future research on the food environment in senior centers is necessary to determine the associations between environmental factors and obesity in the growing older adult population. The data collected in this study support that obesity is a major concern among older adults participating in the Older Americans Act Nutrition Program and that obesogenic elements exist within senior centers. Future studies should be conducted with a modified questionnaire and a larger sample size of senior centers with populations that differ in prevalence of overweight and obesity. The centers included in this study were relatively homogenous in several key areas that we hypothesized to be

obesogenic, including the types of food and meals offered (Table 3.7), access to nutrition experts and dietary counseling (Table 3.6), and senior center food policies (Table 3.5).

Table 4.1. Physical, economic, sociocultural, and political comparison of schools and senior centers[1]

	School	**Senior center**
Physical domain	Many food choices Physical activity opportunities (gyms, sports teams, age appropriate activities, adaptive PE for disabled) Policies discouraging LNED foods (e.g., classroom parties with cake or soda)	Few food choices Few physical activity opportunities (often suited to "lowest common denominator" not challenging to most able bodied) More participants with limited mobility Observed frequent availability of extra snacks, LNED foods
Economic domain	Mixture of economic status Free/reduced meals for all eligible students	Predominantly low income Waitlist for services
Sociocultural domain	Strong parental advocacy for student health Multicultural Community involvement in schools	No "built in" advocacy Predominantly white, African American Can be isolated environments
Political and policy domain	School wellness policy required by law (Section 204, Child Nutrition and WIC Reauthorization Act of 2004) Complex organizational structure and staff duties (i.e., teachers responsible for teaching, not seeking grants)	No wellness policy required; optional Limited staff and wide range of potential duties (i.e., day to day operations only vs. seeking grants and funding for more programs)

[1]Abbreviations: LNED = low nutrient energy dense, PE = physical education

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APPENDICES

APPENDIX A

ENVIRONMENTAL ASSESSMENT PART I – STAFF INTERVIEW

Food Service Characteristics

1) Which of the following best describes your kitchen (USDA 2004):
    1) An on-site kitchen where meals are fully prepared for serving only at the facility in which the kitchen is located.
    2) A receiving or satellite kitchen which obtains partially prepared meals (i.e., frozen) or ingredients from either base or central kitchens.

2) What types of food service facilities/equipment are available on site (check all that apply):
    1) Refrigerator
    2) Sinks
    3) Oven
    4) Range
    5) Microwave
    6) Other institutional kitchen equipment (i.e., Hobart mixer, Salamander) (please specify):

3) Do you receive fully plated meals that are prepared off site (USDA 2004):
    1) Yes (If yes, the vendor is: _____)
    2) No

4) Do you receive chilled or frozen foods that need to be heated (USDA 2004):
    1) Yes (If yes, the vendor is: _____)
    2) No

5) Do you assemble or complete assembly of foods, such as sandwiches or desserts (USDA 2004):
    1) Yes
    2) No

6) What other preparation is done in your kitchen for foods that are prepared off site (USDA 2004):

7) Which group has primary responsibility for deciding which foods to order for the center (CDC 2006):
    1) Senior center staff
    2) Outside contractor
    3) Area Council on Aging
    4) Other

Physical environment

8) How many congregate meal participants do you typically serve daily:

9) How long do participants usually have to eat once they are seated, in minutes (CDC 2006): __ __ min

10) At peak meal time, how full is the eating area compared to maximum capacity (CDC 2006):
    1) Less than 50% full
    2) 50 to 75% full

3) 76 to 100% full
4) Over capacity

11) Are vending machines located in your center:
    1) Yes
    2) No

12) Who receives revenue or profit from these machines (USDA 2004):
    1) Senior center
    2) County
    3) Area Agency on Aging
    4) Other

13) Approximately how much net income does the senior center receive from vending machines (specify yearly, weekly, monthly), if any (USDA 2004): $ _____/ week or month of year?

14) What accommodations do you make for persons with food allergies or other documented dietary needs (USDA 2004):
    1) Substitute components of meal
    2) Substitute whole meal
    3) Post notices about ingredients
    4) Provide separate eating area
    5) Other
    6) None

15) Does your center routinely make information on nutrient content of meals available to participants (USDA 2004):
    1) Yes
    2) No

16) How do you make nutrient content information available to participants (USDA 2004):
    1) Menus/flyers
    2) Post information in the center
    3) Post information online
    4) Other (please specify, e.g., copy to take home):

17) Does your center have enough space to seat all participants during each meal period?
    1) Yes
    2) No

18) How do participants access the facility:
    1) On foot
    2) Personal vehicle, driven by self
    3) Personal vehicle, driven by other
    4) Public transit
    5) Senior center vehicle driven by service operator

19) How frequently does the center offer transportation services:
    1) Less than daily
    2) Single trip per day (i.e., one pick up route and one drop off route)

3) Two trips per day (i.e., two pick up routes and two drop off routes)
4) As needed by participants (i.e., more than two trips per day)

20) Is your facility accessible to pedestrians (i.e., safe and continuous sidewalks connect your facilities to residential centers and/or commercial centers):
    1) Yes, sidewalks access residential and/or commercial centers located within half a mile or less
    2) Yes, sidewalks access residential and/or commercial centers located within one mile or less
    3) Yes, sidewalks access residential and/or commercial centers located greater than one mile
    4) No

Policies

21) Does your center have a wellness policy that addresses nutrition and physical activity (USDA 2004):
    1) Yes, center policy.
    2) Yes, county policy.
    3) Yes, state policy.
    4) No.

22) Does your center have a nutrition or health advisory council that addresses issue and concerns related to nutritional or physical activity (USDA 2004):
    1) Yes
    2) No

23) Are participants allowed to bring personal food into the center (CDC 2006):
    1) Yes
    2) No

24) Are participants allowed to bring communal food into the center:
    1) Yes
    2) No

25) Does the center accept food donations from outside agencies or individuals:
    1) Yes. If yes, from <u>who</u> and <u>what</u> types of food are brought:

    2) No

26) In the past 12 months, how often have you accepted food donations from outside agencies or individuals:
    1) Less than once per month
    2) Monthly
    3) Weekly
    4) Daily
    5) Never

27) How often does the center organize an off site trip that includes a meal:
    1) Less than once per month
    2) Monthly
    3) Weekly
    4) Daily
    5) Never

6) If yes, please describe:

28) How do you make participants aware of the resources or services that your center provides:
    1) Flyers
    2) Post information in the center
    3) Post information online
    4) Word of mouth
    5) Other (please specify):

Resources

29) Do you know how to access a Registered Dietitian in the community to provide nutritional counseling for participants:
    1) Yes
    2) No

30) How frequently is a Registered Dietitian available for counseling participants:
    1) Less than once per month
    2) Monthly
    3) Weekly
    4) Daily
    5) Never

31) How frequently are any other nutritional counseling opportunities available:
    1) Less than once per month
    2) Monthly
    3) Weekly
    4) Daily
    5) Never

32) How frequently are any other medical professionals available for counseling:
    1) Please specify type of medical professional:
    2) Less than once per month
    3) Monthly
    4) Weekly
    5) Daily
    6) Never

33) How frequently are services available to counsel participants on government program eligibility, such as Medicaid, SNAP (food stamps), or other assistance programs:
    1) Less than once per month
    2) Monthly
    3) Weekly
    4) Daily
    5) Never

34) Are there fees for these consultation services:
    1) Yes
    2) No

35) Does your center have access to exercise equipment and facilities:
    1) Yes, we have access to exercise equipment and facilities in our center
    2) Yes, we have access to exercise equipment and facilities outside our center (i.e., participants bussed to YMCA or other, separate location)
    3) We have limited access to exercise equipment, including small scale items (i.e., jump ropes, resistance bands, or hand weights), but no large weight equipment or cardio machines
    4) No, we do not have access to exercise equipment or facilities.

36) Do you charge a fee to access these services:
    1) Yes, on a fee per use basis.
    2) Yes, on a subscription (such as monthly or weekly) basis.
    3) No, we do not charge a fee.
    4) No, we do not have access to exercise equipment or facilities.

