

Implementing Community-Based Nutrition and Physical Activity
Programs that Promote Healthy Aging

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Abstract

Poor nutrition, such as the lack of adequate consumption of fruits and vegetables, and physical inactivity are important public health concerns as the United States (US) adult population continues to age and live longer. According to The Centers for Disease Control and Prevention (CDC), by 2030 the proportion of the US population aged 65 years or older will double to approximately 71 million (The Centers for Disease Control and Prevention [CDC], 2008). With this projected population growth it is imperative to address ways to improve and sustain the health of older adults in an effort to reduce healthcare spending. The Centers for Disease Control and The Merck Company Foundation (2007) estimate that by 2030 the cost of healthcare spending for older adults will increase by 25%. Healthcare spending is associated with the prevalence of chronic disease. Approximately 80% of the older adult population has at least one chronic disease, such as hypertension, type 2 diabetes, cancer and heart disease, and 50% of this population has at least two chronic health conditions (CDC, 2008).

A healthful diet and an active lifestyle are considered major determinants of healthy aging (American Dietetic Association, 2005). The purpose of this paper is to identify evidence-based guidelines and best practices for implementing community-based nutrition and physical activity programs which target older adults throughout North Carolina. A review of the current published literature and a social marketing plan, written by the North Carolina Cooperative Extension Service (NCCES), will be used to develop recommendations for implementing community-based nutrition and physical activity programs that promote healthy aging.

Introduction

Aging in the United States

It is projected that by 2030 the proportion of the United States (US) population aged 65 years or older will double to approximately 71 million older adults, accounting for 20% of the US population (The Centers for Disease Control and Prevention [CDC], 2008). This increased proportion of older adults is a result of two factors, longer life spans and aging baby boomers. The population of baby boomers includes individuals born between 1946 and 1964 (American Hospital Association, 2007). Since life expectancy has continued to increase over the past century, the average life span can be expected to reach or exceed 100 years in the twenty-first century (Dwyer, 2006).

The average age at the onset of chronic disease has not increased at a rate similar to life expectancy. Research conducted by Dwyer (2006) found that the average American age 75 years old may have only four additional years of active health followed by more than seven years of disability. The cause of disability in the older adult population is often related to chronic health problems. Many older Americans have one or more chronic health conditions (Administration on Aging [AOA], 2008). The most frequently occurring conditions in this population during 2004 to 2005 were hypertension (48%), diagnosed arthritis (47%), all types of heart disease (32%), cancer (20%), type 2 diabetes (16%), and sinusitis 14% (AOA, 2008).

Poor nutrition, such as the lack of adequate consumption of fruits and vegetables, and physical inactivity are public health priorities which significantly impact the quality of life for older adults. Since a healthful diet and an active lifestyle are considered major determinants of healthy aging, nutrition and physical activity programs are essential to health promotion targeting older adults (American Dietetic Association, 2005). Positive lifestyle choices based on

healthful nutrition and physical activity benefit older adults by extending life, reducing the likelihood of physical disability, supporting good mental health and cognitive function, and reducing healthcare costs (Stepnick & Whitelaw, 2006). A diet high in fruits and vegetables is associated with a lower risk of several chronic diseases, such as type 2 diabetes, heart disease, and some cancers (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2009). Research indicates that maintaining a healthy weight and engaging in some level of physical activity are two predictors of healthy aging (Hartman-Stein & Potkanowicz, 2003). The U.S. Department of Health and Human Services (2008) reports strong evidence that supports the health benefits associated with regular physical activity including lower risk of early death, coronary heart disease, stroke, high blood pressure, adverse blood lipid profile, type 2 diabetes, metabolic syndrome, colon cancer, and breast cancer. Regular physical activity has been shown to prevent weight gain and falls, and promote better cognitive function (U.S. Department of Health and Human Services [USDHHS], 2008). Moderate to strong evidence supports other benefits of physical activity, such as better functional health and reduced abdominal obesity (USDHHS, 2008).

Good nutrition is important to healthy aging and has been documented for its effectiveness in preventing the progression of type 2 diabetes, hypertension, cardiovascular disease, and cancer (National Council on Aging, 2006). Dietary intake is associated with mortality from heart disease, chronic lower respiratory diseases, type 2 diabetes, influenza, and pneumonia (American Dietetic Association, 2005). During 2000, these were the top five leading causes of death for individuals aged 65 years and older (American Dietetic Association, 2005).

The costs of providing healthcare for an older American are three to five times more than the costs for someone younger than 65 years of age (CDC & The Merck Company Foundation,

2007). Healthcare spending is associated with the prevalence of chronic disease, where approximately 80% of the older adult population has at least one chronic disease, such as hypertension, type 2 diabetes, cancer and heart disease, and 50% has at least two chronic diseases (CDC, 2008). Currently, the cost of treating chronic disease is almost 95% of the total health care expenditure among older Americans (CDC and Prevention & The Merck Company Foundation, 2007). As a result, it is estimated that by 2030 the cost of healthcare spending for older adults will increase by 25% unless improving and maintaining the health of older adults is achieved (CDC & The Merck Company Foundation, 2007).

Additionally, overweight and obesity continue to be a growing health concern for older Americans, particularly the baby boomers. The American Hospital Association (2007) projects that by 2030, more than one out of every three baby boomers will be considered obese. As a result, over 21 million older adults will be considered obese, including 93 million baby boomers (American Hospital Association, 2007). The prevalence of medical complications associated with obesity increases with age and includes hypertension, type 2 diabetes, cardiovascular disease, and osteoarthritis (Villareal, 2005). Obesity also results in functional limitations that often lead to an increase in dependency for assistance with activities of daily living (Chernoff, 2001). Leveille, Wee, and Iezzoni (2005) found that many baby boomers were more obese and became so at younger ages than their predecessors. As a result, strategies designed to address overweight and obesity must be implemented as part of the prevention and treatment of chronic disease. Such a comprehensively designed program will help older adults to maintain their independence in activities of daily living, help to sustain quality of life, and ultimately control healthcare expenditures.

Aging in North Carolina

Nutrition and physical activity programs that target older adults are needed throughout North Carolina (NC), as evidenced by the 18.9% percent increase in the population of adults ages 65 and older, from 1997 to 2007 (Administration on Aging, 2008). Within the NC older adult population, 77.8% (ages 55-64) and 75.8% (ages 65 and older) consumed less than 5 or more daily servings of fruits and vegetables. These rates are higher than the national rate of 75.1% (ages 55-64) and 71.3% (ages 65 and older) (CDC, 2007). It is estimated that 58.6% of NC adults (ages 55-64) and 64% (ages 65 and older) do not achieve the minimum of 30 minutes of daily physical activity (CDC, 2007). This rate is higher than the national rate, in which 50.8% of adult Americans are not physically active at least 30 minutes daily (CDC, 2007). North Carolina now ranks 33rd in the US with the highest rate of obese older adults (North Carolina Division of Public Health, n.d.). Within the state, 74.4% of adults (ages 55-64) and 63.8% (ages 65 and older) are either overweight or obese (CDC, 2007). North Carolina's rate is now higher in comparison to the national rate, which is 63% of all adults are overweight or obese (CDC, 2007).

Rising healthcare expenditures is a major public health priority and concern for NC (Be Active North Carolina, 2008). *Be Active North Carolina* (2008) reported a cost of \$57.36 billion in medical care, prescription drug care, and lost productivity during 2006 related to eight health risk factors. Included in the eight health risk factors were a diet low in fruits and vegetables, excess weight, physical inactivity, high cholesterol, hypertension, tobacco use, type 2 diabetes, and depression (Be Active North Carolina, 2008). It is projected that the 2011 healthcare costs will further escalate to \$75.64 billion - a cumulative five-year increase of 31.8% (Be Active North Carolina, 2008).

Literature Review

Barriers to Fruit and Vegetable Consumption

Older adults' dietary behaviors, including fruit and vegetable consumption, are influenced by many socio-demographic factors. For example, fruit and vegetable intake has been shown to vary by individual race and ethnicity. CDC and The Merck Company Foundation (2007) reported that approximately 40% of Asian/Pacific Islander older adults met the 5-a-day recommendation, compared with only 31% of non-Hispanic whites, 26% of Hispanics, 25% of non-Hispanic blacks, and 24% of Native Americans (CDC & The Merck Company Foundation, 2007). The *Healthy Eating Index* (CDC, 2008) reported that non-Hispanic white males and females had higher fruit and vegetable intake than non-Hispanic black males and females.

Age is also a significant demographic factor influencing fruit and vegetable consumption in older adults. Research (CDC, 2008; Sahyoun, 2006) found that the younger the age category, the lower the frequency of fruit and vegetable intake. Adults ages 65 and older have been reported to eat more servings of fruits and vegetables compared to younger adults (CDC & The Merck Foundation, 2007); however, 71.3% of adults ages 65 and older consumed less than 5 or more daily servings of fruits and vegetables (CDC, 2007).

Along with age, gender and education level are considered determinants of fruit and vegetable consumption. Sahyoun (2006) reported that women typically consume more fruits and vegetables than men. The *Healthy Eating Index* (CDC, 2008) found that men and women (ages 60 years and older) with a high school diploma or higher education had a higher intake of fruits and vegetables.

Existing health, lifestyle, and economic variables also influence fruit and vegetable intake among older adults. Health variables, including disease (CDC, 2008), physical limitations

(CDC, 2008), poor dental health (CDC, 2008; Sahyoun, 2006), poor self-reported health (CDC, 2008; Sahyoun, 2006), medication (CDC, 2008), and obesity (Sahyoun, 2006) have been found to be associated with a lower intake of fruits and vegetables among older adults. Lifestyle factors such as the use of vitamin/mineral supplements, being physically active, and not smoking have been associated with more frequent consumption of fruits and vegetables (Sahyoun, 2006). Other lifestyle factors such as the lack of transportation (CDC, 2008) and social isolation (Sahyoun, 2006) are associated with a lower intake of fruits and vegetables among older adults. Economic variables including limited income (American Dietetic Association, 2005; CDC, 2008) and self-reported food security were found to be associated with lower intake of fruits and vegetables within this population (American Dietetic Association, 2005; CDC, 2008).

Barriers to Physical Activity

Determinants of physical activity behavior also include socio-demographic variables, such as age, education, gender and race as reported in CDC's *US Physical Activity Statistics* (2007). Data from this report show older adults (ages 65 and older) had the lowest percentage of individuals who met the daily recommendations for physical activity, as well as the lowest percentage of leisure-time physical activity, when compared to other age groups. Examples of leisure-time activities supported by the CDC (2007) include any physical activities or exercises such as running, calisthenics, golf, gardening, or walking. Individuals with the least amount of education ranked the lowest in meeting the daily recommendations for physical activity and had the lowest percentage of leisure-time physical activity compared to other groups (CDC, 2007b). Women compared to men had the lowest percentage of individuals who met the daily recommendations for physical activity and had the lowest percentage of leisure-time physical activity (CDC, 2007b). African Americans and Hispanics not only had the lowest percentage of

individuals who met the daily recommendations for physical activity, but also the lowest percentage of leisure-time physical activity compared to Caucasians (CDC, 2007b).