37) In the past 12 months, what sources of funding has your center received for any programs related to nutrition (including meals) and physical activity:
    1) City
    2) County
    3) State
    4) Federal
    5) Non-profit organizations or outside agencies
    6) Private donations

38) In the past 12 months, have you received funding for any of the following:
    1) Nutrition education
    2) Congregate meals
    3) Home delivered meals
    4) Physical activity education
    5) Physical activity equipment
    6) Caregiver education/support
    7) Transportation
    8) Other (please specify):

39) What programs does your center provide to participants that promote health and wellness (i.e., meal programs, Retired and Senior Volunteer Program, exercise classes):

Staff

40) How many staff members are employed by this center full time (last fiscal year):

41) How many staff members are employed by this center part time (last fiscal year):

42) How many unpaid volunteers assist with meal programs (home delivery or congregate) (last fiscal year):

43) In the past 12 months, have you or anyone on your staff engaged in the following activities (USDA 2004):
    1) Provided participants or prospective participants with information about the congregate meal program

2) Participated in a nutrition education activity in the center
3) Conducted a nutrition education activity in the center
4) Other (please specify):
5) None

44) Do you use any of the following ways to get feedback from participants about the congregate meal program (USDA 2004):
    1) Surveys
    2) Suggestion box
    3) Bulletin board
    4) Web page
    5) Advisory council
    6) Other (please specify):
    7) None

45) During the past 12 months, have the senior center staff worked on food service or nutrition activities with staff or members from (CDC 2006):
    1) County cooperative extension office
    2) Local health department
    3) Local hospital
    4) Local mental health or social service agency
    5) Health organization such as the American Heart Association or American Cancer Society
    6) A food commodity organization such as the Dairy Council
    7) A local college or university
    8) A local business

46) During the past 12 months, have any staff members received development on any of the following topics (CDC 2006)
    1) Menu planning for healthy meals
    2) Cultural diversity in meal planning
    3) Implementing Dietary Guidelines for Americans
    4) Selecting and ordering food
    5) Health food preparation methods
    6) Competitive food policies to create a healthy food environment

Interviewee

47) How long have you been in your current position (USDA 2004):

48) What is the highest grade or year of schooling you have completed (USDA 2004):
    1) Less than high school
    2) High school
    3) Some college, no degree
    4) Associate's degree
    5) Bachelor's degree
    6) Graduate degree

49) What recommendations do you have on how to improve the meal service program at your center (USDA 2004):

50) What are the greatest challenges your center faces to providing a healthy environment for older adults:

APPENDIX B

ENVIRONMENTAL ANALYSIS PART II – OBSERVATIONAL ASSESSMENT

To be administered by a University of Georgia student or staff person.

This person will ask the director for permission to take pictures of foods, beverages, kitchen, physical activity equipment, and signage (not people) to be used for educational purposes only (such as when summarizing the findings of this study to students and staff in educational settings).
Who asked? _____
Permission given? Circle one: No Yes

Menu

1) Are any of the following beverages offered with meal service (NEMS-R):
    1) Water
    2) Diet or reduced calorie beverage
    3) 100% fruit juice
    4) 1% or non-fat milk

2) Are any of the following foods offered with meal service (NEMS-R):
    1) Fruit without added sugar
    2) Non-fried vegetables without sauce or toppings
    3) Whole grain bread
    4) Baked potato chips
    5) Other (e.g., condiments, such as salt packets, sugar, ketchup, other _____)

3) Is nutrition information for the day's meal available (NEMS-R):
    1) Yes, menus are available.
    2) Yes, calorie and/or macronutrient content information is available.
    3) No

Environment (remember to record total number of seats: _____)

4) How many senior center participants are present:

5) How many senior center participants are eating food, excluding the congregate meal that is being served if applicable:

6) How many senior center participants are drinking non-water beverages:

7) How many senior center participants are drinking water:

8) Is nutrition signage promoting healthy habits displayed (NEMS-R):
    1) Yes, minimal signage is displayed.
    2) Yes, moderate or abundant signage is displayed.
    3) No, no visible signage displayed.

9) Is signage promoting physical activity displayed:
    1) Yes, minimal signage is displayed.
    2) Yes, moderate or abundant signage is displayed.

3) No, no visible signage is displayed.

10) Is food/beverage available for consumption beyond the standard meal service, excluding vending machines:
    1) Yes
        (a) If yes, what type of food/beverage is available:

    2) No

11) Is a television present:
    1) Yes, in eating area.
    2) Yes, near but not in eating area (within 20 feet).
    3) Yes, in other location.

        (a) If yes, how many:

    4) No, not present.

12) Is exercise equipment present:
    1) Yes
        (a) If yes, what type (i.e., treadmill, hand weights, jump rope, resistance bands):

    2) No

13) Are participants engaged in any physical activities:
    1) Yes
        (a) If yes, what type:

    2) No

Vending Machine Audit

14) Are vending machines present (USDA 2004):
    1) Yes, in eating area.
    2) Yes, near but not in eating area (within 20 feet).
    3) Yes, in other location.
    4) No, not present.

15) Please record the number of vending machines present:

16) Place a circle around the number corresponding to each food and/or beverage sold in the vending machine (USDA 2004):

17) Beverages:
    1) Carbonated Sweetened Soft Drink
    2) Carbonated Diet Soft Drink
    3) Juice (100%)
    4) Juice beverage (i.e., sweetened fruit blends, Hi-C, Lemonade)
    5) Water (unsweetened)
    6) Coffee

7) Tea
8) Dairy (low fat)
9) Dairy (full fat, e.g., whole milk)
10) Energy and Sports Drinks (i.e., Gatorade, Red Bull, Monster)
11) Other (please specify):

Foods:

18) Baked Goods/Dessert
1) Cake type (i.e., brownies, cupcakes, Twinkies)
2) Cake type, reduced fat or low fat
3) Cookies
4) Cookies, reduced or low fat
5) Pastries (i.e., pies, turnovers)
6) Other (please specify):

19) Bread or Grain Products
1) Muffins
2) Muffins, reduced fat or low fat
3) Granola bars
4) Granola bars, reduced fat or low fat
5) Pretzels
6) Crackers/cracker sandwiches
7) Cereal or cereal bars
8) Other (please specify):

20) Fruit
1) Canned fruit
2) Fresh fruit
3) Dried fruit

21) Snacks
1) Chips (i.e., corn, potato, puffed cheese, tortilla)
2) Chips, reduced fat or low fat
3) Nuts and seeds (i.e., almonds, peanuts, sunflower seeds, trail mix)
4) Popcorn, pre-popped
5) Popcorn, unpopped
6) Meat snacks (i.e., jerky, pork rinds)
7) Candy with chocolate (i.e, candy bars, M&Ms)
8) Candy without chocolate (i.e., Skittles, Starburst, gummy candy, or fruit chews)
9) Hard candies (i.e., cough drops, Lifesavers)
10) Gum
11) Gum, sugarfree
12) Energy bars (i.e., Balance Bar, Luna Bar, Power Bar)
13) Other (please specify):

22) Other
1) Please specify:

APPENDIX C

PARTICIPANT CONSENT FORM

LIVE HEALTHY GEORGIA! CONSENT FORM

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

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 medical 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 90 minutes that may be divided into two sessions. The post-test will last up to 60 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 twelve-month period.

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

6) 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 the leaders will arrange for my transportation to an appropriate facility; my insurance company or myself will be responsible for any expense that may be incurred. 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 individually identifiable 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. All research records will be retained for three years after completion of the study.

If I have any further questions about the study, now or during the course of the study I can call 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	May 17, 2010
Signature of Investigator	Printed Name of Investigator	Date

Email: DrMaryAnnJohnson@gmail.com

_____	_____	_____
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. (DHR IRB # 070702, UGA IRB # 2006-10842)

APPENDIX D

SENIOR CENTER PARTICIPANT QUESTIONNAIRE

Read Questions to Participants and Record Their Answers

Name of Trained 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. Today's date (M/D/Y): ___/___/___ todaydate			13-18
3. Age of Participant: ___ ___ ___ age			19-21
4. Gender: Male (0) Female (1) sex			22
5. Ethnicity: White (1) Black (2) Hispanic/Latino (3) Asian (4) Other (5) race			23
6. How many years did you complete in school: ____ years edu			24-25
7. How would you rate your overall health? Circle one: Poor (0) Fair (1) Good (2) Very good (3) Excellent (4)			SRH 26
8. Do you use any tobacco products such as cigarettes, cigars, pipe, or chewing tobacco?	No (0) Yes (1)		Race 27
9. Do you have diabetes?	No (0) Yes (1)		Diab 28
10. Do you have high blood pressure?	No (0) Yes (1)		HBP 29
11. Do you have heart disease such as angina, congestive heart failure, heart attack or other heart problems?	No (0) Yes (1)		Heartdx 30
12. Do you have arthritis?	No (0) Yes (1)		arthritis 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)		Jointpain 32
14. How many prescription medications, including insulin, do you take?			Medp 34-35
15. How many over the counter medications do you take? *(such as a daily multivitamin, supplements, Aspirin®, etc.)*			medotc 336-37
16. 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	Socemo 38
17. 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	depress 39

DIET AND PHYSICAL ACTIVITY		Line 1
18. How many times a day do you eat something sweet, such as candy, cookies, cakes, pie, donuts, ice cream?	0 1 2 3 4 5 6 7	sweet 40
19. How many times a day do you eat salty snacks, such as chips, French fries, pretzels?	0 1 2 3 4 5 6 7	salty 41

20. How many servings of fruits and vegetables should older people eat each day? (Circle the participant's response) 00 01 02 03 04 05 06 07 08 09 10 "5 a day" "5 or more a day" "7 to 10 a day" DK Missing	"5 a day" (05) "5 or more a day" (05) "7 to 10 a day" (71) DK (77) Missing (99)	Fvknow 42-43
21. How many servings of fruits and 100% fruit juices do you usually have each day?	0 1 2 3 4 5 6 7	Fruit 44
22. How many servings of vegetables do you usually eat each day?	0 1 2 3 4 5 6 7	Veget 45
23. 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	Fvdays 46
24. How many DAYS of the last WEEK (seven days) have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	Eathdays 47
25. 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	Pa1 48
26. How many days of the week do you participate in any physical activity (light or moderate)?	0 1 2 3 4 5 6 7	Pa2 49
27. About how many minutes of physical activity do you do on the days you are physically active?	___ ___ ___ min *e.g., 50 min is 050*	Pa3 50-52
28. 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	Pa4 53
FALLS AND FRACTURES		
29. Have you had a fracture or broken bone after age 50?	No (0) Yes (1)	Ff1 54
30. Have you fallen in the past year?	No (0) Yes (1)	Ff2 55
31. Do you feel limited in your daily life by a fear of falling?	No (0) Yes (1)	Ff3 56
32. Have you ever been told by a doctor or other health professional that you have osteoporosis?	No (0) Yes (1)	Osteo 57
FOODS AND SUPPLEMENTS		
33. Do you get a stomachache, gas, or diarrhea after drinking milk?	No (0) Yes (1)	Milkint 58
34. How many servings of milk products should most older people eat daily?	0 1 2 3 4 DK	Milkknow 59
35. How many whole grain servings should people eat each day?	0 1 2 3 4 DK	Wwknow 60
How often do you eat or drink or take these items? (*includes 3 or more per day)		Line 2
36. 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		Wwb 1-2
37. Whole grain cereals (such as oatmeal, Cheerios®, bran flakes or bran cereal)?		Wwc 3-4

<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	
38. 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	Milkb 5-6
39. 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	Milkc 7-8
40. 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	Ojca 9-10
41. 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	Suca 11-12
42. 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	Sucavd 13-14
43. 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	Sumvmvd 15-16
44. 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	Suvd 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 77 99	

FOOD SECURITY		
45. Do you always have enough money to buy the food you need?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused foodmon 19
46. 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 foodbank 20
47. Do you currently receive food stamps?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused foodstamp 21
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).		
48. 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 fi1 22
49. 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 fi2 23

50. 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 fi3 24
53a. 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 fi4 25-26
51. 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 fi5 27
52. 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 fi6 28
53. In the past 30 days, did you overeat when you had more money?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused overeat 29
53a. If yes, in the last 30 days, how many days did this overeating happen? *(interviewer-please write in participant's response)*	_____days	7 Don't know/ not sure 9 Refused overeatd 30-31
54. In the past year, have you wanted to apply for food stamps, but found the process too difficult? **54a. If yes, explain the difficulties:**	No (0) Yes (1)	7 Don't know/ not sure 9 Refused foodstampapp 32

GENERAL HEALTH AND BODY WEIGHT		
Does your current weight affect your ability to . . .		
55. Do daily activities such as walk, do housework, shop, etc?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 33
56. Shop for food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 34
57. Prepare food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 35
58. Cook food?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 36
59. In the past year, have you been told by a doctor or health care professional to <u>reduce your weight</u>?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 37
60. In the past year, have you been told by a doctor or health care professional to <u>increase your physical activity</u>?	No (0) Yes (1)	7 Don't know/ not sure 9 Refused 38
61. How would you describe your present body weight? Would you say:	1) It's about right 2) I should lose a few pounds 3) I should lose many pounds	7 Don't know/not sure 9 Refused 39

	4) I should put on some weight	
62. Your appetite is:	1) Very poor 2) Poor 3) Average 4) Good 5) Very good	7 Don't know/not sure 9 Refused 40
63. Does the health of your mouth and teeth affect your food choices?	0) No If yes, 1) Eat softer foods 2) Avoid certain foods 3) Eat soft and avoid (1&2)	7 Don't know/not sure 9 Refused 41

64. What is your marital status?	Unmarried partner (4) Married (3) Divorced (2) Widowed (1) Other (0)	7 Don't know/not sure 9 Refused 42
65. Including yourself, how many people live in your home?	Code number	43-44
66. How many children aged 17 and younger live in your home?	Code number	45-46

FOR THOSE WITH DIABETES ONLY		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	Diab1 42
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	Diab2 43
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	Diab3 44
4. What medications do you take for your diabetes? 0-None 1-pills only 2-insulin only 3-pills and insulin		Diab4 45
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	Diab5 46
6. On how many DAYS of the last WEEK (seven days) did you check your feet?	0 1 2 3 4 5 6 7	Diab6 47
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	Diab7 48
8. What should your hemoglobin A1c level be? ___% *(interviewer-please write in participant's response)*	77 Don't know/ not sure 99 Refused	Diab8 49
9. What things are the hardest for you to do when managing your diabetes? *(interviewer-please write in participant's response)*		Diab9 50-51
For the diabetes questions, code 8 or 88 = not applicable; 9 or 99 = DK or missing		

Medication Management – Ask of All Participants ***Please answer the following questions regarding your use of prescription medications. Think back over the past 30 days.*** **In the past 30 days…**	No (0)	Yes (1)	Line 3
MM20. Have you ever **taken less** of a medication than prescribed by your doctor because of the cost?			1
MM21. Have you ever **split pills** because of the cost?			2
MM22. Have you ever **delayed refills** of prescriptions because of the cost?			3
MM23. Have you ever **stopped taking medicines** because of the cost?			4
MM24. Have you ever **avoided new prescriptions** because of the cost?			5
MM25. Did you ever **take less effective prescription medications** than those initially prescribed by your doctor because of the cost?			6
MM26. Did you ever **switch to an over-the-counter alternative** to a prescription medication because of the cost?			7
Please answer the following questions about how you obtained your prescription medications. Think back over the past 30 days			
In the past 30 days…	No (0)	Yes (1)	
MM26. Did you ever **seek free samples** of a prescription medication because of the cost?			8
MM28. Did you ever **import** a prescribed medication (order from another country) because of the cost?			9
MM29. Were you ever **not able to purchase** a prescribed medication because of the cost?			10
MM30. Have you ever **had to borrow money** from a relative or friend outside your household to pay for medications?			11
MM31. Have you ever **had to increase credit debt** to pay for medications?			12
MM32. Have you ever **spent less money on food, heat, or other basic needs** so that you would have enough money to pay for your medications?			13
MM33. Have you ever **had to choose between purchasing food or medications**?			14