Additional factors considered to be barriers to leisure-time physical activity among older adults include perceived poor health, lack of time, and symptoms of physical disabilities, such as pain and fear of pain (Brawley, Rejeski, & King, 2003). Similarly, Brawley et al. (2003) found that long-term illness, injury, and the lack of regulatory skills (i.e., goal setting, self-monitoring, self-evaluation and corrective behavior to move toward personal goals) were barriers to physical activity among older adults. Misconceptions about the level of intensity of physical activity and the lack of understanding of the benefits of regular, moderate physical activity were identified as potential barriers to physical activity within this age group (Brawley et al., 2003). Furthermore, Brownson, Baker, Housemann, et al. (2001) found that personal barriers to physical activity within the older adult population and across gender and income groups included lack of time, feeling too tired, obtaining enough physical activity at one's job, and lack of motivation.

Environmental factors related to weather, transportation, and personal safety concerns are considered determinants of physical activity within the population of older adults (American Dietetic Association, 2005). Often communities lack properly designed or maintained infrastructure, including poorly maintained sidewalks, lack of safe walking areas, limited parks and recreation areas, lack of security and upkeep of parks and recreation centers, and lack affordable indoor physical activity options for residents (CDC & The Merck Company Foundation, 2007). In addition, Brownson, Baker, Housemann, et al. (2001) found that the presence of sidewalks, enjoyable scenery, heavy traffic, and hills were positively associated with physical activity.

Criteria for Evidence-based Guidelines

The following criteria were used to identify and evaluate current guidelines pertinent to implementing community-based nutrition and physical activity programs that promote healthy aging. The first criterion was the use of national indicators of health in older adults. The second criterion was the use of evidence-based guidelines and existing programs. The third criterion was based on the use of behavior change models. The fourth criterion was the use of state-level nutrition and physical activity guidelines.

The State of Aging and Health in America 2007

Supported by The Merck Company Foundation and produced with many partner organizations, *The State of Aging and Health in America 2007* (CDC & The Merck Company Foundation, 2007) is the fifth volume of a series that provides a snapshot of health related to aging in the US. This report presents findings on 15 indicators of health in older adults, with 11 of the indicators being identified in the Healthy People 2010 objectives. Two of the 11 indicators, which have not been met by all states, are related to physical activity and nutrition. The first unmet indicator is the lack of leisure time physical activity in the past month, with no states meeting the 2010 target. Eating at least five fruits and vegetables daily is the second unmet indicator, with no states meeting the 2010 target. (CDC & The Merck Company Foundation, 2007)

Recommendations outlined in *The State of Aging and Health in America 2007* (CDC & The Merck Company Foundation, 2007) includes two action steps relevant to nutrition and physical activity. The first recommendation is to address health disparities among older adults, particularly in racial and ethnic minority populations. This action step is important since the adult population is living longer and the proportion of minority groups continues to grow.

Promoting changes to the physical environment as a means to encourage physical activity is the second recommendation outlined in *The State of Aging and Health in America* (CDC & The Merck Company Foundation, 2007). For example, strategies related to the physical environment may include repairing sidewalks, ensuring sidewalks are available, and protecting older adults from crime. Additionally, offering programs that encourage leisure-time activities is encouraged (CDC & The Merck Company Foundation, 2007).

A New Vision of Aging: Helping Older Adults Make Healthier Choices

As an independent nonprofit organization that works to translate health research into policy and practice, the Center for the Advancement of Health, presents four evidence-based strategies for promoting health in “*A New Vision of Aging: Helping Older Adults Make Healthier Choices*” (Stepnick & Whitelaw, 2006). The first strategy is to motivate behavior change, which includes intensive educational programs that can accommodate individual differences in behaviors and risks (Stepnick & Whitelaw, 2006). The second strategy is to keep participants engaged by supporting the use of continuing motivational techniques such as self-monitoring, personal communication with healthcare providers, peer support, and regular reminders to encourage older adults to maintain healthy behaviors (Stepnick & Whitelaw, 2006). The third strategy is to provide access to community programs and resources as a means to implementing health behaviors. Strategy four is to tailor interventions to individual needs and racial and ethnic diversity (Stepnick & Whitelaw, 2006).

Such evidence-based strategies are implemented throughout four model health programs of the National Council on Aging (NCOA) (Stepnick & Whitelaw, 2006). The NCOA Model Programs Project utilized regional advisory panels to develop and test programs, which resulted in four evidence-based model health programs (National Council on Aging [NCOA], 2006). The

model health programs included physical activity, depression, diabetes self-management, and nutrition (NCOA, 2006). These programs were designed to improve the health of older adults and be readily implemented by community-based aging services organizations (NCOA, 2006). All four NCOA model health programs promote the older adult's central role in managing his/her health and recognizing the importance of health promotion and prevention. Additionally, the programs provide older adults with the skills of goal setting, action planning, and problem solving. Participants are encouraged to provide social support to group members through discussion and problem solving activities. The concept of health promotion is discussed instead of illness and disability. Two examples of NCOA's evidence-based programs specific to nutrition and physical activity include *Healthy Eating for Successful Living in Older Adults*TM and *Healthy Moves for Aging Well*TM (NCOA, 2006).

*Healthy Eating for Successful Living in Older Adults*TM

*Healthy Eating for Successful Living in Older Adults*TM (NCOA, 2006) is a community-based program which targets adults ages 60 and older. The regional advisory panel identified evidence-based interventions effective for community-based programs to improve the nutritional status of older adults (NCOA, 2006). Program components that were associated with the more successful interventions were incorporated into the Health Eating program included: limiting messages, using hands-on methods, having participants be actively involved, and use lay leaders as facilitators. The Healthy Eating program was developed and piloted at three agencies over a six-month period with over 100 individuals completing the pilot program (NCOA, 2006). As a result of the program, participants reported healthier eating habits and many individuals reported a reduction in blood pressure and cholesterol, along with weight loss or weight maintenance (NCOA, 2006). Participants associated the positive impact of the program to the support

received from their small group. The use of lay leaders was considered to be an overall strength of the program as viewed by participants (NCOA, 2006).