Subjective Measures of the Food Environment	
The following are questions about food resources you use in your neighborhood/community. Please answer each question for your current situation.	
1. Are there enough supermarkets/grocery stores/convenience stores in your neighborhood/community?	No (0) Yes (1) 15
2. Do supermarkets/grocery stores/convenience stores in your neighborhood/community always offer things you like and need?	No (0) Yes (1) 16
3. Do supermarkets/grocery stores/convenience stores in your neighborhood/community always offer affordable, healthy food choices?	No (0) Yes (1) 17
4. Do you shop for groceries for yourself?	No (0) Yes (1) 18
Income – new 2010 (OARS, Fillenbaum, 1984)	
Inc1. Are your assets and financial resources sufficient to meet emergencies?	No (0) Yes (1) 19

Inc2. Are your expenses so heavy that you cannot meet the payments, or can you barely meet the payments, or are your payments no problem to you?	Cannot meet payments (1) Can barely meet payments (2) Payments are no problem (3) 20
Inc3. Please tell me how well you think you are now doing financially as compared to other people your age – better, about the same, or worse?	Better (3) About the same (2) Worse (1) 21
Inc4. How well does the amount of money you have take care of your needs – very well, fairly, well, or poorly?	Very well (3) Fairly well (2) Poorly (1) 22
Inc. 5 At the present time do you feel that you will have enough for your needs in the future?	No (0) Yes (1) 23

Three Factor Eating Questionnaire: ***Explain to the participant, "The next questions will have four answers, such as always, usually, rarely, or never.***	**Always**	**Usually**	**Rarely**	**Never**	**Line 4**
1. When you see any of your favorite foods, do you find it very difficult to keep from eating, even if you have just finished a meal?	4	3	2	1	Eq1 1
2. Do you deliberately take small helpings as a means of controlling your weight?	4	3	2	1	Eq2 2
3. When you feel anxious, do you find yourself eating?	4	3	2	1	Eq3 3
4. Sometimes when you start eating, do you feel you just can't seem to stop?	4	3	2	1	Eq4 4
5. Being with someone who is eating often makes you hungry enough to eat also?	4	3	2	1	Eq5 5
6. When you feel blue, do you often overeat?	4	3	2	1	Eq6 6
7. When you see a real delicacy, do you often get so hungry that you have to eat right away?	4	3	2	1	Eq7 7
8. Do you get so hungry that your stomach often seems like a bottomless pit?	4	3	2	1	Eq8 8
9. Are you always hungry so it is hard for you to stop eating before you finish the food on your plate?	4	3	2	1	Eq9 9
10. When you feel lonely, do you console yourself by eating?	4	3	2	1	Eq10 10
11. Do you consciously hold back at meals in order not to gain weight?	4	3	2	1	Eq11 11
12. Do you not eat some foods because they make you fat?	4	3	2	1	Eq12 12
13. Are you always hungry enough to eat at any time?	4	3	2	1	Eq13 13

14. How often do you feel hungry?	Almost always (4)	Often between meals (3)	Some-times between meals (2)	Only at meal times (1)	Eq14 14
15. How frequently do you avoid "stocking up" on tempting foods?	Almost Always (4)	Usually (3)	Seldom (2)	Almost never (1)	Eq15 15
16. How likely are you to consciously eat less than you want?	Very likely (4)	Moderately likely (3)	Slightly likely (2)	Unlikely (1)	Eq16 16
17. Do you go on eating binges though you are not hungry?	At least once a week	Sometimes (3)	Rarely (2)	Never (1)	Eq17 17
18. Do you feel you are restrained in your eating? Always restrained (constantly limiting food intake and never "giving in"), Usually restrained, Rarely restrained, or Never restrained (eating whatever you want, whenever you want).	**Always** (4)	**Usually** (3)	**Rarely** (2)	**Never** (1)	Eq18 18
To be completed by the data coder					
19. The cognitive restraint scale is the sum of items 2, 11, 12, 15, 16, 18					Eq19 19-20
20. The uncontrolled eating scale is the sum of items 1, 4, 5, 7, 8, 9, 13, 14, and 17					Eq20 21-22
21. The emotional eating scale is the sum of items 3, 6, and 10					Eq21 23-24

NOTE Question #1 has been reworded from this original question, "When I smell a sizzling steak or juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal." All questions "I" changed to "you" etc.
Original questionnaire from: **http://jn.nutrition.org/cgi/content/full/134/9/2372**

Please answer the following questionnaire and identify which number 0, 1, 2 or 3 indicates how much the statement applied to you over the <u>past week.</u>	0 – Did not apply to me at all	1 – Applied to me to some degree, or some of the time	2 – Applied to me to a considerable degree, or a good part of time	3 – Applied to me very much, or most of the time	**Line 5**
1. You found it hard to wind down					DAS1 1
2. You were aware of dryness of my mouth					DAS2 2
3. You couldn't seem to experience any positive feeling at all					DAS3 3
4. You experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)					DAS4 4
5. You found it difficult to work up the initiative to do things					DAS5 5
6. You tended to over-react to situations					DAS6 6
7. You experienced trembling (eg, in the hands)					DAS7 7
8. You felt that you were using a lot of nervous energy					DAS8 8
9. You felt that you were using situations in which I might panic and make a fool of myself					DAS9 9
10. You found that you had nothing to look forward to					DAS10 10
11. You found myself getting agitated					DAS11 11
12. You found it difficult to relax					DAS12 12
13. You felt down-hearted and blue					DAS13 13
14. You were intolerant of anything that kept you from getting on with what you were doing					DAS14 14
15. You felt you were close to panicking					DAS15 15
16. You were unable to become enthusiastic about anything					DAS16 16
17. You felt you weren't worth much as a person					DAS17 17
18. You felt that you were rather touchy					DAS18 18
19.You were aware of the action of your heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)					DAS19 19

20. You felt scared without any good reason					DAS20 20
21. You felt that life were meaningless					DAS21 21

NOTE All questions "I" changed to "you" etc.

Original questionnaire from: **http://csgpn.org.au/ee/images/uploads/mental_health/DASS_21.pdf**

After attending the health, nutrition, and physical activity education programs at your center these past few months, have you done any of the following? ***Read the list and circle the answers.***	Line 6
1. Increased your physical activity?	No (0) Yes (1) s1 1
2. Tried to follow a healthier diet?	No (0) Yes (1) s2 2
3. Increased your intake of fruit?	No (0) Yes (1) s3 3
4. Increased your intake of vegetables?	No (0) Yes (1) s4 4
5. Learned about healthy foods that are inexpensive?	No (0) Yes (1) s5 5
6. Started washing your hands more often to prevent illness?	No (0) Yes (1) s6 6
7. Started taking a supplement with calcium and vitamin D?	No (0) Yes (1) s7 7
8. Eaten more calcium-rich foods?	No (0) Yes (1) s8 8
9. Learned the warning signs of a heart attack?	No (0) Yes (1) s9 9
10. Learned the warnings signs of a stroke?	No (0) Yes (1) s10 10
11. Taken better care of your feet?	No (0) Yes (1) s11 11
12. Talked with your doctor about bone health and osteoporosis?	No (0) Yes (1) s12 12
13. Talked with your doctor about arthritis?	No (0) Yes (1) s13 13
14. Talked with your doctor about your body weight?	No (0) Yes (1) s14 14
15. Had your medications reviewed?	No (0) Yes (1) s15 15
16. Taken your medications as recommended by your doctor?	No (0) Yes (1) s16 16
17. Made your home a safer place to prevent falls?	No (0) Yes (1) s17 17
18. Made a recipe from one of the lessons?	No (0) Yes (1) s18 18
19. Modified a recipe to make it healthier?	No (0) Yes (1) s19 19
20. If you have diabetes, did these programs help you space carbohydrates over the day?	No (0) Yes (1) No diabetes (8) s20 20
21. If you have diabetes, did these programs help you maintain your blood sugar levels?	No (0) Yes (1) No diabetes (8) s21 21
22. If you have diabetes, did these programs help you control portion sizes of foods?	No (0) Yes (1) No diabetes (8) s22 22
23. What was your overall level of satisfaction with these health and nutrition education programs? **Circle one:** Poor (0) Fair (1) Good (2) Very good (3) Excellent (4)	0 1 2 3 4 s23 23
24. What was your overall level of satisfaction with this physical activity program? Circle one: **Circle one:** Poor (0) Fair (1) Good (2) Very good (3) Excellent (4)	0 1 2 3 4 s24 24

25. How many sessions of the **health, nutrition, and physical activity education programs** did the participant attend? *Staff should document with attendance records. Maximum is 12 sessions.*	s25 25-26

Please ask the participant for any additional comments about the education programs, physical activity programs, menus, recipes, games, etc.:

WAIST CIRCUMFERENCE:

Instructions for Measuring Waist Circumference

The measurement should be made under the clothes.

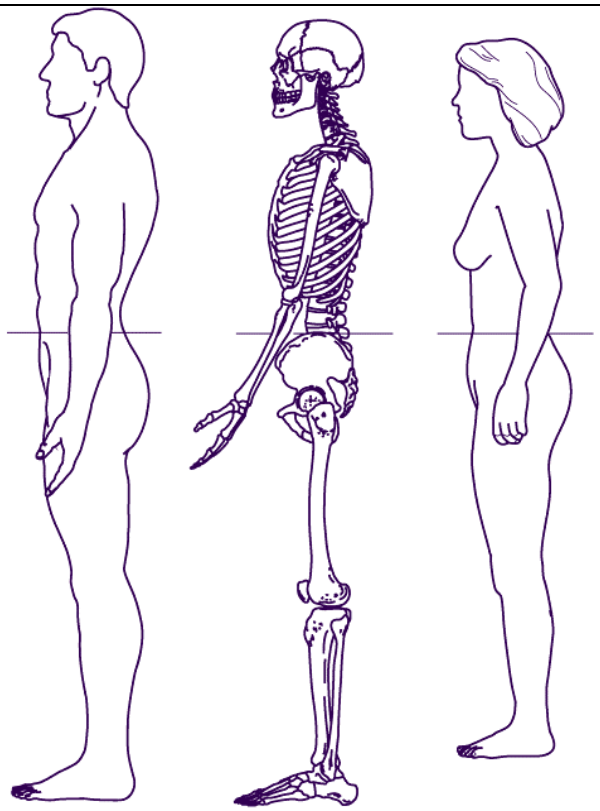
To measure waist circumference, locate the upper hipbone and the top of the right iliac crest. Place a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest. Before reading the tape measure, ensure that the tape is snug, but does not compress the skin, and is parallel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

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

High-Risk Waist Circumference

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

http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf



Waist circumference = ___ ___.___ INCHES	Line 7 WCin ___ ___. ___ 1-4
How was the waist circumference measurement made? (1) Under clothes, (2) Over light (summer) clothes, (3) Over heavy (winter) clothes	WCmeas ___ 5
Chair sit-and-reach: sit in stable chair, keep 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*	csrneg ___ ___ . ___ 6-9 csrpos ___ ___ . ___ 10-13 One of above coded as 88.8
What is your current height without shoes? *** is preferred.* (1) ** Self-report without shoes: ___ feet and ___ ___. ___inches (2) ** Tape measure without shoes: ___ feet and ___ ___. ___inches (3) Tape measure with shoes: ___ feet and ___ ___. ___inches *Enter the total inches: (12 x ft) + inches = total inches*	Htin1 ___ ___ . ___ 14-17 Htin2 ___ ___ . ___ 18-21 Htin3 ___ ___ . ___ 22-25 *(- 9.9 if missing)*

What is your current weight? *** is preferred.* (1) ** By interviewer: with a scale, with clothes, and without shoes: ___ ___ ___.___ pounds (2) ** Self-report without clothes and without shoes: ___ ___ ___.___ pounds (3) Self-report with clothes and with shoes: ___ ___ ___.___ pounds (4) By interviewer: with a scale, with clothes, and with shoes: ___ ___ ___.___ pounds	Wtlbs1 ___ ___ ___ . ___ 26-30 Wtlbs2 ___ ___ ___ . ___ 31-35 Wtlbs3 ___ ___ ___ . ___ 36-40 Wtlbs4 ___ ___ ___ . ___ 41-45 *(- 99.9 if missing)*
BMI body mass index [wtlbs /(htinches)^2] x 703	BMI ___ ___ . ___ 46-49

Nutrition Screening, Weight, Height, BMI (05/8/09)

Name (ID):	**2. County:**	**3. Date (M/D/Y) :**	
NUTRITIONAL HEALTH			
		Circle one *Missing = 9*	Line 8
NH1. Do you have an illness or condition that made you change the kind and/or amount of food you eat.*		No (0) Yes (2)	Nh1 1
NH2. Do you eat fewer than two meals per day?		No (0) Yes (3)	Nh2 2
NH3A. Do you eat few fruits or vegetables?**		No (0) Yes (1)	Nh3a 3
NH3B. Do you eat few milk products?**		No (0) Yes (1)	Nh3b 4
NH4. Do you have 3 or more drinks of beer, liquor or wine almost every day.		No (0) Yes (2)	Nh4 5
NH5. Do you have tooth or mouth problems that make it hard for you to eat.*		No (0) Yes (2)	Nh5 6
NH6. Do you always have enough money to buy the food you need.		No (4) Yes (0)	Nh6 7
NH7. Do you eat alone most of the time.		No (0) Yes (1)	Nh7 8
NH8. Do you take 3 or more different prescribed or over-the-counter drugs a day.		No (0) Yes (1)	Nh8 9
NH9. Without wanting to, have you lost or gained 10 or more pounds in the last 6 months. Circle one: Lost weight OR Gained weight.		No (0) Yes (2)	Nh9 10
NH10. Are you not always physically able to (circle all that apply): Shop, cook, and/or feed yourself.*		No (0) Yes (2)	Nh10 11

If your score is:	**Total Score:**	Nhtot 12-13
0-2: **Good.** Recheck your nutritional score in 6 months.		
3-5: **You are at moderate nutritional risk.** See your dietitian or health care provider to help you improve your eating habits and lifestyle. Recheck your nutritional score in 3 months.		
6 or more: **You are at high nutritional risk.** See your dietitian or health care provider to help you improve your eating habits and lifestyle. Recheck your nutritional score in 3 months.		

BODY WEIGHT, HEIGHT, AND BMI
If possible, use a Scale to Measure Body Weight And Tape Measure for Height
Record from previous pages

What is your current height without shoes? *** is preferred.* (1) ** Self-report <u>without</u> shoes: ___ feet and ___ ___. ___inches (2) ** Tape measure <u>without</u> shoes: ___ feet and ___ ___. ___inches (3) Tape measure <u>with</u> shoes: ___ feet and ___ ___. ___inches *Enter the total inches: (12 x ft) + inches = total inches*	Htin1 ___ ___ . ___ 14-17 Htin2 ___ ___ . ___ 18-21 Htin3 ___ ___ . ___ 22-25 *(- 9.9 if missing)*

What is your current weight? *** is preferred.* (1) ** By interviewer: with a scale, with clothes, and <u>without</u> shoes: ___ ___ ___.___ pounds (2) ** Self-report <u>without</u> clothes and <u>without</u> shoes: ___ ___ ___.___ pounds (3) Self-report <u>with</u> clothes and with shoes: ___ ___ ___.___ pounds (4) By interviewer: with a scale, <u>with</u> clothes, and <u>with</u> shoes: ___ ___ ___.___ pounds	Wtlbs1 ___ ___ ___ . ___ 26-30 Wtlbs2 ___ ___ ___ . ___ 31-35 Wtlbs3 ___ ___ ___ . ___ 36-40 Wtlbs4 ___ ___ ___ . ___ 41-45 *(- 99.9 if missing)*
BMI body mass index [wtlbs /(htinches)^2] x 703	BMI ___ ___ . ___ 46-49
If your BMI is:	
18 or less: You are at risk of being underweight. See your health care provider to help you find out why you are losing weight and to help you gain weight.	
19 to 24.9: This is the normal healthy range.	

25 or higher: You are overweight. See your health care provider to help you find out why you are gaining weight and to help you lose or stop gaining weight.	