Sessions conducted throughout the *Healthy Eating for Successful Living in Older AdultsTM* (NCOA, 2006) program are highly participatory and include education, hands-on activities, social support, and resource connections. Participants must be cognitively alert, ambulatory, and be interested in learning about healthy eating and physical activity. The program consists of six sessions that meet weekly for 2-1/2 hours. A registered dietitian or nutritionist plays a key supportive role throughout the program. Class size is small, typically 8 to 12 participants, and uses facilitated active group participation. The program includes hands-on learning methods to engage participants and opportunities for social interaction. Peer leaders utilize communication and education strategies with limited messages to enhance awareness and motivation. Personalized counseling and education helps to address specific concerns of the participants. Participants track their progress and record biochemical markers, weight changes, and ability to do activities.

Healthy Moves for Aging WellTM

As a physical activity program, *Healthy Moves for Aging WellTM* (NCOA, 2004) is an evidence-based model program developed through the Partners in Care Foundation and the Los Angeles Regional Advisory Panel. Through in-home instruction, this research-based program is designed to increase the physical activity among frail, low-income elderly adults in the California Multipurpose Senior Services Program (NCOA, 2004). *Healthy Moves for Aging WellTM* provides specific interventions to promote independence, slow the progression of chronic disease and disability, and better utilize geriatric care management programs (NCOA, 2004).

Healthy Moves for Aging Well™ is an integrated model, consisting of two evidence-based program components. The first evidence-based component is a physical activity intervention that is modeled and adapted from The Senior Fitness Test, a standardized test used to assess the fitness levels of older adults (Wieckowski & Simmons, 2006). The second evidence-based component is a lifestyle change counseling method, called Brief Negotiation, developed by behavior change experts Prochaska and DiClemente (Wieckowski & Simmons, 2006).

Healthy Moves for Aging Well™ (NCOA, 2004) utilizes the Transtheoretical Model to enhance behavior change among participants. The Transtheoretical Model uses the concept that behavior change is a process and as an individual attempts to change behavior, he or she moves through five stages: precontemplation, contemplation, preparation, action, and maintenance (National Cancer Institute, 2005). Brawley, Rejeski, and King (2003) found that a variety of physical activity programs have utilized the Transtheoretical Model.

Healthy Moves for Aging Well™ is designed for individuals ages 65 years and older, who participate in a care management program, need assistance with two to four activities of daily living, and have the willingness to participate (NCOA, 2004). If the client lives alone or has no caregiver available, the individual must be able to stand unassisted and exercise safely alone (NCOA, 2004). Additionally, participants must have the cognitive status sufficient to follow directions (NCOA, 2004).

Care managers and volunteer peer coaches work to assess and monitor participants as well as teach safe exercises throughout *Healthy Moves for Aging Well™* (NCOA, 2004). Trained-volunteer coaches contact participants on a weekly basis to conduct telephone coaching and monitoring (NCOA, 2004). Clients are formally reassessed at six-month intervals, as well as

during their regularly scheduled appointments with care managers (NCOA, 2004). After a three year pilot program, 76.2% of the 49 clients who had completed *Healthy Moves for Aging Well*TM reported that they were “very or somewhat likely” to continue the in-home exercise program after six months of participation (Wieckowski & Simmons, 2006).

Behavior Change Models

Models of behavior change have effectively been used to develop nutrition and physical activity programs designed for older adults. Sahyoun, Pratt, and Anderson (2004) summarized the components of nutrition education programs that successfully helped develop behavior changes among older adults. Features included limiting to one or two educational messages, providing hands-on activities, incentives, cues, access to health professionals, and using appropriate theories of behavior change (Sahyoun et al., 2004). Overall, Sahyoun et al. (2004) found that increased nutrition knowledge was the most successful outcome reported, whereas behavior change and/or positive biochemical or anthropometric outcomes were variable.

Based on research findings, Sahyoun, Pratt, and Anderson (2004) recommended a combination of individual-level and environmental-level interventions. Individual-level components included: nutrition messages that are limited in number, simple, targeted, practical, and reinforced; the use of incentives; regular contact with health professionals; hands-on activities; the use of an interactive process (Sahyoun et al., 2004). Behavior modification strategies should be based on theoretical models (Sahyoun, et al., 2004). Participants should be actively involved in determining and assessing individual goals throughout the intervention (Sahyoun et al., 2004). Sahyoun et al. (2004) also recommended that participants be segmented based on specific health, socioeconomic or other factors, since dietary behaviors are complex and influenced by such individual factors. Environmental-level interventions include

modifications in the social (i.e., family, friends), physical (i.e., availability of walking trail in neighborhood), and community environments that influence how participants make lifestyle decisions (Sahyoun et al., 2004).

Process and outcome evaluation of interventions should be measured to determine if the intervention was delivered and received as intended as well as the desirable outcomes were achieved (Sahyoun, Pratt, & Anderson, 2004). Process measures may include: degree of participant adherence to program, attrition rate, and outreach (Sahyoun et al., 2004). Outcome measures may include: knowledge gained, dietary/behavioral change, biochemical measures, and anthropometric measures (Sahyoun et al., 2004).

Similarly, other nutrition and physical activity programs targeting older adults (Fitzpatrick, 2008; Hendrix, 2008) have been designed using the Health Belief Model (HBM) (National Cancer Institute, 2005). The HBM identifies six main constructs that influence an individual's decision about whether to take action to prevent, screen for, and control illness (National Cancer Institute, 2005). The main components of the HBM include the concepts of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (National Cancer Institute, 2005).