Question reworded in May 2005*, May 2009**

Physical Performance Test-Task Descriptions **Equipment: <u>Stopwatch</u>, 8-Ft Tape Measure, Ruler, Folding Chair**	**Use stopwatch to record time in SECONDS**	LINE 9 UGA Staff can score with open coding
STANDING BALANCE: Time each item until person stands at least 10 seconds <u>OR</u> until person moves feet or reaches for support.	**Time to the nearest 10th second:**	
• **A-Side-by-side: Feet are touching side-by-side with toes and heels touching. <u>If can hold for 10 seconds</u>, then do the next semi-tandem stand. If not, then go to the 8 foot walk.**	**Standa:** ☐ ☐.☐	___ ___ . ___ 1-4
• **B-semi-tandem: Place heel of one foot at mid-position of the other foot. <u>If can hold for 10 seconds</u>, then do the next tandem stand. If not, then go to the 8 foot walk.**	**Standb:** ☐ ☐.☐	___ ___ . ___ 5-8
• **C-Tandem stand; place one foot directly in front of the other so that the heel and toes touch.**	**Standc:** ☐ ☐.☐	___ ___ . ___ 9-12
STAND SCORE: If A= 0-9 & B= <10, score= 0 A= 10 & B= <10, score= 1 B= ≥10 & C= 0-2, score= 2 B= ≥10 & C= 3-9, score= 3 B= ≥10 & C= ≥10, score= 4		Standscore: ____ 13
8 FOOT WALK: • **Participant begins at standing position and will walk a straight distance of 8-feet, measured with tape on the floor.** • **Instruct the participant to walk at normal gait using any assistive devices. If possible, have them begin walking a few feet before starting mark, and continue walking a few feet past the 8-foot mark. Tester will start and stop watch at the distance marks.** • **Complete the walk twice.**	**Time to nearest 10th second and code the best (lowest) time:** **Walk1:** ☐ ☐.☐ **Walk2:** ☐ ☐.☐ **Assistive device used?** **No (0) . If yes, was it a:** **Cane (1), Walker (2),** **Other (3)**	Wa1ksec: ___ ___ . ___ 4-17 Assistdev: ___ 18
WALK SCORE: 1= ≥5.7 2= 4.1-5.6 3= 3.2-4.0 4= ≤3.1		Walkscore: ____ 19
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 nearest 10th second:** **Chairsec:** ☐	___ ___. ___ 20-23

	□.□	

CHAIR SCORE: 1= ≥16.7 2= 13.7-16.6 3= 11.2-13.6 4= ≤11.1 Chairscore: ____ 24

TOTAL SCORE: Add all 3 total scores, range is 0-12 SPPB: ___ ___ 25-26

Coding: 8 or 88.8 = physically unable (then "scores" = 0), 9 or 99.9 =refused (then "scores" = .); 7 or 77.7 =not applicable.

SPPB: good function (score of 10 to 12); moderate function (score of 6 to 9); poor function (score of 0 to 5).

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

Same tests, but descriptions for the interviewer and coding for the coder are clarified

NUTRITION AND HEALTH STATUS REPORT
From Department of Foods and Nutrition, University of Georgia

NAME: _____ COUNTY: _____ DATE (M/D/Year): _____

Recently, we interviewed you about your nutrition and health. A summary is provided below. For a nutrition consult, please contact the Department of Foods and Nutrition at the University of Georgia (706-542-4838) or an agency in your community (see attached list).

1. Nutritional risk (10 item questionnaire).
____ 0-2, low risk for nutrition problems
____ 3-5, moderate risk for nutrition problems (recommend nutrition consult)
____ 6 or more, high risk for nutrition problems (recommend nutrition consult)

2. Food assistance: some people may need food assistance because of low income and/or high costs of medications, rent, or utility bills, or problems with transportation.
____ No problems noted
____ Recommend continuing food stamps
____ Recommend seeking assistance from a local food bank and/or applying for food stamps (contact your senior center for assistance)

3. Body mass index is a measure of weight and height (kg/m^2). Underweight, overweight or obesity indicates the need for a nutrition consult to help manage weight related health problems.
____ Greater than 30, obese (recommend nutrition consult)
____ 25 to 30, overweight (recommend nutrition consult)
____ 18.5 to 24.9, normal range
____ Less than 18.5, underweight (recommend nutrition consult)

4. Losing weight without meaning to may indicate low food intake or illness. However, some people need to lose weight if they are overweight or obese.
____ No weight loss noted
____ Weight loss of 10 or more pounds in the past 6 months (recommend nutrition consult)

5. Physical function was assessed by balance, an 8 foot walk, and chair stands. No matter what your physical function, try to maintain or increase your physical activity to help improve function, maintain independence, mobility, and the ability to live in the community for as long as possible. Contact your senior center and/or your physician about physical activity programs in your community.
____ Good function (10-12)
____ Moderate function (6-9)
____ Poor function (0-5)

6. Risk for depression:

____ Not assessed at this visit
____ No history of depression
____ History of depression (recommend that you contact your physician)

APPENDIX E

ENVIRONMENTAL ASSESSMENT PART I – STAFF INTERVIEW (WITH POINTS)

Food Service Characteristics

1) Which of the following best describes your kitchen (USDA 2004):
    1) An on-site kitchen where meals are fully prepared for serving only at the facility in which the kitchen is located. **(1 point)**
    2) A receiving or satellite kitchen which obtains partially prepared meals (i.e., frozen) or ingredients from either base or central kitchens. **(0 points)**

2) What types of food service facilities/equipment are available on site (check all that apply):
    1) Refrigerator **(0 points if yes, 1 point if no)**
    2) Sinks **(0 points if yes, 1 point if no)**
    3) Oven **(0 points if yes, 1 point if no)**
    4) Range **(0 points if yes, 1 point if no)**
    5) Microwave **(0 points if yes, 1 point if no)**
    6) Other institutional kitchen equipment (i.e., Hobart mixer, Salamander) (please specify): **(0 points if yes, 1 point if no)**

3) Do you receive fully plated meals that are prepared off site (USDA 2004): **(0 points if yes, 1 point if no)**
    1) Yes (If yes, the vendor is: _____)
    2) No

4) Do you receive chilled or frozen foods that need to be heated (USDA 2004):
    1) Yes (If yes, the vendor is: _____) **(0point)**
    2) No **(1 points)**

5) Do you assemble or complete assembly of foods, such as sandwiches or desserts (USDA 2004):
    1) Yes **(1 point)**
    2) No **(0 points)**

6) What other preparation is done in your kitchen for foods that are prepared off site (USDA 2004): **(no point value assigned to this question)**

7) Which group has primary responsibility for deciding which foods to order for the center (CDC 2006):
    1) Senior center staff **(1 points)**
    2) Outside contractor **(1 point)**
    3) Area Council on Aging **(0 points)**
    4) Other **(1 point)**

Physical environment

8) How many congregate meal participants do you typically serve daily:
    1-15 participants – 0 points
    16-30 participants - 0 points
    31-45 participants – 1 point
    46+ participants – 1 point

9) How long do participants usually have to eat once they are seated, in minutes (CDC 2006): __ __ min
   1-20 minutes – 1 point
   21+ minutes – 0 points

10) At peak meal time, how full is the eating area compared to maximum capacity (CDC 2006):
    1) Less than 50% full **(0 points)**
    2) 50 to 75% full **(.5 points)**
    3) 76 to 100% full **(1 points)**
    4) Over capacity (**1 points)**

11) Are vending machines located in your center:
    1) Yes **(1 points)**
    2) No **(0 points)**

12) Who receives revenue or profit from these machines (USDA 2004):
    1) Senior center **(0 points)**
    2) County **(1 points)**
    3) Area Agency on Aging **(1 points)**
    4) Other **(0 points)**

13) Approximately how much net income does the senior center receive from vending machines (specify yearly, weekly, monthly), if any (USDA 2004): $ _____/ week or month of year?
No points scored for this question

14) What accommodations do you make for persons with food allergies or other documented dietary needs (USDA 2004):
    1) Substitute components of meal **(0 points if yes, 1 point if no)**
    2) Substitute whole meal **(0 points if yes, 1 point if no)**
    3) Post notices about ingredients **(0 points if yes, 1 point if no)**
    4) Provide separate eating area **(0 points if yes, 1 point if no)**
    5) Other **(0 points if yes, 1 point if no)**
    6) None **(no points scored; 5 above are scored)**

15) Does your center routinely make information on nutrient content of meals available to participants (USDA 2004):
    1) Yes **(0 points)**
    2) No **(1 point)**