Caldwell et al. (2006) used a Multi-Level Model, an adapted version of the Socio-Ecological Model (McLeroy, Bibeau, Steckler, & Glanz, 1988), to develop *North Carolina's Plan to Prevent Overweight, Obesity and Related Chronic Diseases 2007-2012*. The Socio-Ecological Model illustrates how multiple factors (individual, interpersonal, organizational, community, and society) influence a specific health behavior of an individual (Eat Smart Move More North Carolina [ESMMNC], n.d.). Caldwell et al.'s plan (2006) outlines specific goals,

objectives and strategies, that can be used by individuals, organizations, and public and private partners to help North Carolinians in achieving a healthy weight.

Glanz, Rimer, & Lewis (2002) provided several principles of ecological approaches to health behavior change, which can be found in the Multi-Level Model (ESMMNC, n.d.). The first principle is that multiple levels of factors influence behavior including intrapersonal factors, sociocultural factors, policies, and physical environments. The second principle is that multiple types of environment influence health behavior, such as the natural environment (i.e., weather and climate), built environment (i.e., community design and resources) and technological environment (Glanz, Rimer, & Lewis, 2002). The third principle is that multi-level interventions may be the most effective, instead of targeting only the individual level (Glanz, Rimer, & Lewis, 2002). The fourth principle is that political dynamics (i.e., inadequate enforcement of policies and negative corporate behavior) can limit ecological interventions (Glanz, Rimer, & Lewis, 2002).

Utilizing the Multi-Level Model, Caldwell et al. (2006) include strategies to address individual factors, behavioral settings, sectors of influence, and social norms and values. Organizational, community, social and physical environmental change is addressed through policy and interventions (Caldwell et al., 2006). Caldwell et al.'s plan (2006) outlines key strategies that are relevant to older adults and target each level of the Multi-Level Model as presented in the *North Carolina Blueprint for Changing Policies and Environments in Support of Healthy Eating* (Eat Smart, Move More NC [ESMMNC], n.d.). Individual level strategies include motivating change in individual behavior by increasing knowledge, influencing attitudes or changing beliefs (ESMMNC, n.d.). Interpersonal strategies include recognizing that groups, such as family members or peers, provide social identity and support (ESMMNC, n.d.).

Individual level factors such as age, gender, race, and genetics must be considered in program development for older adults (Caldwell et al., 2006). Behavioral settings include home and family, school, community, work site, and healthcare (Caldwell et al., 2006). Example individual and family level strategies include preparing and eating more meals at home, and establishing physical activity as a daily routine for all family members (Caldwell et al., 2006).

Policy and Environmental Strategies

Policy and environmental strategies designed to create systems-level change occur at the organizational level, community level, and society level (ESMMNC, n.d.). Organizational strategies include changing the policies, practices, and physical environment of an organization to support behavior change (ESMMNC, n.d.). Community strategies include coordinating the efforts of community members (i.e., organizations, community leaders, and citizens) about change and engaging community leaders as role models in promoting healthy eating and physical activity (ESMMNC, n.d.). At the community level, local policy development and enforcement work to support behavior change (ESMMNC, n.d.). Society level strategies include developing and enforcing state policies and laws that can promote health behavior change (ESMMNC, n.d.). The use of media campaigns that promote public awareness of the health need and advocacy for change are also society level approaches (ESMMNC, n.d.).

North Carolina' Plan to Prevent Overweight, Obesity and Related Chronic Diseases 2007-2012

There are four goals identified through the *North Carolina's Plan to Prevent Overweight, Obesity and Related Chronic Diseases 2007-2012* (Caldwell et al., 2006). The first goal is to increase healthy eating and physical activity opportunities for all North Carolinians by fostering supportive policies and environments. The second goal is to increase the percentage of North Carolinians who are at a healthy weight. The third goal is to increase the percentage of North

Carolínians who consume a healthy diet. The fourth goal is to increase the percentage of North Carolina adults and children ages 2 and up who participate in the recommended amounts of physical activity.

North Carolina's Plan to Prevent Overweight, Obesity and Related Chronic Diseases 2007-2012 (Caldwell et al., 2006) is built on national sources of evidence-based strategies. For example, Caldwell et al. (2006) recommended that programs be adapted to each participant's interests, preferences and readiness for change, as well as teach goal setting and self-monitoring skills. This recommendation is supported by the CDC based on strong evidence of the effectiveness in increasing physical activity and improving physical fitness among adults and children (Community Guide Branch, 2009). Other recommendations included the need to build social support for new behaviors and to provide behavioral reinforcement through self-reward and positive self-talk (Caldwell et al., 2006). This recommendation is supported by the CDC based on strong evidence of the effectiveness in increasing physical activity and improving physical fitness among adults and children (Community Guide Branch, 2009b).

Methods

Literature Review

National and state-level population data related to baby boomers and older adults were collected from the AOA, American Association of Retired Persons, American Hospital Association, and the CDC. Nutrition and physical activity goals and objectives specific to NC were reviewed on The Eat Smart, Move More NC website. The CDC and the NCOA websites were reviewed for existing evidence-based physical activity and nutrition programs and public health policy, which target older adults. Appropriate evidence-based programs were further used to identify behavior change models that were associated with community-based nutrition and

physical activity programs targeting older adults, such as the CDC's Community Guide. Current physical activity guidelines for older adults were researched on the US Department of Health and Human Services and the Centers for Disease Control websites. Using the course textbook, *Public Health Leadership: Putting Principles into Practice*, leadership issues were researched.

A review of the current published literature was conducted using PubMed, Google Scholar, and ISI Web of Knowledge to search for journal articles related to barriers to fruit and vegetable consumption and to physical activity. The key words included "nutrition," "physical activity," "nutrition education," "baby boomers," "older adults," "healthcare costs," "determinants," "factors," "fruit and vegetable intake," and "public health policy", and "public health leadership." In addition, articles were identified through cross-references.

Social Marketing Plan

The use of a social marketing plan is recognized by the CDC (2009) as an effective approach to promote health behavior change through program planning and partnership development. By using a social marketing plan, the project team would more fully understand the target audience, enabling the team to develop a curriculum with the greatest potential to change behavior (CDC, 2009). Also, the social marketing planning process addresses the components of the Multi-Level Model (ESMMNC, n.d.) and how they impact individual behavior change. Findings from the literature review were used by the NCCES project team to develop a social marketing plan specific to nutrition and physical activity programs targeting older adults.

Currently, the existing community-based programs developed by the ESMMNC leadership team target young children (four- and five-year-olds), families with children, and individuals desiring weight loss and/or weight maintenance (ESMMNC, 2009). The use of the

social marketing program plan would enable the project team to expand programming to target older adults and to incorporate key behavioral health messages used throughout the Eat Smart, Move More NC programs (ESMMNC, 2009).

The social marketing plan was developed using the My Plan template, a resource available on the *CDCynergy Social Marketing Edition* computer software (RWJ Turning Point Initiative, Academy for Educational Development, CDC, & Oak Ridge Institute for Science and Education, n.d.). The My Plan template consisted of six phases used to complete a social marketing plan. Completed Phase 1 activities included: developed problem description, identified relevant models of behavior change and best practices, formed a strategy team, and conducted a SWOT (strength, weaknesses, opportunities, and threats) analysis. During Phase 2 market research activities were completed such as: defined research questions, developed a market research plan, conducted and analyzed the market research, and summarized the research results. Phase 3 was used to develop a market strategy which included segmentation of target audience, defined current and desired behaviors for each audience segment, written behavior change goals, selected interventions, and written intervention goals. Phase 4 focused on interventions and included activities such as assigned roles for the project team, wrote measurable objectives for each intervention activity, summarized program plan and reviewed factors affecting it, and confirmed plans with stakeholders. Phase 5 focused on program evaluation and identified which program elements to monitor, selected key evaluation questions, determined methods to be used for collecting information, and developed a data analysis and reporting plan. During Phase 6 execution and management components of the selected intervention were identified and an evaluation plan was developed so that intervention activities can be modified as needed.

Baby Boomers Eat Smart, Move More

The literature review and social marketing plan resulted in the development of a community-based curriculum nutrition and physical activity, *Baby Boomers Eat Smart, Move More* (BBESMM) targeting both baby boomers and older adults. Program goals and objectives were adapted from the *North Carolina's Plan to Prevent Overweight, Obesity and Related Chronic Diseases 2007-2012* (Caldwell et al., 2006). Program evaluation tools were developed to measure the success in meeting program goals and objectives.

The BBESMM program is different in several ways compared to other curriculum discussed throughout this paper. First, the program is designed to be taught by public health educators of the NC Cooperative Extension and the NC State Health Department instead of lay leaders. Second, the evaluation tools are designed to collect state level data based on the goals and objectives of the NC plan (Caldwell et al., 2006). Third, BBESMM encourages the development of community-level policy to support the availability of healthy foods and places to be physically active, whereas the featured NCOA programs focus specifically on individual level behavior change. Fourth, BBESMM lessons are based on key health behavior change messages utilized by ESMMNC (ESMMNC, n.d.), instead of focusing on MyPyramid or the US Dietary Guidelines.

The short-term, intermediate and long-term outcome objectives for each of the three intervention goals are as follows:

Goal One: Increase the percentage of participants who consume a healthy diet.	
Short-term Objective 1A:	By December 31, 2011, 25% more participants will consume five or more servings of fruits and vegetables each day.
Long-term Objective 1A:	By December 31, 2014, 35% more participants will consume five or more servings of fruits and vegetables each day.
Short-term Objective 1B:	By December 31, 2011, when eating out, 25% more participants will choose food and beverages generally considered to be healthier. Healthier will be defined by: lower in fat, sugar, calories; fast-food meals once per week or less often and labeled as healthy.
Long-term Objective 1B:	By December 31, 2014, when eating out, 35% more participants will choose food and beverages generally considered to be healthier. Healthier will be defined by: lower in fat, sugar, calories; fast-food meals once per week or less often and labeled as healthy.
Short-term Objective 1C:	By December 31, 2011, 25% fewer participants will eat fast food 3 or more times per week.
Long-term Objective 1C:	By December 31, 2014, 35% fewer participants will eat fast food 3 or more times per week.
Short-term Objective 1D:	By December 31, 2011, 25% more participants will prepare and eat their meal at home 5 times or more per week.
Long-term Objective 1D:	By December 31, 2014, 35% more participants will prepare and eat their meal at home 5 times per week.
Short-term Objective 1E:	By December 31, 2011, 25% fewer participants will consume more than one 12-ounce serving of sugar-sweetened beverages per day.
Long-term Objective 1E:	By December 31, 2014, 35% fewer participants will consume more than one 12-ounce serving of sugar-sweetened beverages per day.

Goal Two: Increase the percentage of participants who participate in the recommended amounts of physical activity.	
Short-term Objective 2A:	By December 31, 2011, 25 percent more participants will get the recommended amounts of physical activity each week and fewer than 25 percent will report no leisure time physical activity.
Long-term Objective 2A	By December 31, 2014, 35 percent more participants will get the recommended amounts of physical activity each week and fewer than 30 will report no leisure time physical activity.

Goal Three: Increase healthy eating and physical activity opportunities for participants by fostering supportive policies and environments.	
Short-term Objective 3A:	By December 31, 2011, at least 1 policy, practice or incentive will be created as a result of the program to promote healthy eating and physical activity within 25% of participating counties.
Long-term Objective 3A:	By December 31, 2014, at least 1 policy, practice or incentive will be created as a result of the program to promote healthy eating and physical activity within 50% of participating counties.
Short-term Objective 3B:	By December 31, 2011, at least one new facility/environment will be identified as a result of the program to promote healthy eating and physical activity within 25% of participating counties.
Long-term Objective 3B:	By December 31, 2014, at least one new facility/environment will be identified as a result of the program to promote healthy eating and physical activity within 50% of participating counties.

The BBESMM curriculum was developed utilizing constructs from both the Health Belief Model (National Cancer Institute, 2005) and the Multi-Level Model (ESMMNC, n.d.) . Relative to the Health Belief Model, the curriculum is designed to increase participants'

perceived susceptibility by discussing risk factors for common chronic diseases specific to the target population, in addition to tailoring information based on the participants' characteristics or behavior. To increase participants' *perceived severity*, explanation is provided on the long-term costs and complications associated with chronic disease. Instruction that includes information on how, where, and when to take action and what potential benefits may result is incorporated into each weekly lesson as means to increase participants' *perceived benefits*. Simple strategies are incorporated throughout the curriculum to help participants make the behavior change, such as eating more fruits and vegetables or being more physically active. Steps to building participants' level of *self-efficacy* include providing hands-on learning activities, such as individual goal setting, reading food labels, and conducting physical activity breaks.

Using the Multi-Level Model (ESMMNC, n.d.) the BBESMM curriculum includes strategies to target the multi-level factors that impact healthy eating and physical activity among older adults. For example, 13 weekly lessons included in the curriculum incorporate individual goal setting, which focuses on specific behaviors related to healthy eating and physical activity. A "family spotlight" is featured in each weekly lesson to provide tips for helping friends and family members to incorporate healthy eating and physical activity into their lifestyles. Through group discussion, simple strategies are provided to promote behavior change, as well as opportunities for social interaction and peer support. Each session also provides an opportunity for participants to participate in a physical activity break. The curriculum promotes local policy change by providing sample healthy foods and physical activity policies that can be implemented at local senior centers, churches, and other community locations.

Conclusions

This research demonstrates the need for a multi-level approach to implementing community-based nutrition and physical activity programs that promote healthy aging. Scientific evidence has been presented to demonstrate how fruit and vegetable consumption and physical activity play an important role in chronic disease management, quality of life, and maintaining independence in activities in daily living. Several of the existing barriers to fruit and vegetable consumption and physical activity have been discussed, further illustrating the need for programs to work beyond the individual-level of behavior change. A discussion of policy and environmental changes demonstrate the need for strategies to create systems-level change that can occur at the organizational level, community level, and society level.

Public health leadership expertise will be needed throughout this multi-level approach to ensure effective program implementation and success of community-based nutrition and physical activity programs (Rowitz, 2003). Coordination and collaboration across organizations, agencies, and levels of government is an important leadership task required for implementing community-based health promotion programs (Marshall & Altpeter, 2005). Collaboration will help enable funding and other resources to be best utilized for healthy aging programs (Navarro et al., 2007). Collaboration of community partners, such as local government, health agencies, and faith-based organizations is essential to changing policies and environments. A focus on policy development (i.e., healthy food options) the built environment (i.e., community design and layout) is essential to sustaining healthy eating and physical activity among older adults.

Community-based programs require public health leadership to enhance community competence (Marshall & Altpeter, 2005). For example, coordination with community coalitions of the NC Healthy Carolinians program can enable public health leaders to work with older adults in defining community needs and developing effective strategies to promote healthy eating

and physical activity (Marshall & Altpeter, 2005). Collaboration of community partners will increase capacity needed to implement community assessments, design programs and services, and to implement community-based programs (Navarro et al., 2007).

Organizational leadership is also needed to support public health employees in implementing community based nutrition and physical activity programs that target older adults. Leadership activities include providing appropriate training, information, and motivation on a continual basis (McGinnis, Williams-Russo, & Knickman, 2002).

Recommendations

NCCES has the potential to play an important role in promoting healthy eating and physical activity among older adults across NC. Since NCCES is located in each 100 counties and the Cherokee Reservation of NC, the organization has the capacity to reach older adults in both rural and urban counties. With the use of the NCCES advisory leadership system, volunteer leaders work on the county, district, and state level to provide community input as well as program promotion for a variety of NCCES programs. For example, advisory members often advocate for policy development in collaboration with NCCES county staff and local elected officials.

Additionally, NCCES can further expand its capacity to provide nutrition and physical activity programs by utilizing other volunteer leaders. For example, the North Carolina Extension and Community Association (NCECA) and the Seniors Supplemental Health Insurance Information Program (SHIIP) are supported by NCCES and consist of both county and state level affiliations. NCECA and SHIIP are comprised of many potential “target audience” members of the BBESMM program, giving them added incentive to support and participate in the BBESMM program.

Research (Sahyoun, et al., 2004) shows that evidence-based educational programs which incorporate appropriate models of behavior change are recommended to help move individuals throughout the process of change. Programs should include strategies that provide the education necessary to motivate individual behavior change and to develop new skills, such as goal-setting and problem-solving skills (Stepnick & Whitelaw, 2006). Social support through group interaction is also an important process of behavior change (Stepnick & Whitelaw, 2006). Program planners also should allow for individual differences and concerns to be addressed among program participants (Stepnick & Whitelaw, 2006).

Public health organizations must be flexible, innovative, and resourceful when implementing programs for older adults in an effort to successfully improve health behaviors related to nutrition and physical activity. Program planning should include input from the target audience in an effort to accommodate scheduling, accessibility, and to help lower as many potential programs barriers as possible. Programs should be adapted as needed based on participant feedback in an effort to accommodate ethnic diversity and other differences among participants (CDC & The Merck Company Foundation, 2007). Activities may include peer support groups, use of email reminders, newsletters, and special health promotion activities (i.e., senior Olympics, healthy foods cook-off, or community walking events) which can be held within a variety of settings (Stepnick & Whitelaw, 2006). Baby boomers may not attend senior centers, which have traditionally been an ideal location for older adults. As a result, program planners will need to gain direct input from target audience members and consider the different values and beliefs of baby boomers compared with older populations (CDC, 2009). Public health educators also need to provide leadership to community programs by modeling healthy eating

and physical activity, while providing a sense of enthusiasm and support among group participants as part.

Providing health programs is not enough to change behavior – communities must work to ensure access to nutrition and physical activity programs and resources, such as safe places to be physically-active and access to low-cost or no-cost fruits and vegetables. As communities across North Carolina continue to grow and become more urbanized, it is important for public health organizations to advocate for policy development that promotes “walkable” communities and physical activity facilities such as walking trails and parks (CDC & The Merck Company Foundation, 2007).

Community-based nutrition and physical activity programs that target older adults can effectively promote healthy behaviors, such as eating more fruits and vegetables and being more physically active. The development of the BBESMM curriculum has been designed based on national recommendations, evidence-based programs, and appropriate models of behavior change as identified throughout this paper. The program incorporates strategies designed to promote behavior change at the individual, community, and environmental level.

Educating both staff and stakeholders on the impact of poor nutrition and physical inactivity on healthcare costs and quality of life among older adults is an essential public health service that NCCES needs to address prior to the implementation of the BBESMM curriculum (Rowitz, 2003). The use of agenda setting activities, such as a mass media campaign, can be effectively used to educate the public and expand programs that address the changing needs across the human life cycle (Rowitz, 2003). For example, mass media messages can be developed in partnership with the Eat Smart, Move More NC (www.eatsmartmovemorenc.com), a state-wide campaign that promotes increased opportunities for healthy eating and physical

activity wherever people live, learn, earn, play and pray. Eat Smart, Move More NC is guided by the work of the Eat Smart, Move More NC Leadership Team, a multi-disciplinary team comprised of statewide partners working together to increase opportunities for healthy eating and physical activity.

Other agenda setting activities should include reporting to staff and stakeholders at both the county and state-level (Rowitz, 2003). County-level stakeholder groups often include clients and individuals served, locally elected officials, NCCES volunteer associations, partnering community organizations, and county Extension staff. State-level stakeholder groups often include elected officials, partnering state organizations, and Extension staff from NC State University and NC A&T University.

There are several potential limitations and challenges that must be addressed in further implementing the BBESMM curriculum. One such challenge is the financial cost to develop the curriculum and to provide training to NCCES educators. Currently no financial resources have been allocated for such a project, especially now that university-level budget reductions continue to be necessary. Because of this, NCCES will need to look for funding sources such as the NCCES Family & Consumer Science Foundation or grant sources.

At this time, much of the NCCES leadership focus remains on continuing budget reductions that impact the organization's capacity to deliver programs, especially new curricula development projects. Because of the state's current economic constraints, NCCES leaders are focused on short-term goals necessary to survive continued budget reductions. Nevertheless, the organization must continue to look ahead in preparation for the future and plan for long-range goals. Now more than ever NCCES must prove its relevancy to the many stakeholders that support the organization including county, state, and federal government. Like other

organizations involved in public health activities, NCCES must continue to find innovative, cost-efficient, and effective ways to provide education to the clients served through North Carolina.

Furthermore, the BBESMM project team can benefit from partnering with other state-wide organizations that are working on similar programs targeting older adults (Marshall & Altpeter, 2005). Such a partnership would increase resource capacity, including both staff expertise and financial resources, as well as promote creative and innovative strategy development for implementing healthy eating and physical activity programs within the target population (Marshall & Altpeter, 2005). It will be vital that trust is established among all organizations within the partnership, especially since the BBESMM curriculum can then serve as a tool for other organizations besides NCCES (Rowitz, 2003).

The emphasis of policy development will be important for developing communities across North Carolina where older adults have opportunities to eat healthy and be physically active (Caldwell et al., 2006). The BBESMM curriculum does address community policy development, which could easily be overlooked as an important component of the program. Since policy development is a core function of public health leadership, this program component must be emphasized and supported (Rowitz, 2003). Programs such as BBESMM can support grass-roots policy development by implementing healthy foods policy or physical activity with sponsoring organizations, in addition to modeling the appropriate behavior change among the organization.

It will be important for the NCCES leadership team to communicate how the BBESMM curriculum fits within the organizational mission, vision, goals and objectives (Rowitz, 2003). Since the leadership team is comprised of agents across each of the six NCCES districts, a direct linkage exists to each 100 counties and the Cherokee Reservation throughout NC. In an effort to

successfully implement the BBESMM curriculum, staff training will need to be conducted by the NCCES leadership team. Due to budget and travel restrictions, the use of an interactive computer-based learning module would be useful to provide communication and information regarding the BBESMM program.

As part of the systems approach to organizational change presented by Rowitz (2003) it will be important to include several leadership components into the training. The NCCES leadership team will need to relate the BBESMM program to the organization's mission and vision (Rowitz, 2003). Members of the leadership team will serve as important resource to help motivate agents across the state and to provide additional support that may be needed throughout the districts. The BBESMM goals and objectives need to be communicated clearly and linked to the NC Plan (Caldwell et al., 2006). It will be important that NCCES agents receive intensive background information related to the health problems being addressed in the BBESMM program. NCCES agents will need to fully understand the evaluation tools and how this information is used to measure process and outcome objectives related to the NC Plan (Caldwell et al., 2006) as well as electronic reporting done through the Extension Reporting System.

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