16) How do you make nutrient content information available to participants (USDA 2004):
    1) Menus/flyers **(0 points if yes, 1 point if no)**
    2) Post information in the center **(0 points if yes, 1 point if no)**
    3) Post information online **(0 points if yes, 1 point if no)**
    4) Other (please specify, e.g., copy to take home): **(0 points if yes, 1 point if no)**

17) Does your center have enough space to seat all participants during each meal period?
    1) Yes **(0 points)**
    2) No **(1 point)**

18) How do participants access the facility:
    1) On foot **(0 points if yes, 1 point if no)**
    2) Personal vehicle, driven by self **(0 points if yes, 1 point if no)**

3) Personal vehicle, driven by other **(0 points if yes, 1 point if no)**
4) Public transit **(0 points if yes, 1 point if no)**
5) Senior center vehicle driven by service operator **(0 points if yes, 1 point if no)**

19) How frequently does the center offer transportation services:
1) Less than daily **(1 points)**
2) Single trip per day (i.e., one pick up route and one drop off route) **(1 point)**
3) Two trips per day (i.e., two pick up routes and two drop off routes) (**.5 points)**
4) As needed by participants (i.e., more than two trips per day) **(0 points)**

20) Is your facility accessible to pedestrians (i.e., safe and continuous sidewalks connect your facilities to residential centers and/or commercial centers):
1) Yes, sidewalks access residential and/or commercial centers located within half a mile or less **(0 points)**
2) Yes, sidewalks access residential and/or commercial centers located within one mile or less **(0 points)**
3) Yes, sidewalks access residential and/or commercial centers located greater than one mile **(1 point)**
4) No **(1 point)**

Policies

21) Does your center have a wellness policy that addresses nutrition and physical activity (USDA 2004):
1) Yes, center policy. **(1 point)**
2) Yes, county policy. **(1 point)**
3) Yes, state policy. **(1 point)**
4) No. **(0 points)**

22) Does your center have a nutrition or health advisory council that addresses issue and concerns related to nutritional or physical activity (USDA 2004):
1) Yes **(0 points)**
2) No **(1 point)**

23) Are participants allowed to bring personal food into the center (CDC 2006):
1) Yes **(1 point)**
2) No **(0 points)**

24) Are participants allowed to bring communal food into the center:
1) Yes **(1 point)**
2) No **(0 points)**

25) Does the center accept food donations from outside agencies or individuals:
1) Yes. If yes, from <u>who</u> and <u>what</u> types of food are brought: **(1 point)**

2) No **(0 points)**

26) In the past 12 months, how often have you accepted food donations from outside agencies or individuals:
1) Less than once per month **(0 points)**
2) Monthly **(1 point)**

3) Weekly **(1 point)**
4) Daily **(1 point)**
5) Never **(0 points)**

27) How often does the center organize an off site trip that includes a meal:
7) Less than once per month **(0 points)**
8) Monthly **(1 point)**
9) Weekly **(1 point)**
10) Daily **(1 point)**
11) Never **(0 points)**
12) If yes, please describe:

28) How do you make participants aware of the resources or services that your center provides:
1) Flyers **(0 points if yes, 1 point if no)**
2) Post information in the center **(0 points if yes, 1 point if no)**
3) Post information online **(0 points if yes, 1 point if no)**
4) Word of mouth **(0 points if yes, 1 point if no)**
5) Other (please specify): **(0 points if yes, 1 point if no)**

Resources

29) Do you know how to access a Registered Dietitian in the community to provide nutritional counseling for participants:
1) Yes **(0 points)**
2) No **(1 point)**

30) How frequently is a Registered Dietitian available for counseling participants:
1) Less than once per month **(1 point)**
2) Monthly **(0 points)**
3) Weekly **(0 points)**
4) Daily **(0 points)**
5) Never **(1 point)**

31) How frequently are any other nutritional counseling opportunities available:
1) Less than once per month **(1 point)**
2) Monthly **(0 points)**
3) Weekly **(0 points)**
4) Daily **(0 points)**
5) Never **(1 point)**

32) How frequently are any other medical professionals available for counseling:
1) Please specify type of medical professional:
2) Less than once per month **(1 point)**
3) Monthly **(0 points)**
4) Weekly **(0 points)**
5) Daily **(0 points)**
6) Never **(1 point)**

33) How frequently are services available to counsel participants on government program eligibility, such as Medicaid, SNAP (food stamps), or other assistance programs:
1) Less than once per month **(1 point)**

2) Monthly **(0 points)**
3) Weekly **(0 points)**
4) Daily **(0 points)**
5) Never **(1 point)**

34) Are there fees for these consultation services:
1) Yes **(1 point)**
2) No **(0 points)**

35) Does your center have access to exercise equipment and facilities:
1) Yes, we have access to exercise equipment and facilities in our center **(0 points if yes, 1 if no)**
2) Yes, we have access to exercise equipment and facilities outside our center (i.e., participants bussed to YMCA or other, separate location) **(0 points if yes, 1 if no)**
3) We have limited access to exercise equipment, including small scale items (i.e., jump ropes, resistance bands, or hand weights), but no large weight equipment or cardio machines **(0 points if yes, 1 if no)**
4) No, we do not have access to exercise equipment or facilities. **(0 points if yes, 1 if no)**

36) Do you charge a fee to access these services:
1) Yes, on a fee per use basis. **(1 point)**
2) Yes, on a subscription (such as monthly or weekly) basis. **(1 point)**
3) No, we do not charge a fee. **(0 points)**
4) No, we do not have access to exercise equipment or facilities. **(0 points)**

37) In the past 12 months, what sources of funding has your center received for any programs related to nutrition (including meals) and physical activity:
1) City **(0 points if yes, 1 point if no)**
2) County **(0 points if yes, 1 point if no)**
3) State **(0 points if yes, 1 point if no)**
4) Federal **(0 points if yes, 1 point if no)**
5) Non-profit organizations or outside agencies **(0 points if yes, 1 point if no)**
6) Private donations **(0 points if yes, 1 point if no)**

38) In the past 12 months, have you received funding for any of the following:
1) Nutrition education **(0 points if yes, 1 point if no)**
2) Congregate meals **(0 points if yes, 1 point if no)**
3) Home delivered meals **(0 points if yes, 1 point if no)**
4) Physical activity education **(0 points if yes, 1 point if no)**
5) Physical activity equipment **(0 points if yes, 1 point if no)**
6) Caregiver education/support **(0 points if yes, 1 point if no)**
7) Transportation **(0 points if yes, 1 point if no)**
8) Other (please specify): **(0 points if yes, 1 point if no)**

39) What programs does your center provide to participants that promote health and wellness (i.e., meal programs, Retired and Senior Volunteer Program, exercise classes):

(no points scored for this question)

Staff

40) How many staff members are employed by this center full time (last fiscal year): **(no points scored for this question)**

41) How many staff members are employed by this center part time (last fiscal year): **(no points scored for this question)**

42) How many unpaid volunteers assist with meal programs (home delivery or congregate) (last fiscal year): **(no points scored for this question)**

43) In the past 12 months, have you or anyone on your staff engaged in the following activities (USDA 2004):
    1) Provided participants or prospective participants with information about the congregate meal program **(0 points if yes, 1 point if no)**
    2) Participated in a nutrition education activity in the center **(0 points if yes, 1 point if no)**
    3) Conducted a nutrition education activity in the center **(0 points if yes, 1 point if no)**
    4) Other (please specify): **(0 points if yes, 1 point if no)**
    5) None

44) Do you use any of the following ways to get feedback from participants about the congregate meal program (USDA 2004):
    1) Surveys **(0 points if yes, 1 point if no)**
    2) Suggestion box **(0 points if yes, 1 point if no)**
    3) Bulletin board **(0 points if yes, 1 point if no)**
    4) Web page **(0 points if yes, 1 point if no)**
    5) Advisory council **(0 points if yes, 1 point if no)**
    6) Other (please specify): **(0 points if yes, 1 point if no)**
    7) None

45) During the past 12 months, have the senior center staff worked on food service or nutrition activities with staff or members from (CDC 2006):
    1) County cooperative extension office **(0 points if yes, 1 point if no)**
    2) Local health department **(0 points if yes, 1 point if no)**
    3) Local hospital **(0 points if yes, 1 point if no)**
    4) Local mental health or social service agency **(0 points if yes, 1 point if no)**
    5) Health organization such as the American Heart Association or American Cancer Society **(0 points if yes, 1 point if no)**
    6) A food commodity organization such as the Dairy Council **(0 points if yes, 1 point if no)**
    7) A local college or university **(0 points if yes, 1 point if no)**
    8) A local business **(0 points if yes, 1 point if no)**

46) During the past 12 months, have any staff members received development on any of the following topics (CDC 2006)
    1) Menu planning for healthy meals **(0 points if yes, 1 point if no)**
    2) Cultural diversity in meal planning **(0 points if yes, 1 point if no)**
    3) Implementing Dietary Guidelines for Americans **(0 points if yes, 1 point if no)**
    4) Selecting and ordering food **(0 points if yes, 1 point if no)**
    5) Health food preparation methods **(0 points if yes, 1 point if no)**
    6) Competitive food policies to create a healthy food environment **(0 points if yes, 1 point if no)**

Interviewee (no points scored for this section)

47) How long have you been in your current position (USDA 2004)**:**
48) What is the highest grade or year of schooling you have completed (USDA 2004):
    1) Less than high school
    2) High school
    3) Some college, no degree
    4) Associate's degree
    5) Bachelor's degree
    6) Graduate degree

49) What recommendations do you have on how to improve the meal service program at your center (USDA 2004):

50) What are the greatest challenges your center faces to providing a healthy environment for older adults:

APPENDIX F

ENVIRONMENTAL ANALYSIS PART II – OBSERVATIONAL ASSESSMENT (WITH POINTS)

To be administered by a University of Georgia student or staff person.

This person will ask the director for permission to take pictures of foods, beverages, kitchen, physical activity equipment, and signage (not people) to be used for educational purposes only (such as when summarizing the findings of this study to students and staff in educational settings).
Who asked? _____
Permission given? Circle one: No Yes

Menu

1) Are any of the following beverages offered with meal service (NEMS-R):
    1) Water **(0 points if yes, 1 point if no)**
    2) Diet or reduced calorie beverage **(0 points if yes, 1 point if no)**
    3) 100% fruit juice **(0 points if yes, 1 point if no)**
    4) 1% or non-fat milk **(0 points if yes, 1 point if no)**

2) Are any of the following foods offered with meal service (NEMS-R):
    1) Fruit without added sugar **(0 points if yes, 1 point if no)**
    2) Non-fried vegetables without sauce or toppings **(0 points if yes, 1 point if no)**
    3) Whole grain bread **(0 points if yes, 1 point if no)**
    4) Baked potato chips **(0 points if yes, 1 point if no)**
    5) Other (e.g., condiments, such as salt packets, sugar, ketchup, other _____) **(0 points if yes, 1 point if no)**

3) Is nutrition information for the day's meal available (NEMS-R):
    1) Yes, menus are available. **(0 points)**
    2) Yes, calorie and/or macronutrient content information is available. **(0 points)**
    3) No **(1 point)**

Environment (remember to record total number of seats: _____)

4) How many senior center participants are present**: (0 points if 0-50% capacity of total seats, 1 point if 51% or greater)**

5) How many senior center participants are eating food, excluding the congregate meal that is being served if applicable: **(0 points if 0-50% of participants, 1 point if 51% or greater)**

6) How many senior center participants are drinking non-water beverages:
    (0 points if 0-50% of participants, 1 point if 51% or greater)
7) How many senior center participants are drinking water:
    (1 points if 0-50% of participants, 0 points if 51% or greater)
8) Is nutrition signage promoting healthy habits displayed (NEMS-R):
    1) Yes, minimal signage is displayed. **(.5 points)**
    2) Yes, moderate or abundant signage is displayed. **(0 points)**
    3) No, no visible signage displayed. **(1 point)**

9) Is signage promoting physical activity displayed:
    1) Yes, minimal signage is displayed. **(.5 points)**
    2) Yes, moderate or abundant signage is displayed. **(0 points)**
    3) No, no visible signage is displayed. **(1 point)**

10) Is food/beverage available for consumption beyond the standard meal service, excluding vending machines:
    1) Yes **(1 point)**
        (a) If yes, what type of food/beverage is available:

    2) No **(0 points)**

11) Is a television present:
    1) Yes, in eating area. **(1 point)**
    2) Yes, near but not in eating area (within 20 feet). **(1 point)**
    3) Yes, in other location. **(0 points)**

        (a) If yes, how many:

    4) No, not present. **(0 points)**

12) Is exercise equipment present:
    1) Yes **(0 points)**
        (a) If yes, what type (i.e., treadmill, hand weights, jump rope, resistance bands):

    2) No **(1 point)**

13) Are participants engaged in any physical activities:
    1) Yes **(0 points)**
        (a) If yes, what type:

    2) No **(1 point)**

Vending Machine Audit

14) Are vending machines present (USDA 2004):
    1) Yes, in eating area. **(1 point)**
    2) Yes, near but not in eating area (within 20 feet). **(1 point)**
    3) Yes, in other location. **(0 points)**
    4) No, not present. **(0 points)**

15) Please record the number of vending machines present: **(0 points if none, 1 point if 1, 2 if 2, etc)**

16) Place a circle around the number corresponding to each food and/or beverage sold in the vending machine (USDA 2004):

17) Beverages:
    1) Carbonated Sweetened Soft Drink **(1 point per item)**
    2) Carbonated Diet Soft Drink **(0 if yes, 1 if no)**

3) Juice (100%) **(0 if yes, 1 if no)**
4) Juice beverage (i.e., sweetened fruit blends, Hi-C, Lemonade) **(1 point per item)**
5) Water (unsweetened) **(0 if yes, 1 if no)**
6) Coffee **(0 if yes, 1 if no)**
7) Tea **(0 if yes, 1 if no)**
8) Dairy (low fat) **(0 if yes, 1 if no)**
9) Dairy (full fat, e.g., whole milk) **(1 point per item)**
10) Energy and Sports Drinks (i.e., Gatorade, Red Bull, Monster) **(1 point per item)**
11) Other (please specify):

Foods:

18) Baked Goods/Dessert
    1) Cake type (i.e., brownies, cupcakes, Twinkies) **(1 point per item)**
    2) Cake type, reduced fat or low fat **(0 if yes, 1 if no)**
    3) Cookies **(1 point per item)**
    4) Cookies, reduced or low fat **(0 if yes, 1 if no)**
    5) Pastries (i.e., pies, turnovers) **(1 point per item)**
    6) Other (please specify):

19) Bread or Grain Products
    1) Muffins **(1 point per item)**
    2) Muffins, reduced fat or low fat **(0 if yes, 1 if no)**
    3) Granola bars **(1 point per item)**
    4) Granola bars, reduced fat or low fat **(0 if yes, 1 if no)**
    5) Pretzels **(1 point per item)**
    6) Crackers/cracker sandwiches **(1 point per item)**
    7) Cereal or cereal bars **(0 if yes, 1 if no)**
    8) Other (please specify):

20) Fruit
    1) Canned fruit **(0 if yes, 1 if no)**
    2) Fresh fruit **(0 if yes, 1 if no)**
    3) Dried fruit **(0 if yes, 1 if no)**

21) Snacks
    1) Chips (i.e., corn, potato, puffed cheese, tortilla) **(1 point per item)**
    2) Chips, reduced fat or low fat **(0 if yes, 1 if no)**
    3) Nuts and seeds (i.e., almonds, peanuts, sunflower seeds, trail mix) **(0 if yes, 1 if no)**
    4) Popcorn, pre-popped **(1 point per item)**
    5) Popcorn, unpopped **(1 point per item)**
    6) Meat snacks (i.e., jerky, pork rinds) **(1 point per item)**
    7) Candy with chocolate (i.e, candy bars, M&Ms) **(1 point per item)**
    8) Candy without chocolate (i.e., Skittles, Starburst, gummy candy, or fruit chews) **(1 point per item)**
    9) Hard candies (i.e., cough drops, Lifesavers) **(0 if yes, 1 if no)**
    10) Gum **(1 point per item)**
    11) Gum, sugarfree **(0 if yes, 1 if no)**
    12) Energy bars (i.e., Balance Bar, Luna Bar, Power Bar) **(0 if yes, 1 if no)**
    13) Other (please specify):

22) Other
    1) Please specify: