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Mixed-methods assessment of a local Meals on Wheels program

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Mixed-methods assessment of a local Meals on Wheels program

by

Catherine S. Rudolph

A thesis submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Diet and Exercise

Program of Study Committee:
Sarah L. Francis, Major Professor
Shannon Coleman
Jennifer Margrett

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2019

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ABSTRACT

Community food and nutrition programs, such as home-delivered meals (HDM), support the health and well-being of older adults. The purpose of this study was to conduct a needs assessment of a local Meals on Wheels (MOW) program using a mixed-methods approach.

Study One assessed nutritional risk (NR) and dietary intake frequencies (DIF) among newly enrolled MOW participants (n=167), utilizing the dietary screening tool. Participants were primarily female (62.9%), and enrolled in MOW during a winter month (85%). Nearly all (97.6%) were “at NR” or “at possible NR.” NR was attributed to “low” DIF of dairy, lean protein, and processed meat. Gender significantly influenced NR ($p < .05$), with males averaging a higher nutritional risk score. Season of MOW enrollment and whether participants had access to cooking appliances did not have a meaningful impact on NR or DIF.

Study Two evaluated factors influencing MOW or HDM participation. Four focus groups were conducted determining awareness, perceptions, motivators, barriers, and preferred program attributes; 31 older adults participated. All completed a sociodemographic questionnaire. Focus group sessions were audio-recorded, transcribed, and analyzed for themes using framework analysis. Sociodemographic questionnaires were analyzed using descriptive statistics. Participants were mostly retired, White females between ages 65-84 years. Over half (54.8%) were involved in a congregate meal program. A majority were responsible for their own transportation (80.6%), food purchases (80.6%), and meal preparation (77.4%). Most were aware of MOW, but not of

other HDM services. MOW was positively associated with companionship, and negatively linked to loss of independence and poor food quality. Motivators to HDM participation were affordability, menu choice, involvement of dietitian/nutritionist, and positive testimonies from past clientele. Barriers included affordability, skepticism of program marketing claims, food safety concerns, and limited meal storage space. Preferred program attributes were convenience and quality menu options. Promotional references included brochures and in-person group presentations with taste testing. These findings demonstrate the high NR of newly enrolled MOW participants and highlight the pre-conceived perceptions influencing HDM participation. These findings can be used to modify MOW offerings to help reduce NR of participants as well as better promote the MOW program toward older adults.

CHAPTER 1. INTRODUCTION

Background

The older adult population, those aged 60 to 65 years and older, is rapidly expanding and makes up around 15-21% of the U.S. population (U.S. Census Bureau, 2017a). From 2006 to 2016, the older adult population rose by 33% and is expected to grow by 81.7% by 2040, and 97.5% by 2060 (Administration on Aging, 2018). Older adults face a multitude of health-related barriers related to rising chronic disease rates, multiple co-morbidities, health care costs, food insecurity, and functional impairments that are predicted to multiply as the age group grows (United Health Foundation, 2017; Salive, 2013; Administration on Aging, 2018; Feeding America & National Foundation to End Senior Hunger, 2014). With this in mind, the aging population is in need of services to overcome preventable obstacles and achieve health-related quality of life through optimal aging.

Adequate nutrition plays a critical role in older adults' ability to optimally age, supporting physical function, promoting chronic disease prevention and management, and reducing health care expenditures (Bernstein & Munoz, 2012; The Malnutrition Quality Collaborative, 2017). Yet, a majority of older adults do not consume the recommended 2015-2020 Dietary Guidelines for Americans, an evidence-based set of guidelines developed to promote health and reduce chronic disease risk (The Center for Nutrition Policy and Promotion, 2015). This is important as many older adults are at an increased risk of malnutrition, which is characterized by a dietary pattern of excess or inadequate amount of nutrients (Hamirudin, Charlton, & Walton, 2016; Tilly, 2017).

Malnutrition can result in harmful consequences such as weight loss, sarcopenia (muscle wasting), decreased life expectancy, reduced cognition, and functional impairments (Tilly, 2017).

Older adult community-based food and nutrition programs provide valuable resources to reduce nutritional risk and promote health-related quality of life among an aging population. Home-delivered meals are an example of such a program. Home-delivered meal programs, funded by the Older Americans Act of 1965 and private funding resources, provide nutritious meals to homebound older adults. To promote adequate nutrition, these meals are required to provide at least one-third of the Dietary Reference Intakes set by the current Dietary Guidelines for Americans (Older Americans Act of 1965). Home-delivered meal programs have been found to increase nutrient intake, reduce food insecurity, decrease nutritional risk, and reduce health care expenditures among participants (Berkowitz et al., 2018; Zhu & An, 2014). Meals on Wheels is one of the largest organizations providing home-delivered meals under the Older Americans Act (Thomas & Dosa, 2015).

Despite these positive outcomes, older adults exhibiting need for home-delivered meals does not match participation rates (Colello, 2011; Jeszeck, 2015). Approximately 75% of older adults in need of home-delivered meals and up to 90% of older adults who are food insecure do not receive home-delivered meals (Jeszeck, 2015). Furthermore, 93.2% of older adults with at least one difficulty performing activities of daily living (ADL) and 88% reporting difficulties performing at least two or more ADLs do not receive home-delivered meals (Jeszeck, 2015). Additionally, the percentage of home-delivered meal participants at a high nutritional risk status has been steadily growing,

increasing 26% from 2007 to 2017 (U.S. Department of Health and Human Services [HHS] & Administration for Community Living [ACL], 2019).

There is opportunity for further research surrounding the needs of older adults eligible to receive home-delivered meal programs. This study aims to fill current knowledge gaps regarding the nutritional needs of newly enrolled Meals on Wheels participants as well the needs and preferences influencing participation in home-delivered meal programs. A mixed-methods design provides an innovative approach, combining the advantages of quantitative and qualitative data to assess the needs of this population. Knowledge gained from these studies can help to determine effective action steps home-delivered meal programs can take to better meet the needs of an aging population.

Goals and Objectives

Study 1: Nutritional Risk and Dietary Intake Among Newly Enrolled Meals on Wheels Participants

Objective: The aim of this study was to conduct a quantitative assessment to determine the nutritional risk and dietary intake of newly enrolled Meals on Wheels participants.

Long-term goals are to improve the nutritional status of home-delivered meal participants through early nutritional risk identification and dietary intervention. The following research questions were addressed:

1. What was the nutritional risk status of MOW participants prior to enrollment?
2. What factors influenced the nutritional risk status of MOW participants prior to enrollment?

Study 2: Making Home-Delivered Meals Relevant for Today's Aging Adult

Objective: The aim of this study was to use a qualitative focus group design to explore factors influencing older adults' interest in participating in Meals on Wheels or other home-delivered meal programs. Long-term goals are to revise home-delivered meal program attributes and implement marketing strategies to increase the percentage of older adults benefitting from these services. The following research questions were addressed:

1. To what extent were older adults' aware of Meals on Wheels or other available home-delivered meal programs and what are their perceptions?
2. What were common motivators and barriers toward participating in the Meals on Wheels program and other home-delivered meal programs?
3. What were preferred attributes for a home-delivered meal program?

Thesis Organization

This thesis begins with a review of literature examining the U.S. older adult population, optimal aging, factors impacting older adult nutritional risk, and the impact of older adult community food and nutrition programs. Following the review of literature, the methodology behind the two studies will be described and will lead into two separate manuscripts to be submitted to the *Journal of Nutrition in Gerontology and Geriatrics*. Lastly, conclusions, references, and an appendix of supported documents will conclude this thesis.

CHAPTER 2. REVIEW OF LITERATURE

As the aging population continues to grow, older adults are facing accumulating barriers towards achieving optimal health and nutrition. Adequate nutrition is a key indicator of optimal aging, playing an important role among health-related barriers. This is especially important with reports of high malnutrition risk among older adults. Community food and nutrition programs, such as home-delivered meal programs, may be an effective solution towards optimizing health and nutrition among older adults. Further research is needed to identify how to maximize program reach and effectiveness.

Background

The United States (U.S.) population is experiencing a shift in demographics as older adults, those aged 60 to 65 years and older, have become the largest growing age group. It is estimated that around 1 in 7 Americans classify as an older adult, with about 20.9% aged 60 years and older and 14.9% aged 65 years and older (U.S. Census Bureau, 2017a). Of this group, women outnumber men (Administration on Aging, 2018). In Iowa, older adults make up 16.4% of the total state population, with 55.6% being female (Administration on Aging, 2018). There is also a steady increase of older adults from underrepresented audiences. The number of persons of color age 60 years and older increased from 6.9 million in 2006 (19%) to 11.1 million in 2016 (23%) and is projected to increase to around 21.1 million (Administration on Aging, 2018). As of 2017, the older adult population was comprised of 7.9% Hispanic, 8.9% Black, 4.2% Asian, 0.5% American Indian or Alaska Native, and 0.1% Native Hawaiian/Pacific Islander (U.S.

Census Bureau, 2017b). However, Iowa is not representative of this diversity, with 97.3% of older adults estimated to be White (U.S. Census Bureau, 2017b). The growing diversity among the older adult population presents an opportunity to produce more culturally appropriate and diverse resources for this age group.

Services to support an aging population are crucial right now as older adults are and will continue to be the most rapidly growing population. From 2006 to 2016 alone, the older adult population grew by 33% and is projected to increase by 81.7% by 2040, and 97.5% by 2060 (Administration on Aging, 2018). Two primary causes of the growing older adult demographic are the aging of the baby boomer generation and increases in average life expectancy, which has risen to an additional average of 19.4 years as of 2015 (20.6 years for females and 18 years for males) (Administration on Aging, 2018). It is anticipated that this growth will impact society at both the individual and community level. Examples include higher demand for health and caregiving expenditures, further stress on policies and programming for older adults such as Social Security and Medicare, and increased challenges for families, businesses, and health care providers (Ortman, Velkoff, & Hogan, 2014).

Older adults spend the most of any other age group on health care expenditures. From 2006-2016, older adults saw a 38% increase in out-of-pocket health care expenditures of on average \$5,994, compared to an average of \$4,612 for the rest of the population (Administration on Aging, 2018). In 2016, older adults spent 13.1% of their total expenditures on health while the rest of consumers spent 8% (Administration on Aging, 2018). Government programs and private health care assistance programs are essential in providing funding to support the increasing costs related to aging. Around

93% of older adults are covered by Medicare, while 84% rely on Social Security as their primary source of income (Administration on Aging, 2018). With this age group growing faster than younger cohorts, reorganization of current health care programming is needed.

Currently, long-term health care services are expensive and projected to continue increasing in cost each year (Genworth Cost of Care, 2017). Nationally, the cost of assisted living averages \$45,000 each year. Long-term care facilities average \$85,775 for a semi-private room and rise to \$97,455 for a private room (Genworth Cost of Care, 2017). In Iowa, the annual median cost of assisted living is \$44,835, a long-term care facility semi-private room is \$68,894, and a private room is \$74,825 (Genworth Cost of Care, 2017). Home health care options allow older adults to age in place, however they are comparative in price with national median costs of \$47,934 per year for homemaker services and \$49,192 for a home health aide (Genworth Cost of Care, 2017).

Food insecurity among older adults is also on the rise. From 2001 to 2011, older adults experiencing food insecurity doubled to 8.4% of the older adult population (Feeding America & National Foundation to End Senior Hunger, 2014). While it is estimated that U.S. older adults report lower rates of food insecurity than younger populations, older adults are at higher risk for severe health consequences due to food insecurity (Feeding America & National Foundation to End Senior Hunger, 2014). This age group faces heightened physical limitations, health care costs, and transportation difficulties that create additional barriers to meeting their food and nutrient needs (Strickhouser, Wright, & Donley, 2015). Factors such as physical health, mobility limitations, and transportation difficulties are often left out in food security measurements, underestimating researchers' abilities to capture an accurate reflection of

food insecurity among the older adult population (Strickhouser et al., 2015). More importantly, older adult participation in programs aimed at reducing food insecurity are low, highlighting the need for greater awareness and available resources among older adults experiencing food insecurity (Feeding America & National Foundation to End Senior Hunger, 2014).

Baby Boomers

The aging of the baby boomer generation, those born between 1946 and 1964, plays an influential role in the rapid growth rate of older adults. During this time, there was a drastic spike in birth rates following the end of World War II. The National Center for Health Statistics reported a 20% increase from 2.9 million births in 1945 to 3.4 million births in 1946 (Colby & Ortman, 2014). Birth rates continued to rise, ending at 72.5 million births by 1964. This rise was a significant part of history due to the size and prolonged length of time the high birth rates took place (Colby & Ortman, 2014). As of 2011, the baby boomers started turning 65 years of age (Colby & Ortman, 2014) and the youngest of the baby boomer generation will not turn age 65 years until 2029, contributing to the predicted growth rate of older adults in the approaching years.

The baby boomer generation is often called the “sandwich generation” (Fingerman et al., 2012), as increases in modern life expectancy have positioned them in a middle age state of caring for both their children and their parents. This can be a burden on financial and personal stability (Taylor, Parker, Patten, & Motel, 2013). Studies looking at common traits among the baby boomers have found them to value individuality which drives them to make decisions based on their own personal reward (Fingerman et al., 2012). Frequently, baby boomers have been reported to be demanding.

They demand to be informed, to have choices, and to have access to high quality health care services (Blanchette & Valcour, 1998). This generation also tends to prioritize maintaining an active lifestyle to keep up with grandchildren, privacy, and getting the best services for their money (FONA International, 2014). Identifying common trends in generational traits among the baby boomers can help tailor community food and nutrition programs to be most effective among this generation. Opportunities for reaching this generation may see impact in targeting their desire to have choices, providing them valuable health information, and showing them the personal benefits to gain from healthy lifestyle behaviors.

Older Adults and Health

Despite average increases in life expectancy, many older adults are experiencing a decrease in quality of life as individuals live longer with chronic disease (Crimmins & Beltrán-Sánchez, 2011) and very often, more than one (Salive, 2013). Modern day health care is moving away from the use of life expectancy and low mortality rate as quality indicators of public health (Crimmins & Beltrán-Sánchez, 2011). Instead the objective is “health-related quality of life,” which focuses on an individual’s well-being under physical, mental, emotional, and social factors (Healthy People 2020). Health initiatives such as Healthy People 2020 are putting a primary focus on improving health-related quality of life among all age groups (Healthy People 2020). While aging is an inevitable process of life, a key concept to achieving health-related quality of life throughout the aging process is optimal aging. Optimal aging encompasses the ability to function across various domains—physical, functional, cognitive, emotional, social, and spiritual—to one’s contentment despite medical conditions (Brummel-Smith, 2007).

Today's older adults have higher chronic disease rates compared with previous generations who experienced more widespread acute conditions (Harris, 2013). The most common chronic conditions seen among older adults today are hypertension, arthritis, heart disease, cancer, and diabetes (United Health Foundation, 2017). Among those 65 years and older in 2015, 58% of the population had hypertension, 48% hyperlipidemia, 31% arthritis, 29% ischemic heart disease, and 27% diabetes (Administration on Aging, 2018). Prevalence of obesity among this age group has also risen to 27.6% as of 2017, the highest it has been in the past 5 years (United Health Foundation, 2017). The 2017 America's Health Rankings Senior Report revealed that the next generation of older adults will have a 55% higher incidence of diabetes, 25% increase in obesity, and 9% decline in self-reports of very good or excellent health status among older adults (United Health Foundation, 2017). Nearly all of these conditions can be prevented, treated, and/or maintained in part by diet.

It is important to note that the effect of the natural aging process on the prevalence of deteriorating health among older adults is minimal compared to the long-term effects of chronic disease. The position of the Academy of Dietetics is that with healthy lifestyle behaviors such as consuming a nutritious diet, staying physically active, and maintaining a healthy body weight; chronic health conditions have been shown to be preventable and manageable (Bernstein & Munoz, 2012). Community food and nutrition programs for older adults serve an important role in promoting healthy lifestyle habits that can better enable older adults to prevent or manage chronic disease.

Ageing in Place. The field of Gerontology health and wellness commonly refers to the term "ageing in place" as the ability to age safely, comfortably, and independently in

one's home and community (Ahn, Kwon, & Kang, 2017). In the context of this review, "aging in place" represents the environmental, physical, psychological, and financial benefits that often support older adults' well-being as they remain in their home (Ahn et al. 2017). "Aging in place" plays an important role in the health of older adults as the concept considers holistic aspects of their well-being. Around 90% of older adults prefer to remain in their homes as they age (Faber et al., 2011). There is a level of attachment, connection, security, and familiarity involved with remaining in their own home and community (Wiles, Leibing, Guberman, Reeve, & Allen, 2012). Main factors driving the desire of older adults to age in place include the ease of maintaining their home, confidence in their ability to take care of themselves, proximity to local services, a strong sense of community connection, feelings of safety, and not having the financial support to move (Ahn et al. 2017). Community resources should support older adults that can benefit from aging in place.

Aging in Iowa. Iowa has its own strengths and challenges with a growing older adult population. In comparison to the rest of the U.S., Iowa's older adult population ranks low in prevalence of food insecurity (10.6%) and poverty (7.0%), hospital death rates (16.3%), and negative mental health factors (i.e., mental distress, cognition, depression; 4.6%, 6.8%, 12.9%) (United Health Foundation, 2017). However, compared to the national average Iowa experiences higher obesity rates (31.1% versus 27.6%), fall rates (31.6% versus 28.7%), and percentage of residents living in long-term care facilities who have low-care needs 16.8% versus 11.7%) (United Health Foundation, 2017). A total of 75.4% of individuals aged 65-74 years and 65.9% of those aged 75 and older can be classified as overweight or obese (Iowa Department of Public Health, 2017).

Additionally, most older Iowans receive a home health care service (86.6%) (United Health Foundation, 2017).

Iowa's 2016 Behavioral Risk Factor Surveillance (BRFSS) report reported 16.2% of older adults aged 65-74 years and 22.7% of those 75 years and older self-reported their health as "fair or poor" (Iowa Department of Public Health, 2017). Cardiovascular disease of any kind was found among 18.0% of individuals 65-74 years of age and 27.2% of those 75 years and older (Iowa Department of Public Health, 2017). Diabetes is also prevalent among Iowa's older adults. As of 2016, 22.6% of individuals 65-74 years of age and 20.0% of those 75 years and older have been diagnosed with diabetes (Iowa Department of Public Health, 2017).

Nutritional Risk Among Older Adults

Adequate nutrition is a key health indicator of optimal aging among older adults, supporting an active lifestyle, improving overall health outcomes, and reducing health care costs (Bernstein & Munoz, 2012; The Malnutrition Quality Collaborative, 2017). Malnutrition is defined as any nutritional disorder with characteristics of excess, inadequacy, or imbalance in an individual's diet (Tilly, 2017). While it is unclear the prevalence of malnutrition among community-dwelling older adults, a review of nutritional risk studies reported high malnutrition risk rates ranging from 7.5% to 83% (Hamirudin et al., 2016). This wide range stresses the importance of using consistent, valid methodology to assess nutritional risk. Malnutrition can lead to negative health consequences such as weight loss, sarcopenia (condition characterized by muscle wasting), decreased life expectancy, reduced cognition, weakened immune response,

higher susceptibility to infection, functional impairments, reduced quality of life, and more (Tilly, 2017). Furthermore, malnutrition has been found to increase medical costs by up to 300% (Correia & Waitzberg, 2003). In Iowa, estimated medical costs of \$137,240,256 annually have been attributed to malnutrition (Goates, Du, Braunschweig, & Arensberg, 2016).

Although shifts in energy and nutrients needs are associated with aging, many older adults face further obstacles placing them at high nutritional risk. Malnutrition risk is elevated due to many factors including those that are: disease-associated (e.g., inflammation, decreased appetite, difficulty chewing or swallowing), function-associated (e.g., physical limitations, strength, endurance), social and mental health associated (e.g., depression, changes in mental status, emotional needs), and hunger and food security related (Bernstein & Munoz, 2012; The Malnutrition Quality Collaborative, 2017). Food and nutrition services across all settings, including home delivered meal services, are encouraged to work together in addressing factors contributing to the higher risk of malnutrition among older adults (Institute of Medicine & Food and Nutrition Board, 2012).

Older Adult Energy and Nutrient Requirements

Age-related physiological changes can alter the energy and nutrients needs of older adults (Tilly, 2017). These changes typically result in lower energy (calorie) requirements due to the slowing of metabolism, which can cause difficulties as specific nutrient needs either remain the same or increase with age (Bernstein & Munoz, 2012; Tilly, 2017). Malabsorption can also reduce the efficient use of nutrients that are consumed (Tilly, 2017). Balancing a diet that provides less energy while maintaining or

increasing the nutrient content is a challenge among older adults (Bernstein & Munoz, 2012). In addition, decreased nutrient intake is a serious issue among older adults, often related to the numerous medications individuals are taking that may decrease appetite and alter digestion, absorption, metabolism or excretion of essential nutrients (Bernstein & Munoz, 2012). Declines in taste with aging may also contribute to decreased nutrient intake among older adults (Giacalone et al., 2016). Older adult food and nutrition providers, such as home-delivered meals must pay extra attention to balance nutrient needs and taste preferences among this age group.

A national study comparing the baby boomer generation to the previous generation of older adults found increased intakes of energy, fat, protein, cholesterol, and sodium along with decreased intakes of vitamin C, water, and vegetables among the baby boomers (King, Jun Xiang, & Brown, 2014). These dietary intake trends are often correlated with increased chronic disease rates, indicating a potential connection between the dietary intake of baby boomers and higher prevalence of chronic disease (King et al., 2014).

The Healthy Eating Index-2010 measurements reported older adults on average at an index of 65.29 out of a total score of 100, indicating they do not frequently meet the recommended 2015-2020 Dietary Guidelines for Americans (The Center for Nutrition Policy and Promotion, 2015). The 2015-2020 Dietary Guidelines for Americans (inclusive of age groups 51 years and older) recommends a nutrient dense diet including a variety of vegetables from all subgroups (e.g., dark green, red and orange, legumes, starchy), fruits, grains (at least half of which are whole grains), fat-free or low-fat dairy, a variety of protein foods (e.g., seafood, lean meats, poultry, eggs, legumes, nuts, soy

products, and oils while limiting saturated fats, *trans* fats, added sugars, and sodium (U.S. Department of Health and Human Services, 2015). Thus, encouraging older adults to meet the 2015-2020 Dietary Guidelines for Americans would likely result in improved dietary quality among older adults versus the promotion of specific nutrient requirements that may be confusing for older adults (Bernstein & Munoz, 2012). Furthermore, promotion of the 2015-2020 Dietary Guidelines for Americans in community food and nutrition programs for older adults is encouraged.

Community-based food and nutrition settings have the opportunity to target and support the diverse circumstances affecting nutritionally at risk older adults. Interventions should be based on the target audience's culture, geographic location, and individual traits of older adults in local communities (Institute of Medicine & Food and Nutrition Board, 2012). Such community-based interventions can promote older adult nutrition by expanding participant health literacy, providing resources to individuals with functional impairments, and creating affordable and accessible nutritious food sources for older adults experiencing food insecurity.

Health Literacy and Nutritional Risk

An individual's health literacy encompasses his or her ability to obtain, communicate, process, and understand basic health information, critically impacting the practice of healthy lifestyle habits (Centers for Disease Control and Prevention, 2016). Low health literacy has been largely associated with poor health outcomes, such as poor physical and mental health, high hospitalization rates, and increased health care costs (Parker, Wolf, Kirsch, 2008). In addition, research suggests aging negatively correlates with health literacy making it especially important to assist older adults in understanding

healthy lifestyle habits, such as the consumption of a nutrient dense diet (Chin et al., 2017). Community food and nutrition programs are ideal settings for educating individuals with low levels of health literacy about healthy lifestyle habits surrounding food and nutrition. Examples include education on the 2015-2020 Dietary Guidelines for Americans, food safety, and sharing information on available resources for individuals dealing with food insecurity.

Disability and Nutritional Risk

Age-associated disabilities are not a major component of the normal aging process. In fact, lifestyle and environmental factors may play a more important role than genetics (Food and Nutrition Board et al., 2016). Disability is frequently tied to chronic health conditions and its associated activity limitations have been negatively correlated with well-being (Lin & Wu, 2014; Qui et al., 2010). About one-third of adults aged 65 years and older report having one or more disability (United Health Foundation, 2017). Of these, 23% are estimated to be ambulatory disabilities and 7% due to vision impairments (Administration on Aging, 2018). Similarly, in Iowa, 32.7% of those aged 65 years and older report having a disability (State Data Center of Iowa & The Office of Persons With Disabilities, 2017). Among older adults with functional disabilities, higher rates are seen among women and those living in poverty (Bernstein & Munoz, 2012).

Assessment of disability is typically measured through performance of activities of daily living (ADL) and instrumental activities of daily living (IADL). Examples of activities of daily living include bathing, eating, dressing, and moving around the household. Instrumental activities of daily living may include preparation of meals, shopping, telephone usage, and housework (Administration on Aging, 2016). Requiring

assistance to perform ADLs or IADLs indicates an individual's level of dependence. The greater the number of functional disabilities, the greater the severity of dependence. The 2011 National Health and Aging Trends Study reported that half of older adults enrolled in Medicare needed help performing activities of daily living, and a large percentage having lower incomes (Freedman & Spillman, 2013).

Functional impairments among an older adult population can have a detrimental impact on their ability to consume a nutrient dense diet. For example, visual and ambulatory disabilities directly affect an older adults' cooking and shopping abilities. Therefore, it is important for individuals with functional impairments to have access to services that can support them in consuming nutrient dense meals. Home-delivered meal programs offer one way of providing accessible, nutritious meals.

Frailty and Nutritional Risk

Frailty is characterized by fluctuating energy levels resulting in slowing, fatigue, decreases in muscle mass, weakened strength, and reduced physical activity (Bandeem-Roche et al., 2015). Frailty affects about 15.3% of the older adult population with the greatest proportion coming from women, underrepresented audiences, persons in residential care, and those with limited resources. The prevalence is as high as 65-85% among Blacks and Hispanics, and over twice as large among those receiving residential care and with lower income.

Poor nutritional intake affects diagnostic criteria for frailty including unintentional weight loss, low muscle strength, feelings of exhaustion, reduced physical activity capacity, and slow walking speed (Yannakoulia, Ntanasi, Anastasiou, & Scarmeas, 2017). Compounding this effect, frailty symptoms can cause decreased

consumption of food due to difficulty preparing and consuming food as well as fluctuating energy levels (Yannakoulia et al., 2017).

Individuals who are frail or disabled also have a higher risk of falling which can have detrimental impacts on an aging body (Bandeem-Roche et al., 2015). Likelihood of falling or fear of falling along with number of hospital visits was estimated to be three to four times as high among individuals who are frail. Additionally, the fear of falling is often a barrier among an older adult's ability to independently prepare meals. A study among Meals on Wheels participants found 56% stated they were worried about falling and 79% indicated these fears limited their daily activity (Thomas & Dosa, 2015).

Food Insecurity, Hunger, and Nutritional Risk

Food insecurity and hunger can have profound impacts on nutritional status and health-related quality of life. Although food insecurity and hunger are often used interchangeably, the two are different degrees of the same indicators. Food insecurity is characterized by having irregular access and uncertainty in obtaining food, putting individuals at higher risk for malnutrition, chronic disease, and low quality of life (Gregory & Coleman-Jensen, 2017). Those categorized as “marginally food secure” are facing the *threat of hunger*, “low food secure” considered *at-risk of hunger*, and those of “very low food secure” status to be *facing hunger* (Table 2-1).

There are four levels of food security (a) high, (b) marginal, (c) low, (d) very low (Table 2-1). “High food security” is demonstrated by an individual who has zero issues having access to food. On the other end, a person with “very low food security” experiences disrupted eating patterns and reduced food intake related to food accessibility. In other terms, these individuals are food insecure and have periodic

moments where the availability of nutrient dense and safe foods or the ability to obtain them in socially acceptable ways is limited or uncertain (Lee & Frongillo, 2001).

Table 2-1. *Description of Food Security and Hunger Terminology*

USDA food security terminology^a	Hunger terminology^b	Description^a
High food security	No threat of hunger	No indication of food-access problems or limitations.
Marginal food security	Threat of hunger	One or two reported indications of food-access problems or limitations. Little or no indication of dietary or intake changes.
Low food security	At-risk of hunger	Reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake.
Very low food security	Facing hunger	Multiple indications of disrupted eating patterns and reduced food intake.

^a(U.S. Department of Agriculture Economic Research Service, 2016)

^b(Ziliak & Gundersen, 2017)

Multiple factors may lead to a food insecure lifestyle. These include physical impairments, financial instability, geographic isolation, lack of knowledge of assistance programs, pride, and psychiatric health. Older adults experiencing food insecurity often have significantly lower energy and nutrient intakes, worse health outcomes, and a 30% increased risk of early mortality than those who are food secure (Berkowitz, 2017; Ziliak & Gundersen, 2017). Food insecurity is also linked to a significant increase in health care expenditures (Berkowitz, Basu, Meigs, & Seligman, 2018).

The threat of food insecurity and hunger among older adults is spreading across the U.S. As of 2017, food insecurity among older adults 60 years and older had risen to about 15.8% of the U.S. population (United Health Foundation, 2017). Those at highest risk for food insecurity among older adults are those with a low income, those under the

age of 70, individuals of underrepresented audiences, and people living in Southern states (Ziliak & Gundersen, 2017).

Over 9.8 million (14.7%) older adults face the threat of hunger (Ziliak & Gundersen, 2017). From 2001 to 2015, the percentage of older adults experiencing the threat of hunger grew 200% (Ziliak & Gundersen, 2017). A majority of whom have incomes above the poverty line and are white (Ziliak & Gundersen, 2017). Also, most are women (58.9% female versus 41.1% male) (Ziliak & Gundersen, 2017). This data suggests that there may be additional factors besides income and race/ethnicity affecting hunger among older adult populations.

Physical impairments can have a serious impact on an individual's level of food security and risk of hunger. Reports have found those with "marginal food security" have significantly higher trends of ADL limitations (Ziliak, Gundersen, & Haist, 2008). As stated previously, chronic conditions of disability and frailty are prevalent among the older adult population. These impairments specifically affect an older adult's ability to take transportation to, shop for, prepare, and consume a nutrient dense diet. Often these physical impairments serve as a barrier to seeking the help of community food and nutrition programs, further adversely impacting those who have the greatest need for these programs. The most recent State of Senior Hunger national report found older adults who were facing the threat of hunger were 30% more likely to report at least one ADL limitation (Ziliak & Gundersen, 2017).

Low income levels are associated with increased food insecurity risk and hunger; however, they are not the main cause as often believed. In 2016, 4.6 million older adults (9.3%) were below the poverty line (Administration on Aging, 2018). However, when

utilizing the Supplemental Poverty Measure, which accounts for regional variation living costs, non-cash benefits received, and non-discretionary expenditures, 14.5% of older adults were below the poverty level, an increase of about 5% (Administration on Aging, 2018). An additional 4.9% were found to be “near-poor” (Administration on Aging, 2018). Of this proportion of older adults below the poverty line, 18.7% were Black, 17.4% Hispanic, 11.8% Asian, and 7.1% were White (Administration on Aging, 2018). Older women were more likely to be classified as being in a state of poverty, at 10.6% compared to 7.6% among older men (Administration on Aging, 2018). Living alone was another factor associated with higher poverty rate, constituting 17.3% of older adults experiencing poverty (Administration on Aging, 2018). Living above the poverty line decreases the risk of “marginal food insecurity” by 15%, “low food insecurity” by 6%, and “very low food security” by 2% (Ziliak et al., 2008). Among older adults experiencing hunger in 2015, 32.7% were below the poverty line, 32.6% between 100-200% of the poverty line, and 18.9% above the poverty line (Ziliak & Gundersen, 2017). In Iowa, the poverty rate was 6.9% of older adults in 2017, compared to 11.8% of all Iowans (State Data Center of Iowa & Iowa Department on Aging, 2018).

Income significantly impacts an individual’s ability to obtain adequate and nutritious food as well as causing high levels of daily financial stress. Persons reporting “marginal food insecure” and “very low food secure” often spend about 60% and 88% less on food needs respectively (Ziliak et al., 2008). These findings are supported by Guthrie and Lin (2002) who found older adults with lower incomes consumed significantly lower intakes of energy and all macronutrients compared to older adults with a higher income level.

In some geographic regions, access, availability, and low cost of nutritious food items is scarce, putting many individuals living in these areas at high risk for food insecurity. Older adults living in non-metropolitan communities as opposed to urban areas have reported higher risks of food insecurity (Ziliak et al., 2008).

It is noteworthy to mention cases of food insecurity among older adults often go unnoticed and unreported due to fluctuations in access to food. In a past study, older adults reporting “food insecure” were highly dependent on food exchange support and timing of the month (Frongillo, Valois, & Wolfe, 2003). Some weeks, these individuals receive food from visiting family members or neighbors, leaving them to feel at ease with their food intake when exchanges are frequent. Additionally, they are more likely to feel better at the beginning of the month when financial stability was high as opposed to the end of the month when money was sparse (Frongillo et al., 2003). Dependence on these factors puts food insecure older adults in a constant flux of high and low access to food. Not only does this put them at risk for malnutrition, but increases their level of stress. Stress may independently have adverse consequences on an older adult’s health status and quality of life (Frias & Whyne, 2015).

Despite a common misconception that a person who is food insecure will be underweight and frail, food insecurity and obesity are often positively correlated (Berkowitz, 2017). Therefore, it is important that older adults be screened for food insecurity when seeking community food and nutrition assistance as well as when interacting with their health care provider. A quick, easy, and valid tool for use in community settings is the two-item food insecurity screen (Gundersen, Engelhard, Crumbaugh, & Seligman, 2017). The questionnaire consists of two questions and has

been determined to be sensitive, specific, and valid in identifying those at risk of food insecurity (Gundersen et al., 2017). This tool is being used in many community food and nutrition program like the Congregate Meal Program and the Supplemental Nutrition Assistance Program Education (SNAP-Ed) to screen participants.

Community food and nutrition programs should be comprehensive in their approach to preventing and combating factors influencing the nutritional risk status of older adults. Administering food insecurity screenings, providing easy to understand nutritional education, creating resources to support functional independence, as well as expanding accessibility to affordable, nutrient dense meals are just some examples of ways community food and nutrition programs can provide valuable resources to an aging population. As nutritional status may be impacted by a variety of factors—health, functional, cognitive, environmental—food and nutrition providers should work to understand and adapt resources to meet the specific needs of older adults in their community.

Nutritional Risk Screening and Prevention

Since nutritional risk is of high concern among older adults, identifying those at risk and preventing it is of utmost importance. This can be accomplished through conducting community-based nutritional risk assessments using easy-to-use validated tools. It is recommended that community-based services conduct quarterly screenings to identify individuals at risk of malnutrition for further assessment and intervention (Tilly, 2017). However, screening and identification of malnutrition in community settings is often overlooked (Hamirudin et al., 2016). Community food and nutrition programs should focus on the use of validated nutrition risk assessment tools to ensure proper

prevention and management of nutritional risk among older adults. These tools should be quick and easy to use to match the diverse settings of community programming.

Nutrition screening is only the first step in the ongoing process of nutrition care for preventing malnutrition, which also includes assessment, diagnosis, intervention, monitoring, and evaluation (Bernstein & Munoz, 2012; Tilly, 2017). While nutrition screening can increase awareness among individuals who are at risk, nutrition screening alone is insufficient for improving nutrient intake among at risk older adults (Weekes et al., 2009). While most screening tools do not include guidelines for follow-up assessment and intervention, it is important to determine effective methods to reduce nutritional risk after it has been identified (Hamirudin et al., 2016).

Older Adult Health Care

Government and private health care assistance organizations have policies and programs in place to support older adults in need of affordable aging-related services and health care. However, with the rapid growth of older adults and projected spike in health care costs it has become more challenging for these programs to balance the needs of older adults with sufficient support.

Medicare is the primary health care insurance among older adults with coverage available for the aged (65 years and older), severely disabled (younger than 65), and those with end stage renal disease and amyotrophic lateral sclerosis (Medicare Act of 1965). In 2016, older adults comprised 84.2% (47.8 million out of 56.8 million) of total Medicare beneficiaries (Government Relations and Policy, 2018). As the first set of baby boomers became eligible for benefits between 1995 and 2009, enrollment rose to about

623,000 each year (Potetz, Cubanski, Neuman, 2011). Growth in participants is only expected to increase. Between 2010 and 2030, it is projected that more than 1.6 million beneficiaries will be enrolled each year steadily increasing to 17.4% by 2020 (Potetz et al., 2011).

The Affordable Care Act (ACA) was enacted in 2010 to improve health care for American citizens by expanding coverage, lowering health care costs, and increasing quality of care (DeNavas-Walkt, Proctor, & Smith, 2012). A recent revision to the act aims at lowering Medicare spending through a reduction in preventable hospital readmissions. Now under the ACA, hospitals must pay additional financial penalties if a patient is readmitted within 30 days of discharge (Boccutti & Casillas, 2017). Efforts to improve quality of care and reduce health-related Medicare costs may find success with greater overlap between clinical services and community food and nutrition programs. The 30 days post discharge present a prime opportunity for patient referral to community food and nutrition programs and can be a way to target older adults in need of services. These community programs can work to reduce nutritional-related factors contributing to readmission (e.g., food insecurity, functional inability to prepare or shop for meals, decreased energy and nutrient intake, weight loss, muscle wasting, impaired wound healing) (Anyanwu, Sharkey, Jackson, & Sahyoun, 2011; Buys et al., 2017; Krumholz, 2013; Marshall, Bauer, & Isenring, 2013; Vaudin & Sayoun, 2015), with the goal of improving post-discharge recovery and reducing health care costs associated with readmission. In fact, those at risk for hospital readmission have been linked to higher need for Older Americans Act Nutrition Program Home-Delivered services (Sattler, Lee, & Young, 2015). Preliminary research has shown positive improvements among

participation in a meal delivery program, like Meals on Wheels, post discharge compared to non-recipients; however, more research is needed providing evidence of this association (Cho, Thorud, Marishak-Simon, Frawley, & Stevens, 2015).

Food and Nutrition Programs Support Needs of Older Adults

Community food and nutrition programs that enable older adults to “age in place,” may be an effective solution to reduce health care costs, as well as provide social, nutritional, and emotional benefits to those in need (Kamp, Wellman, & Russell, 2010). Through these programs, the goal is to maintain the health and well-being of older adults throughout the aging process. In turn, this supports them in maintaining their independence and reducing rates of nutritional risk, chronic disease, frailty, and disabilities (Kamp, Wellman, & Russell, 2010). Aging in place also decreases the financial burden associated with moving to an assisted living facility, thus putting less pressure on providers of aging-related services as well as on family members.

Older Americans Act

The Older Americans Act (OAA), enacted in 1965, funds home and community-based services for older adults with the primary goal of keeping older adults independent in the comfort of their home (Lloyd & Wellman, 2015). Under this act, older adults are defined as 60 years and older (Lloyd & Wellman, 2015). Although there is no income or disability requirement for participation, funding is targeted at older adults who exhibit the greatest social and economic need, are low-income, rural-residing, from underrepresented audiences, limited in English proficiency, and at risk of institutionalization (Lloyd & Wellman, 2015; Tilly, 2017). OAA programs are administered by the Administration on

Aging and Aging Services Network, now under the Administration for Community Living within the Department of Health and Human Services. Title III of the OAA includes nutrition programs, such as home-delivered meal programs and congregate meals (Older Americans Act of 1965). Title IIIC (Section 330) aims to reduce hunger and food insecurity, promote socialization, health and well-being, and delay adverse health conditions for older individuals (Older Americans Act of 1965).

The OAA Nutrition Program, also referred to as the Elderly Nutrition Program, achieves its goals by providing older adults access to nutrition and disease prevention services (Lloyd & Wellman, 2015). It is the largest OAA program, constituting approximately 42% of the OAA's total funding in 2011 (Colello, 2011). Participants in the Elderly Nutrition program have reported positive perception of the programs, with many congregate and home-delivered meal participants indicating the services helped them to stay independent, age in place, and provided more socialization opportunities (Mabli et. al., 2017).

Each state has their own structure of receiving OAA funding and distributing these funds to Area Agencies on Aging to implement programming. The OAA is designed to be flexible to allow states to implement the programs to best fit the needs of their population. For example, various states may set their own participation assessment criteria, requirements for targeting individuals with particular sociodemographic characteristics, menu plans, meal delivery options, or contribution policies (Lloyd & Wellman, 2015). Iowa receives funding through the Iowa Department on Aging, which distributes this money to six Area Agencies on Aging (Iowa Department on Aging, 2017). Recipients of Iowa OAA nutrition services are more likely to live alone, live in

urban areas, have lower income, and be part of an underrepresented audience (Iowa Department on Aging, 2017). Over half of Iowan home-delivered meal participants have reported eating alone for most meals and having difficulty with meal preparation and shopping (Iowa Department on Aging, 2017). Due to fewer opportunities for socialization, older Iowans in need of this service are at higher risk for mental and physical illness, loss of independence, and greater risk of death due to loneliness (Iowa Department on Aging, 2017).

Title III C1 and C2 of the OAA aims to provide nutritious meals to older adults in the form of congregate meal sites and home-delivered meal programs. Meals served are required to follow the current Dietary Guidelines for Americans, provide at least one-third of Dietary Reference Intakes, comply with state and local food codes, be appealing for consumption, and be adjusted to meet special dietary needs as related to health, religion, and cultural/ethnic needs (Lloyd & Wellman, 2015). Although voluntary contribution to meal cost is encouraged among meal program providers, payment is not required to receive meals (Mabli et al, 2017).

Nationally, around 44% of congregate meal sites and 30% of home-delivered meal program expenditures are from federal sources, the rest an accumulation of public and private sources within each state (Lloyd & Wellman, 2015). Congregate meal sites are offered at public community centers and offer a nutritious meal following the OAA guidelines as well as an opportunity for socialization. As of 2017, 1,520,507 people were served congregate meals across the U.S. (HHS & ACL, 2019).

Home-delivered meal programs provide a similar service to those who face obstacles in leaving their home as well as provide safety checks. To be eligible for home-

delivered meals, persons must be assessed as “homebound, frail, or isolated” (Lloyd & Wellman, 2015). Home-delivered meal programs, funded through the OAA, are offered under a variety of settings including congregate meal site locations, affiliated central kitchens, or nonaffiliated food service organizations (Mabli et al., 2017). In 2017, 850,880 individuals were served home-delivered meals across the United States (HHS & ACL, 2019). In 2017, 20,648 older Iowans were served in congregate meal sites while 11,852 received home-delivered meals (HHS & ACL, 2019). Within these groups, almost one-fifth of congregate meal site recipients and around half of home-delivered recipients were screened to be at high nutritional risk, many reporting they would skip meals or eat less if the programs weren’t available to them (HHS & ACL, 2019; Iowa Department on Aging, 2017; Mabli et. al. 2017). Home-delivered meal program participants have reported improvements in nutrient intake, reduced food insecurity, and declines in nutritional risk status after receiving the service (Zhu & An, 2014). When compared to non-participants, meal program recipients have higher adequate nutrient intakes and lower hospitalization rates (Lloyd & Wellman, 2015; Mabli et. al., 2017).

The growth of home-delivered delivered meals surpassed congregate meals by about 47% from 1990 to 2009 (Colello, 2011). State funding increases for home-delivered meals have been linked to fewer residents living in long-term care facilities who have low-care needs, allowing them to live independently and age-in-place (Thomas & Mor, 2013a-b). These correlations have significant implications for Iowa which is higher than the national average in its percentage of residents in long-term care facilities with low-care needs (16.8% versus 11.7%) (United Health Foundation, 2017). Residents with low-care needs do not require assistance with most activities of daily living and

therefore do not depend upon all the services provided by long-term care facilities (Thomas & Mor, 2013a; United Health Foundation, 2017). Such individuals may be able to live in a less restrictive environment with the support of community-based food and nutrition services like home-delivered meal programs as well as other home health services. Additionally, significant savings in state Medicaid programs are linked to higher rates of home-delivered meal participation (Thomas & Mor, 2013a-b). Research also suggests home-delivered meal program use may contribute to reduced health care expenditure among participants (Berkowitz et al., 2018).

Meals on Wheels. Meals on Wheels is the largest organization providing home-delivered meals to older adults under funding from the OAA. In Iowa alone, Meals on Wheels serves around 33,675 older adults per year (Senior State Fact Sheet, 2018), 11,470 of which received home-delivered meals. Meals on Wheels services are effective in increasing nutrient intake, decreasing isolation, improving self-reported health, increasing feelings of safety, and increasing the ability of clients to remain in their home (Lloyd, 2017; Thomas & Dosa, 2015). Older adults on waiting lists for Meals on Wheels services are more likely to have fallen in the past month than the national average population of older adults, 87% have stated they are physically unable to shop for groceries, and 69% are unable to prepare or heat up food (Thomas & Dosa, 2015). There is a deficit in services to support individuals with need who are waiting to receive services.

Areas for Further Research

Food and nutrition programs under the OAA provide essential and effective services to meet the needs of older adults. However, many limitations must be addressed.

A systematic review of the literature on home-delivered meals services found that most studies are descriptive, lack outcome-based reports, and measure nutritional status based on self-reported dietary intake (Campbell, Godfryd, Buys, & Locher, 2015). More research is needed utilizing validated nutritional risk tools, identifying why few eligible older adults access home-delivered meals programs, and determining how best to target home-delivered meal programs where they are needed (Campbell et al., 2015).

A wide gap has been identified between older adults exhibiting need for home-delivered meal programs and number of participants (Colello, 2011; Jeszeck, 2015). It is estimated that approximately 75% of older adults in need of home-delivered meals do not receive them and up to 90% of older adults who are food insecure do not receive congregate or home-delivered meals (Jeszeck, 2015). Additionally, 93.2% of older adults with at least one ADL difficulty and 88% reporting difficulties with at least two or more ADLs do not receive home-delivered meal programs (Jeszeck, 2015). This gap in participation is hypothesized to be due to lack of federal funding, low awareness among eligible older adults of service existence, limited access to available services, and negative appeal of meals and times served (Colello, 2011; Institute of Medicine & Food and Nutrition Board, 2012; Jeszeck, 2015). However, further assessment of barriers to participation in older adult food and nutrition-related services may help determine effective solutions to serve more individuals in need of these services.

Furthermore, despite the impact home-delivered meal programs provide to improve nutrient intake, the percentage of participants at high nutritional risk has been steadily growing (HHS & ACL, 2019). From 2005 to 2016, home-delivered meal participants at high nutritional risk increased by 36.2% (HHS & ACL, 2019). More

research is needed to identify factors beyond the meal intervention contributing to nutritional risk and how to mitigate these.

Summary

Older adults face a multitude of health and nutrition-related challenges that are predicted to multiply as the age group experiences rapid growth rates. Many of these factors can have a large impact on the nutritional risk status of an aging population. Nutritional status serves an important role in an older adults' ability to optimally age. Community food and nutrition programs can enable older adults to "age in place" as well as help to reduce health care costs, and provide nutritional, social, and emotional benefits to an aging population. Home-delivered meal programs are one such program aiming to reduce hunger and food insecurity, promote socialization, health, and well-being, and delay adverse health conditions for older individuals. Although benefits from its services are promising, there is a wide gap between the numbers of those in need of home-delivered meal programs and participation rates.

CHAPTER 3. METHODOLOGY

Research Design

A mixed-methods research design combining quantitative and qualitative methodology was used to conduct a needs assessment of a local Meals on Wheels Program. Quantitative research was applied in Study One to objectively determine the nutritional needs of newly enrolled Meals on Wheels participants and identify factors impacting their nutritional risk. Qualitative research was utilized in Study Two to gather insights into the needs and preferences of aging adults not currently receiving home-delivered meals. For both studies, study protocol was reviewed by Iowa State University's Institutional Review Board for Human Subjects and classified as exempt (Appendix A).

Social Marketing Theory

Social marketing theory (SMT) served as the theoretical framework (Storey, Saffitz, & Rimon, 2008). SMT applies commercial marketing concepts to analyze, plan, implement, and evaluate health programs to influence the behavior of target audiences (Storey et al., 2008). The goal is not to simply influence behavior but to do so in an overall effort to improve individual and societal welfare. To be most effective, SMT focuses on behavioral outcomes, placement of consumers' benefits, and segmenting audiences to identify differences that may influence their response to products or services offered (Storey, Saffitz, & Rimon, 2008).

With these goals in mind, SMT utilizes a continuous cycle of (1) planning/strategy, (2) selecting channels and materials, (3) developing materials and pretesting, (4) implementation, (5) assessing effectiveness, and (6) gathering feedback to revise the program (Lefebvre & Rochlin, 1997). The mixed-methods research described in this thesis focused on SMT step one—planning and strategy (Figure 3-1). To maximize the impact of home-delivered meal programs, it is first important to understand the needs and preferences of aging adults. Results from these studies can then be used to guide the future development of home-delivered meal program marketing materials, program revisions, and nutritional risk interventions.

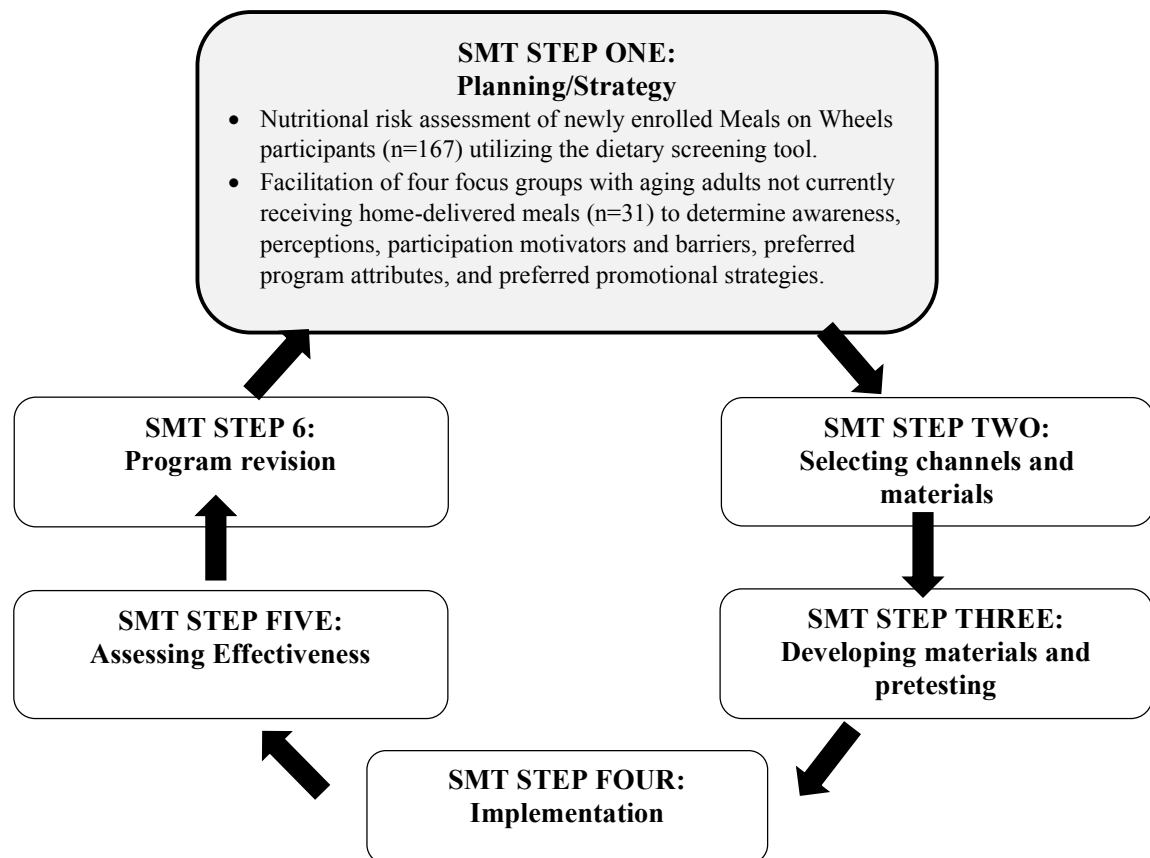


Figure 3-1. Social Marketing Theory Process Model

Study One: Nutritional Risk and Dietary Intake Among Newly Enrolled Meals on Wheels Participants

Recruitment/Data Collection

A cross-sectional study assessed the nutritional risk of adults aged 60 years and older (n= 167) who were newly enrolling in a local Meals on Wheels program. At the time of enrollment, social workers and intake specialists working for the Meals on Wheels program administered the dietary screening tool (DST) via the phone during three winter months (January, February March) and two summer months (July and September). Participants were also asked if they had a working stove, oven, or microwave. In addition to the DST and appliance information, the Meals on Wheel program provided us with gender and age; they did not provide race or ethnicity data.

Nutritional Risk Assessment

Nutritional risk and dietary intake frequencies were assessed utilizing the dietary screening tool (DST) (Bailey et al., 2007; Bailey et al., 2009). DST is an effective and practical method to detect nutritional risk among community-residing older adults (Bailey et al., 2007; Bailey et al., 2009). The DST questionnaire (Appendix B) consists of a total of 25 questions determining participant intake frequencies of “whole fruit and juice,” “vegetables,” “total and whole grains,” “lean proteins,” “added fats, sugars, and sweets,” “dairy,” “processed meats,” and “dietary supplement use” (Bailey et al., 2007; Bailey et al., 2009).

DST diet categories are grouped into “Prudent” and “Western” dietary patterns (Table 3-1). A “Prudent” dietary pattern reflects a nutrient dense diet of dairy, lean protein, vegetables, whole grains, and fruit. These dietary intakes are given more points

for higher intake frequencies (Table 3-1). On the other hand, a “Western” dietary pattern indicates a low nutrient dense diet of processed meats, and added fats, sugars, and sweets. A lower DST score for these foods is desirable and therefore, contributes to a higher total DST score (Table 3-1).

Total DST scores place participants’ nutritional intake into classification categories of “at risk” (scores <60), “possible risk” (scores 60-75), and “not at risk” (scores >75) (Bailey et al., 2009). Measurements of sensitivity (83%), specificity (75%), positive predictive value (75%), and reliability (0.83 test-retest coefficient) with the DST have found the tool to be effective in measuring nutritional risk among older adults (Bailey et al., 2009). However, these measurements were tested among a sample of primarily white, rural older adults, limiting its cross-cultural generalizability.

The DST is a practical tool for measuring nutritional intake among older adults as it meets key criteria for the administration of screening tools and has been validated against 24 hour recalls and biomarkers of nutritional status (Bailey et al., 2007). The questionnaire takes approximately 10 minutes to complete, making this a quick and efficient tool to determine nutritional status. The tool also withstands barriers to dietary intake assessments such as minimizing memory and computation error as well as being correctly understood by participants (Bailey et al., 2007). The DST is particularly useful for community food and nutrition programs to quickly target at-risk participants and measure program impact on decreasing nutritional risk.

Table 3-1. *Dietary Screening Tool Diet Categories and Scoring*

Diet Category (Maximum Points)	“Low” Classification Point Total	“Moderate” Classification Point Total	“High” Classification Point Total
Prudent Dietary Pattern^a			
Dairy (10)	0-5	--	6-10
Lean Protein (10)	0-5	--	6-10
Vegetables (15)	0-5	6-10	11-15
Total and whole grains (15)	0-5	6-10	11-15
Whole fruit and juice (15)	0-5	6-10	11-15
Western Dietary Pattern^b			
Processed meat (10)	6-10	--	0-5
Added fats, sugars, and sweets (25)	6-25	11-15	0-10

^aHigher score indicates a high intake frequency; ^bHigher score indicates a low intake frequency (desired)

Data Analysis

Statistical analyses were conducted using IBM Statistical Package for the Social Sciences (SPSS), version 25.0. Total DST scores, nutritional risk classifications, dietary intake frequencies, gender, enrollment month, and working cooking appliances were reported using descriptive analysis. Dietary intake frequencies were grouped into “low,” “moderate,” and “high” intake classifications based on the DST scoring categories (Table 3-1). To determine seasonal impact, month of enrollment was categorized into binomial variables: winter (January, February, March) and summer (July, August, September). A main effects general linear model was used to identify whether gender, season of enrollment, and having a working cooking appliance impacted nutritional risk and dietary intake frequencies. After determining that gender and season of enrollment had an impact, independent samples t-tests were run to determine the extent to which each variable influenced nutritional risk and dietary intake frequencies. Statistical significance was determined at $p < .05$.

Study Two: Making Home-Delivered Meals Relevant for Today's Aging Adult

Recruitment

Adults 50 years of age and older in two Central Iowa counties were recruited to participate in one of four focus groups. Exclusion criteria included individuals who are currently receiving Meals on Wheels. Recruitment locations included congregate meal sites (in-person recruitment), housing choice voucher (formerly known as Section 8) apartments, which provide federally funded housing for older adults with a low income (invitation by social worker), and churches (email listservs). While adults aged 50 to 59 years of age were included in recruitment to gain future perspective into the needs and preferences of aging adults, none responded to the email invitation sent to the churches. Focus group sites included two congregate meal sites and two housing choice voucher apartments. In total, thirty-one older adults participated with between five to thirteen participants in each focus group.

Data Collection

During each focus group session, participants completed a 21-question sociodemographic questionnaire (Appendix C) and were asked 13 open-ended questions related to awareness, perceptions, participation motivators and barriers, preferred attributes, and how they would like to receive information about Meals on Wheels or other home-delivered meal programs (Appendix D). Each session lasted up to one to two hours.

Data Analysis

Questionnaire responses were analyzed with IBM Statistical Package for the Social Sciences (SPSS), version 25.0 using descriptive analysis. Each focus group session

was audio-recorded and transcribed verbatim by a research assistant not involved with focus group facilitation. Transcriptions were then analyzed for themes using framework analysis (Rabiee, 2004). A research team (n=5), trained in thematic framework analysis by Francis, reviewed the transcripts independently to develop a thematic framework. Following independent analysis, the research team met for further theme development (indexing, charting, interpreting) and determined final consensus.

CHAPTER 4. NUTRITIONAL RISK AND DIETARY INTAKE AMONG NEWLY ENROLLED MEALS ON WHEELS PARTICIPANTS

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Abstract

Nutrition screening in community food programs like Meals on Wheels (MOW) promotes understanding of the nutritional risk (NR) and needs of participants. This cross-sectional study in a Midwest state assessed the NR and dietary intake frequencies (DIF) of newly enrolled MOW participants utilizing the dietary screening tool. Participants were primarily female (62.9%) and enrolled in MOW during the winter (85%); 167 older adults (OA) participated. Over half (53.9%) classified “at NR,” 43.7% “at possible NR,” and 2.4% “not at NR.” Participants reported “low” dairy, lean protein, and processed meat DIF, and “moderate” vegetable, total and whole grains, whole fruit and juice, and added fats, sugars, and sweets DIF. Male participants experienced higher NR and lower fruit and vegetable DIF. Season and working cooking appliances had no meaningful impact on NR or DIF. Early identification of NR and factors influencing NR can help community food programs better address OA nutrition concerns.

Keywords: nutritional risk, older adults, homebound

Introduction

Adequate nutrition is essential for supporting the health and well-being of a rapidly aging population. Yet, a majority of older adults do not meet the recommended 2015-2020 Dietary Guidelines for Americans (The Center for Nutrition Policy and Promotion, 2015a). This is concerning as many older adults are at an increased risk of malnutrition (Hamirudin, Charlton, & Walton, 2016), especially among those who are homebound (Millen et al., 2001). Among community-dwelling older adults there is a wide range of malnutrition risk rates ranging from 7.5% to 83% (Hamirudin et al., 2016). Malnutrition is characterized by an imbalanced dietary intake of excess or lacking nutrients and can lead to negative health consequences such as sarcopenia (i.e., muscle wasting), impaired physical function, and reduced quality of life (Tilly, 2017). These consequences can ultimately result in the loss of independence.

Older adult community-based food and nutrition programs, such as Meals on Wheels (MOW), can help to mitigate factors contributing to nutritional risk (i.e., undernutrition) and/or risk for malnutrition (i.e., overnutrition or undernutrition) among older adults. MOW is the largest organization providing home-delivered meals (HDMs) under the Older Americans Act (OAA) of 1965, which funds home and community-based services for older adults (Lloyd & Wellman, 2015). HDM services provide nutritious meals, containing at least one-third daily nutrient requirements, to older adults in need of them (Older Americans Act of 1965).

Participation in home-delivered meal programs is associated with decreased nutritional risk, reduced food insecurity, improved self-reported health, and an enhanced ability of participants to age in place, which can have a significant impact on the

environmental, physical, psychological, and financial well-being of older adults (Ahn, Kwon, & Kang, 2017; Lloyd, 2017; Thomas, Smego, Akobundu & Dosa, 2015; Zhu & An, 2014). Despite these promising outcomes, the percentage of participants classified at “high nutritional risk” has been steadily rising (U.S. Department of Health and Human Services [HHS] & Administration for Community Living [ACL], 2019). From 2007 to 2017, the percentage of HDM participants classified at “high nutritional risk” grew by 26% with about 58% of HDM participants being classified at “high nutritional risk” in 2017 (HHS & ACL, 2019).

To ensure the MOW program is meeting the nutritional needs of its customers, it is important to better understand their nutritional risk level and factors influencing that risk such as gender, season, and access to working cooking appliances. It is expected that these factors may impact nutritional status as gender differences in dietary intake have been reported in previous studies (Locher et al., 2008; MacNab et al., 2018; Mercille et al., 2016), and season and available cooking equipment could impact participant access to food. Through nutrition screening, community-based food and nutrition programs such as MOW can more effectively take steps (e.g., menu revisions, educational materials, supplemental snacks) to improve the nutritional status of program participants and enhance their ability to optimally aging. The purpose of this cross-sectional study was two-fold: (1) to determine the nutritional risk status of newly enrolled MOW participants and (2) to identify the impact of gender, season, and access to cooking appliances on their nutritional risk. Study protocol was reviewed by the Iowa State University Institutional Review Board and classified as “exempt.”

Methodology

This study took place over a six-month period (3 winter months, 3 summer months) in an urban county in a Midwest state. This timeframe was selected to assess if there were seasonal effects on nutritional risk. MOW program social workers and intake specialists oversaw the administration of the nutritional risk assessment at the time of enrollment. This was done to ensure the confidentiality of the participants.

Nutritional Risk Assessment

Nutritional risk was assessed using the validated dietary screening tool (DST); sensitivity (83%) and specificity (75%) (Bailey et al., 2007; Bailey et al., 2009). The DST questionnaire includes 25 questions designed to determine the dietary intake frequencies (DIF) of “whole fruit and juice,” “vegetables,” “total and whole grains,” “lean proteins,” “added fats, sugars, and sweets,” “dairy,” and “processed meats” (Bailey et al., 2007; Bailey et al., 2009). DIF identified how often during a week the food group is typically consumed. Points for each category are specified and weighted using the Healthy Eating Index guidelines (The Center for Nutrition Promotion and Policy, 2015b) to sum up to a total possible score of 100 (Bailey et al., 2009). Diet categories are separated into “Prudent” and “Western” dietary patterns (Bailey et al., 2009).

A “Prudent” dietary pattern reflects a nutrient dense diet of dairy, lean protein, vegetables, whole grains, and fruit, which are given more points for higher dietary intake frequencies (Bailey et al., 2009) (Table 4-2). On the other hand, a “Western” dietary pattern represents a low nutrient dense diet of processed meats, and added fats, sugars, and sweets. The foods included with the “Western” dietary pattern used a reverse score in

that a higher score reflects a lower dietary intake frequency of these foods (Bailey et al., 2009) (Table 4-2).

Total DST scores classify participants' nutritional intake into categories of "at risk" (scores <60), "possible risk" (scores 60-75), and "not at risk" (scores >75) (Bailey et al., 2009). The DST has been used in a variety of community-based programs and studies to assess nutritional risk and dietary intake frequencies (Cottell, Dorfman, Straight, Delmonico, & Lofgren, 2011; Francis, MacNab, & Shelly, 2014; Lillehoj, Yap, Montgomery, Shelley, & Francis, 2018; MacNab et al., 2018; Taetzsch et al., 2015).

Participants

Newly enrolled MOW participants (n= 167) were assessed. At the time of the screening, the following information was collected: nutritional risk, dietary intake frequencies, month of enrollment, gender, and access to a working stove, oven or microwave. Age and ethnicity were not included with the data shared by the MOW program due to confidentiality concerns of the MOW program; however, all participants were 60 years and older. In terms of race, it is likely most participants were white as the census for this area indicates 97.3% of older adults are White, 1.1% Black, 0.8% Asian, and 0.2% American Indian or Alaska Native (U.S. Census Bureau, 2017b).

Statistical Analysis

Data analysis was completed using the IBM Statistical Package for the Social Sciences (SPSS), version 25.0. Total DST scores, nutritional risk classification, dietary intake frequencies, and participant characteristics (gender, enrollment, working cooking appliances) were reported using descriptive statistics. Month of enrollment was characterized into binomial variables: winter (January, February, March) and summer

(July, August, September). Dietary intake frequencies were grouped into “low,” “moderate,” and “high” intake classifications (Table 4-2). These groupings were based on total DST scores for each food component. In the “Prudent” diet category, whole fruit and juice, total and whole grains, and vegetables classifications were based on a score of 0-5 points indicating “low” intake, 6-10 points indicating “moderate” intake, and 11-15 points indicating “high” intake (Table 4-2). Furthermore, dairy and lean protein were classified based on a score of 0-5 points indicating “low” intake and 6-10 points indicating “high” intake (Table 4-2). In the “Western” diet category, processed meat was classified based on 0-5 points indicating “high” intake and 6-10 points indicating “low” intake, while added fats, sugars, and sweets were classified based on 0-10 points indicating “high” intake, 11-15 points indicating “moderate” intake, and 16-25 points indicating “low” intake (higher scores reflect lower dietary intake frequencies, which is desirable for these groups) (Table 4-2).

A main effects general linear model was used to determine to what extent gender, seasonal enrollment, and working cooking appliances impacted nutritional risk and dietary intake frequencies. Independent-samples t-tests were conducted to assess to what extent gender and season impacted nutritional risk and dietary intake frequencies.

Statistical significance was determined at $p < .05$.

Results

A majority of the sample population was female (62.9%) and enrolled in MOW during the winter (85%) (Table 4-1). Enrollment months included January (n=41), February (n=54), March (n=47), July (n=14), August (n=0), and September (n=11)

(Table 4-1). August information was not provided due to administrative challenges towards collecting the DST information. Most participants reported having a working stove, oven, or microwave (96.4%) (Table 4-1). Over half (53.9%) were classified “at nutritional risk”, 43.7% “at possible nutritional risk”, and 2.4% “not at nutritional risk” (Table 4-1).

Table 4-1. *Characteristics of Newly Enrolled Meals on Wheels Participants (n=167)*

	Number	Percent (%)
Gender		
Females	105	62.9
Males	62	37.1
Enrollment Month		
January	41	24.6
February	54	32.3
March	47	28.1
July	14	8.4
August	0	0
September	11	6.6
Enrollment Season		
Winter	142	85
Summer	25	15
Working stove, oven, or microwave		
Yes	161	96.4
No	6	3.6
Nutritional Risk Classification		
At nutritional risk (<60)	90	53.9
At possible nutritional risk (60-75)	73	43.7
Not at nutritional risk (>75)	4	2.4

Participants reported “low” dietary intake frequencies of dairy (5.37 ± 2.90), lean protein (4.74 ± 1.85), and processed meat (7.47 ± 2.38). “Moderate” dietary intake frequencies were found for vegetables (8.74 ± 3.60), total and whole grains (10.29 ± 3.75), whole fruit and juice (9.39 ± 3.85), and added fats, sugars, and sweets (11.42 ± 4.01) (Table 4-2).

Table 4-2. *Dietary Intake Frequencies (DIFs)*

DIF Categories (Maximum Points)	Mean Score ± SD	“Low” DIF	“Moderate” DIF	“High” DIF
Dairy (10)	5.4 ± 2.90	0-5	--	6-10
Lean Protein (10)	4.7 ± 1.85	0-5	--	6-10
Vegetables (15)	8.7 ± 3.60	0-5	6-10	11-15
Total and whole grains (15)	10.3 ± 3.75	0-5	6-10	11-15
Whole fruit and juice (15)	9.4 ± 3.85	0-5	6-10	11-15
Processed meat (10) ^a	7.5 ± 2.38	6-10	--	0-5
Added fats, sugars, and sweets (25) ^a	11.4 ± 4.01	16-25	11-15	0-10

^a A higher score reflects a lower dietary intake frequency.

Factors Impacting Nutritional Risk

Mean DST scores were significantly ($p=.0005$) lower among males (53.3 ± 1.61) compared to females (59.8 ± 1.02) (Table 4-3). Season of enrollment and working cooking appliances did not significantly impact nutritional risk.

Factors Impacting Dietary Intake Frequencies

Working cooking appliances did not significantly impact dietary intake frequencies. Mean whole fruit and juice dietary intakes were significantly ($p=.030$) lower among males (8.6 ± 4.25) compared to females (9.9 ± 3.53) (Table 4-3). Mean vegetable dietary intake was also significantly lower ($p<0.0005$) among males (7.0 ± 3.45) compared to females (9.8 ± 3.30) (Table 4-3). Mean lean protein dietary intake was significantly ($p=.04$) lower among winter enrollment (4.6 ± 1.79) compared to summer enrollment (5.4 ± 2.08) (Table 4-3).

Table 4-3. *Factors Impacting Nutritional Risk and Dietary Intake Frequencies*^a

	Mean difference	Standard error	p-value	95% CI for difference	
				Lower bound	Upper bound
Gender^b					
DST Score (M<F)	6.49	1.81	<.0005*	2.91	10.07
Dairy (M<F)	0.85	0.46	0.07	0.06	1.76
Lean protein (M<F)	0.25	0.30	0.40	0.34	0.83
Vegetables (M<F)	2.72	0.54	<.0005*	1.66	3.78
Total and whole grains (M<F)	0.82	0.60	0.17	.37	2.00
Whole fruit and juice (M<F)	1.34	0.61	0.030*	0.13	2.54
Processed meat (M<F)	0.62	0.38	0.10	0.13	1.37
Added fats, sugars, sweets (M>F)	0.10	0.64	0.87	1.17	1.38
Season^c					
DST Score (W>S)	1.01	2.55	0.69	-4.02	6.04
Dairy (W<S)	0.46	0.63	0.47	0.79	1.70
Lean protein (W<S)	0.83	0.40	0.04*	0.04	1.61
Vegetables (W>S)	0.59	0.78	0.45	0.95	2.13
Total and whole grains (W>S)	1.00	0.81	0.22	0.61	2.60
Whole fruit and juice (W<S)	1.42	0.83	0.09	0.22	3.07
Processed meat (W>S)	0.98	0.51	0.58	0.03	1.99
Added fats, sugars, sweets (W>S)	1.15	0.87	0.19	0.56	2.87

^aBased on estimated marginal means. ^bM=Males, F=Females ^cW=Winter enrollees, S=Summer enrollees *Significance indicated by a p value <0.05.

Limitations

The generalizability of these findings is limited due to a small sample size and limited sociodemographic data on the sample population. Unequal samples sizes between the summer (n= 25) and winter (n=142) groups likely contributed to the lack of seasonal impact. Additionally, self-reported dietary intake utilizing the DST may be subject to social desirability, which drives participants to report information in a way that represents themselves more positively (Subar et al., 2015). Despite these limitations, these findings add to the body of literature surrounding nutritional risk among home-delivered meal

participants. Expanding this work to include a larger, diverse sample of home-delivered meal participants is warranted.

Discussion

Nutritional Risk

Results from this study indicated that most of the MOW participants screened were “at nutritional risk” or “at possible nutritional risk.” MacNab and others (2018) found similar outcomes when assessing nutritional risk among community-residing older adults where in over three-quarters (78.4%) were “at risk” or “at possible risk.” This is not surprising however, since the national percentage of HDM participants categorized at “high nutritional risk” has grown exponentially (HHS & ACL, 2019).

The lack of association between access to working cooking appliances and nutrition risk among this sample is likely because nearly all had a working stove, oven or microwave. This is consistent with Mabli et al. (2017) and Frongillo et al. (2018) who reported a majority of home-delivered meal participants in their samples had a working stove, oven, or microwave. Furthermore, season of enrollment (winter versus summer) did not impact nutritional risk among this sample. However, inability to determine a seasonal influence on nutritional risk may have been due to a small sample size of summer enrollees related to challenges collecting August DST data. While seasonal changes in dietary intake (Aparicio-Ugarriza et al., 2018; Bernstein et al., 2016; Ersoy et al., 2018; Jahns, et al. 2016; Stelmach-Mardas et al., 2016) and biomarkers of nutritional status (Ersoy et al., 2018) have been previously examined, to our knowledge there is little research available looking at the association between season and nutritional risk,

especially among Western populations. Further research is necessary to understand this gap in knowledge.

In this study, gender did impact nutritional risk. MacNab et al. (2018) and Mercille et al. (2016) report similar outcomes among community dwelling older adults. Similarly, Locher et al. (2008) found homebound older adult males were at a higher risk of under-eating than females. Previous research has suggested that poor dietary habits among males may be related to a traditionally feminized role of food purchasing and cooking (Anne, Bisakha, Kilgore, & Locher, 2014; Drummond & Smith, 2006; Thompson, Tod, Bissell, & Bond, 2017), lack of nutritional knowledge (Baker & Wardle, 2003; Drummond & Smith, 2006; Mercille et al., 2016; Nicklett & Kadell, 2013), and eating alone (Atkins et al., 2015; Wham & Bowden, 2011). A trend in female responsibility for a majority of household food purchasing and meal preparation has held consistent across various age groups (Adams et al., 2015; Hartmann, Dohle, & Siegrist, 2013; Lake et al., 2006); however, this trend may shift over time as younger cohorts of both genders have been suggested to have a reduced interest in meal preparation (Adams et al., 2015). More research is needed to examine gender-specific nutritional risk influences on the nutritional risk of males.

Dietary Intake Frequencies

Except for whole grains, dietary intake frequencies among this sample were low compared to national older adult average intakes, as indicated by the Healthy Eating Index-2015 (The Center for Nutrition Policy and Promotion, 2015a). Additionally, when compared to the community-residing older adults in MacNab et al. (2018), our sample of newly enrolled MOW participants exhibited reduced dietary intake frequencies in all the

DST diet categories. Furthermore, our study participants had an estimated lower dietary intake of fruits, vegetables, and dairy in comparison to the national sample of HDM participants in Mabli et al. (2017).

The DST is a helpful tool for identifying specific dietary components HDM services can focus on to prevent nutritional risk among participants. Among this sample, the dietary intake frequency findings suggest the MOW program should encourage the consumption of dairy and lean protein foods, as these were identified to be “low” in terms of dietary intake frequencies. Doing so may help to prevent their risk of sarcopenia (muscle wasting) (Deer & Volpi, 2015; Gorissen & Witard, 2018; Hanach, McCullough, & Avery, 2019; Jensen, 2008). Additionally, dairy consumption has been associated with improved body composition, reduced susceptibility to chronic disease, improved bone mineral density, and may be especially beneficial for the prevention of bone loss and frailty in older adults (Lana, Rodriguez-Artalejo, & Lopez-Garcia, 2015; Rozenberg et al., 2016; Thorning et al., 2016).

Similar to nutritional risk, gender had a significant impact on dietary intake frequencies among this sample. Males reported lower dietary intake frequencies of whole fruit and juice, as well as vegetables compared to females. Other studies have also suggested that males tend to consume fewer servings of fruits and vegetables, in addition to having decreased knowledge of fruit and vegetable recommendations and their benefits (Baker & Wardle, 2003; MacNab et al., 2018; Nicklett & Kadell, 2013).

Lean protein intake was significantly lower among winter enrollees compared to summer enrollees, although to a small degree. To our knowledge, few studies have looked at the impact of season on older adult dietary patterns. Among general adult

populations, seasonal influence on dietary intake is inconsistent and influenced by climate as well as cultural habits (Stelmach-Mardas et al., 2016). While Bernstein et al. (2016) found no seasonal variation among adult dietary intake patterns in metropolitan Washington D.C., a systematic review by Stelmach-Mardas et al. (2016) reported decreased intakes of fruit and increased intake of vegetables from winter to spring, further increased intake of vegetables from spring to summer, and decreased intakes of vegetables, meat, and eggs from summer to autumn. This review spanned 21 countries and include both rural and urban communities. The previous studies were conducted with a wide range of healthy adults spanning 14 to 85 years of age (Bernstein et al., 2016; Stelmach-Mardas et al., 2016). Ages 14 through 18 were included in one of the 26 studies reviewed by Stelmach-Mardas et al., as the country where data collection occurred recognizes adulthood at age 14. Work by Jahns et al. (2016) also identified decreased intake of some fruits and vegetables during winter compared to summer months among women who were middle age residing in urban North Dakota.

Summary

With rising rates of nutritional risk among home-delivered participants, determining factors contributing toward their nutritional risk can help home-delivered meal programs optimize the impact of their services. Such factors can guide development of program design and intervention strategies. This study provides evidence of high nutritional risk among newly enrolled MOW recipients, primarily attributable to low dietary intake frequencies of lean protein and dairy. These findings also suggest higher nutritional risk status among older adult males compared to females that is consistent with previous research. Future studies determining gender-specific factors influencing

nutritional risk and response to dietary interventions may help to optimize nutritional status among male and female participants. Further research is needed to determine the impact of season on nutritional risk.

Take-Away Points

- Identification of factors influencing nutritional risk (e.g., gender, dietary patterns, season) can guide the development of strategies optimizing the ability of home-delivered meal programs to combat high nutritional risk rates among clients.
- Gender-specific factors influencing nutritional risk should be considered to optimize dietary interventions among male and female HDM participants, as older adult males are suggested to be at a higher nutritional risk status compared to females.
- Identifying dietary intake frequencies contributing to nutritional risk, such as low lean protein and dairy intake among this study, can help tailor dietary interventions encouraging consumption of “prudent” dietary patterns among individuals at risk.

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**CHAPTER 5. MAKING HOME-DELIVERED MEAL PROGRAMS RELEVANT
FOR TODAY'S AGING ADULT**

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Abstract

The growing aging population increases the need for community food programs like home-delivered meals (HDM). This study explored factors influencing aging adults' interest in HDM programs, like Meals on Wheels (MOW). Four focus groups were held with 31 primarily retired, White, females between ages 65-84 years in a Midwest state. Focus groups were audio-recorded, transcribed, and analyzed. Many were aware of MOW but lacked awareness of other HDM programs. MOW was associated with loss of independence, poor food quality, and companionship. Participation motivators included affordable cost, choices/variety, nutritionist/dietitian involvement, and clientele testimonies. Participation barriers were distrust of marketing claims, food safety concerns, and limited meal storage space. Preferred program attributes included convenience and quality menu options. Preferred promotional strategies included brochures, in-person presentations, and product sampling. By addressing these motivators and preferred marketing strategies HDM programs may be better able to appeal to today's aging adult.

Keywords: older adults, meal service, Meals on Wheels, aging, perceptions

Introduction

As the United States (U.S.) continues to experience rapid growth trends among an aging population, community-based resources to meet the needs of older adults are becoming increasingly important. Around one in seven U.S. citizens classifies as an older adult, those aged 60 to 65 years and older (Administration on Aging, 2018). Growth rates are expected to reach 81.7% by 2040, and 97.5% by 2060 (Administration on Aging, 2018).

Parallel to the aging boom, older adults face increasing barriers to optimal aging (Brummel-Smith, 2007). Despite increases in average life expectancy, older adults on average are living longer with rising rates of chronic disease, food insecurity, functional impairments, and health care costs (Administration on Aging, 2018; Crimmins & Beltrán-Sánchez, 2011; United Health Foundation, 2017). These issues along with factors such as mental health and aging-related physiological changes put many older adults at an increased risk of malnutrition (Bernstein & Munoz, 2012; Hamirudin, Charlton, & Walton, 2016; Malnutrition Quality Collaborative, 2017).

Malnutrition is defined by dietary excess, inadequacy, or imbalance and can lead to adverse health consequences such as severe weight loss, sarcopenia, decreased life expectancy, reduced cognition, elevated inflammation, and functional impairments (Tilly, 2017). Adequate nutrition is a key component of optimal aging, supporting activities of daily living (ADLs), improving overall health, and reducing health care costs (Bernstein & Munoz, 2012; The Malnutrition Quality Collaborative, 2017). Yet, many older adults do not meet the recommended 2015-2020 Dietary Guidelines, indicated by an average

Healthy Eating Index score of 65.5 out of 100 (The Center for Nutrition Policy and Promotion, 2015).

Food insecurity, characterized by irregular access and uncertainty in obtaining food, is a serious issue contributing to malnutrition rates among older adults (Gregory & Coleman-Jensen, 2017). From 2001 to 2015, older adults experiencing food insecurity increased by 200% (Ziliak & Gundersen, 2017). As of 2017, food insecurity among older adults grew to 15.8% (United Health Foundation, 2017). Older adults are at high risk of adverse health effects related to food insecurity (Feeding America & National Foundation to End Senior Hunger, 2014). One significant barrier contributing to malnutrition and food insecurity among older adults is functional impairment. One in three older adults has one or more disabilities (United Health Foundation, 2017). This can negatively impact their ability to take transportation to, shop for, prepare, and consume a nutrient-dense diet.

Community-based food and nutrition programs are valuable resources in addressing the nutritional health of aging adults. One such program is the home-delivered meal program. Home-delivered meals programs aim to reduce hunger and food insecurity; promote socialization, health, and well-being; and delay adverse health conditions among older adults (Older Americans Act of 1965). Meals served under the programs provide at least one-third of Dietary Reference Intakes, and meet the special dietary needs of older adults (Older Americans Act of 1965). Home-delivered meal programs improve nutrient intake, reduce food insecurity, and may reduce health care utilization among aging adults (Berkowitz, 2017; Cho, Thorud, Marishak-Simon, Frawley, & Stevens, 2015; Lloyd & Wellman, 2015; Mabli et. al., 2017; Mabli et al.,

2018; Thomas & Mor, 2013a-b; Zhu & An, 2014;). The largest provider of home-delivered meals under the Older Americans Act is Meals on Wheels. Meals on Wheels participation has resulted in increased nutrient intake, decreased isolation, improved self-reported health, increased feelings of safety, and a greater ability to remain in their home (Lloyd, 2017; Thomas, Smego, Akobundu, & Dosa, 2015).

Despite promising outcomes among those receiving home-delivered meal programs, many who are eligible for meals are not participating (Colello, 2011; Jeszeck, 2015). Up to 75% of older adults in need of home-delivered meal programs do not receive them. Of older adults who are food insecure, 90% do not receive either congregate or home-delivered meals, and 93.2% of older adults with at least one difficulty performing ADLs do not receive home-delivered meals (Jeszeck, 2015). Low participation rates are thought to be attributable to many factors including limited federal funding, low program awareness, limited access, and negative appeal of meals; however, further research is needed to determine why this gap exists (Colello, 2011; Institute of Medicine & Food and Nutrition Board, 2012; Jeszeck, 2015).

While previous research has identified preferences among older adults already participating in a home-delivered meal program (Evans et al., 2014; Frongillo, Isaacman, Horan, Wethington, & Pillemer, 2010; Joung, Kim, Yuan, & Huffman, 2011; Kretser, Voss, Kerr, Cavadini, & Friedmann, 2003; Mabli et al., 2017; Timonen & O'Dwyer, 2010), there is limited research on the perceptions and preferences of older adults not currently receiving home-delivered meals. This qualitative study aimed to determine factors influencing older adults' interest in and likelihood to participate in home-delivered meal programs, such as Meals on Wheels.

Methodology

Adults 50 years and older in a Midwest state were recruited to participate in one of four focus groups. Focus group locations included congregate meal sites (n=2 meal sites) and apartments funded through the housing choice voucher (formerly known as Section 8) for older adults (n=2 apartment buildings). Thirty-one adults participated. Participants completed a 21-question sociodemographic questionnaire and were asked 13 open-ended questions related to awareness, perceptions, participation motivators and barriers, preferred attributes, and how they would like to receive information about Meals on Wheels or other home-delivered meal programs. Study protocol was reviewed by Iowa State University's Institutional Review Board for Human Subjects and was classified as exempt.

Social Marketing Theory

To increase participation in home-delivered meal programs, providers need to have a better understanding of the needs and preferences of older adults. One means of doing this is to utilize social marketing theory (SMT) principles. With the benefit of the consumer in mind, SMT is a theory that applies commercial marketing principles to analyze, plan, execute, and evaluate programs to influence voluntary behavior with the goal of improving personal and societal well-being (Storey, Saffitz, & Rimon, 2008). SMT provides a useful framework for implementing strategies promoting the use of home-delivered meals among eligible older adults, and has been used to promote participation among other community food and nutrition programs (Finney Rutten, Yaroch, Pinard, & Story, 2013; Francis, Martin, & Taylor, 2011).

The SMT framework involves a continuous cycle of (1) planning/strategy, (2) selecting channels and materials, (3) developing materials and pretesting, (4) implementation, (5) assessing effectiveness, (6) gathering feedback to revise the program (Lefebvre & Rochlin, 1997). This study focuses on step one of the SMT—planning and strategy (Figure 5-1). The goal of this initial research was to gather information on the needs and preferences of potential home-delivered meal participants. Gaining insight of the factors influencing home-delivered meal use can then be used to guide future revisions of program services and development of marketing techniques that are compatible with the target audience.

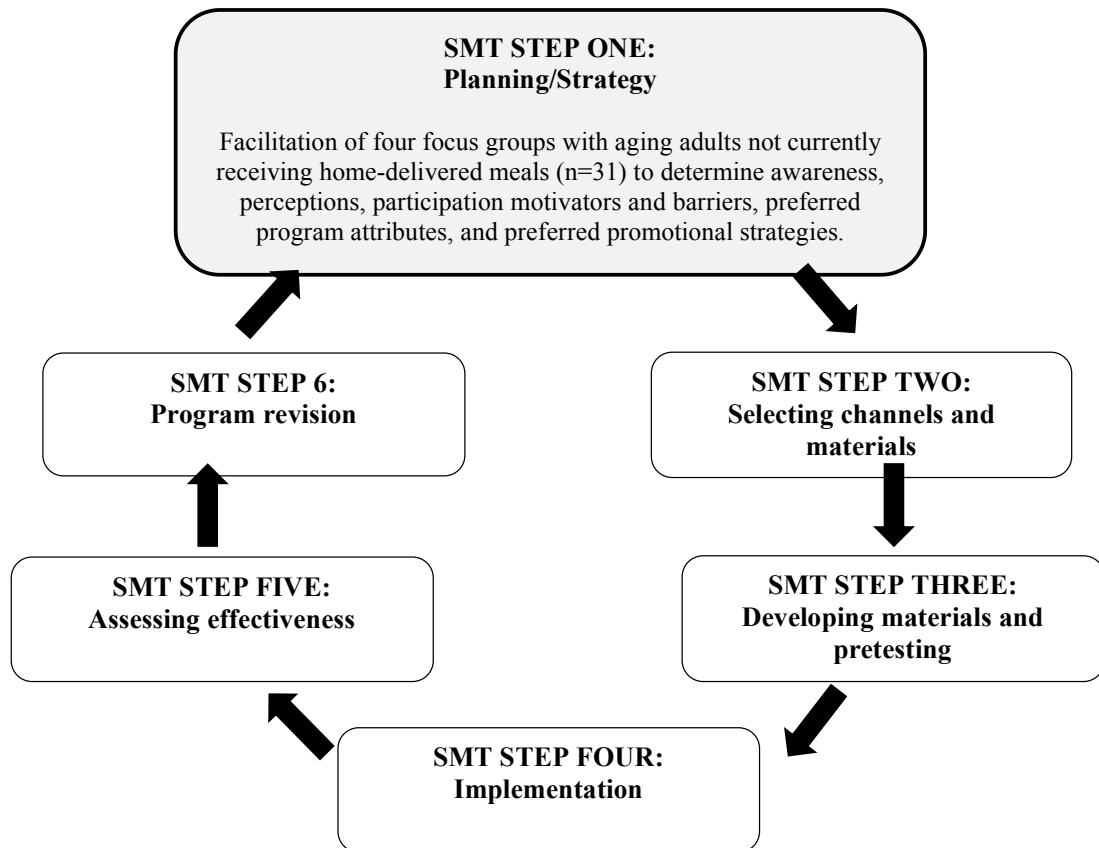


Figure 5-1. Social Marketing Theory Process Model

Recruitment

Adults ages 50-75 years who were not currently receiving Meals on Wheels were recruited to participate. A sample size of 30 to 50 (6-10 participants/focus group x 5 focus groups) was needed to obtain adequate feedback for framework analysis and the identification of themes; 31 participated. Participants were recruited from congregate meal sites (in-person recruitment), housing choice voucher apartments for older adults (invitation by social worker), and churches (email listservs). Adults 50-59 years of age were included in recruitment efforts to provide future insights into the needs of aging adults; however, none responded to the email invitation sent to the churches.

Data Collection and Analysis

Sociodemographic characteristics were analyzed using descriptive statistics (IBM Statistical Package for the Social Sciences, version 25.0). Focus groups sessions were facilitated by Rudolph, audio-recorded, and transcribed verbatim by a research team member who was not present during the focus groups. Transcriptions were analyzed for themes using framework analysis principles of familiarization, indexing, charting, and interpreting (Rabiee, 2004). A research team (n=5), trained in thematic framework analysis by Francis, reviewed the transcriptions independently to develop a thematic framework. Following independent analysis, the research team met for further theme development (indexing, charting, interpreting) and determined consensus on resulting themes.

Results

Participants

The majority of participants were retired (80.6%), white (90.2%), educated females (77.4%) between the ages of 65-84 years of age (Table 5-1). Most participants reported living alone (74.2%). Social security was the primary source of reported income (80.6%) (Table 5-1). Almost half categorized their health as “somewhat good” (45.2%) and had at least one chronic health condition (83.9%) (Table 5-1). A majority (71%) classified as food secure (Gundersen, Engelhard, Crumbaugh, & Seligman, 2017) and reported using a personal vehicle as their primary transportation (Table 5-1).

Table 5-1. *Sociodemographic Characteristics of Participants (n=31)*

Characteristic	Number	Percent (%)	
Age (years)	< 65	4	12.9
	65 to 74	12	38.7
	75 to 84	14	45.2
	≥ 85	1	3.2
Gender	Females	24	77.4
	Males	7	22.6
Race^a	American Indian/Alaska Native	2	6.5
	Black	2	3.2
	Hispanic	1	6.5
	White	28	90.2
	More than one race	2	6.5
Education	Less than HS degree	1	3.2
	High School/GED	9	29.0
	Some College	4	12.9
	Associates	4	12.9
	Technical School	1	3.2
	Bachelor's	6	19.4
	Graduate	6	19.4

^aParticipants selected more than one answer.

Table 5-1. *Sociodemographic Characteristics of Participants (n=31) (continued)*

Characteristic	Number	Percent (%)
Food Security Classification^b		
Food Insecure	9	29.0
Food Secure	22	71.0
Household Size		
1	23	74.2
2	8	25.8
Marital Status		
Divorced	9	29.0
Married	9	29.0
Separated	1	3.2
Single, never married	2	6.5
Widowed	10	32.3
Primary Source of Income^a		
Retirement Funds	11	35.5
Social Security	25	80.6
Spouse/partner	3	9.7
Stock Portfolio	2	6.5
Other	4	12.9
Primary Transportation		
Friend/Family	2	6.5
Personal Vehicle	25	80.6
Public Transportation	4	12.9
Self-report health		
Somewhat poor	6	19.4
Average	5	16.1
Somewhat good	14	45.2
Very good	6	19.4
Diagnoses^a		
Cancer	5	16.1
Diabetes	10	32.3
Heart attack, high blood pressure, high cholesterol	13	41.9
Kidney Disease	1	3.2
Stroke	2	6.5
Other	8	25.8
None	5	16.1

^aParticipants selected more than one answer.

^b(Gundersen et al., 2017)

Over half (54.8%) attended a congregate meal site (Table 5-2). Many reported being responsible for their food purchases (87.1%) and meal preparation (77.4%) (Table 5-2). Nearly half (48.4%) of participants did not follow a special diet.

Table 5-2. *Food Behaviors of Participants (n=31)*

	Number	Percent (%)
Community Food and Nutrition Program Use^a		
Commodity	8	25.8
Congregate Meal Site	17	54.8
Family/Friends	7	22.6
Food Pantries	4	12.9
Senior Farmer's Market	1	3.2
SNAP	3	9.7
Purchasing Status		
Independent	27	87.1
Able to make small purchases	3	9.7
Needs to be accompanied	1	3.2
Preparation Status		
Independent	24	77.4
If supplied ingredients	4	12.9
Can prepare but don't maintain nutritious diet	3	9.7
Special Dietary Practices^a		
Dairy-free	1	3.2
Diabetes	7	22.6
Gluten-free	1	3.2
Heart healthy	9	29.0
Restrict red meat/pork	2	6.5
Other ^b	2	6.5
None	15	48.4

^aParticipants selected more than one answer.

Themes

Awareness and Perception of Home-Delivered Meal Programs. Few

participants were aware of home-delivered meal services aside from Meals on Wheels such as Mom's Meals, local food service organizations, or home-delivered meals served out of local churches and congregate meal sites. Although most participants were aware of Meals on Wheels, many lacked knowledge of the specific program eligibility

components frequently asking questions about cost and requirements. General perceptions of Meals on Wheels associated the program with poor food quality, tasteless food, and limited variety. For many, receiving Meals on Wheels symbolized a loss of independence. One participant made the analogy that signing up for Meals on Wheels was similar to giving up a driver's license, stating, *"We don't want to admit we can't do something... Kind of like giving up your driver's license. Take that away it's just like you lost your arm and both legs."* Another responded, *"It doesn't, right now, appeal to me as something to do. Because I can still move myself. It would probably take away my independence."* Participants placed high value on maintaining their independence, whether it's selecting the food they eat or holding on to the responsibility of preparing their own meals.

Meals on Wheels was positively associated with companionship. In speaking of past experiences with friends or family using Meals on Wheels, participants stated appreciation for the safety and socialization Meals on Wheels provides. When describing an experience with a family member receiving Meals on Wheels one person stated, *"More than the meal component was the companionship component, the checking in on someone every day was just as important."* While another shared, *"A bigger picture than just the food—the fact of the person coming to the house and seeing somebody who might not see anybody."*

Factors Influencing Home-Delivered Meal Program Use. Key motivators that would influence participants to use a home-delivered meal program were cost, number of

choices, nutritionist or dietitian involvement, and positive testimonies from others who have used the program.

Cost was the driving force behind the participant's decision to choose any home-delivered meal program. This was illustrated by comments such as, *"Cost overrides everything,"* and *"the dollar bill is important to us."* The preferred cost ranged between \$5-7 per meal; however, a few participants noted that they would be willing to pay higher prices for the benefit of staying out of long-term care services and if the meal is of a higher quality and quantity. One participant stated, *"If this keeps you out of assisted living, then it's worth quite a lot."* Discounts such as providing reduced prices for customer duration and age were also of interest to the participants.

Choice was a top priority among participants; associated with independence, taste preferences, and flexibility. It was noted, *"Choice is important; in being able to make choices for yourself."* Although most participants did not indicate the need for specialty meal options such as diabetes-friendly and heart healthy meals, they preferred the options be made available to them.

Participants were also asked about factors that would specifically influence their decision to use Meals on Wheels. Themes identified were acquisition of a short or long-term physical impairment, cost, food selection, convenience, and the ability to maintain their independence. For some it was preferred for short-term use, reporting, *"... for myself, when I think about it, [I wouldn't use it] unless it's just the temporary thing."*

Barriers to general home-delivered meal program use were affordability, distrust of meal program marketing claims, food safety concerns, and lack of meal storage space.

When describing health advertisements of various home-delivered meal programs and business organizations providing full meal delivery, health claims were not favored among participants, noting that this, *“Doesn’t sound very tasty.”* Concerns of food safety centered around participants worry of the food being at unsafe temperatures during delivery, meal expiration dates, and added preservatives. Refrigerated meals lasting up to two weeks were viewed negatively as having added preservatives that may poorly impact their health. Buying meals in bulk was also of concern due to limited refrigerator and freezer space.

Factors Influencing Food Selection. When purchasing food, participants consider cost, foods to support management of health conditions, health conscious choices, what they’re in the mood for, general food preferences, and accessibility to a grocery store. Participants preferred foods they grew up with and are familiar with as demonstrated by the comment, *“Well I tend to eat the way I was raised.”* Participants also valued convenience when selecting foods. They tended to prefer foods that are easy to prepare, frozen, and have an extended shelf life.

Cooking was of low interest. One mentioned, *“Part of me avoids cooking anything real elaborate because I do not want the mess.”* Other obstacles were related to limited time, lack of motivation to cook for one or two household members and dislike of food waste. One participant reported changing taste buds with age, *“... the things that used to be really savory and [that I was] really really looking forward to, I can barely taste them... sugar, and salt and fat and stuff [makes] it tastes better.”*

Participants were also asked to identify perception of “healthy food” compared to “unhealthy food.” Perceptions of “healthy” food included food patterns that followed

MyPlate recommendations such as consumption of fruits, vegetables, lean meats, fish, grains, fiber, and protein (U.S. Department of Agriculture, 2019). “Restrictions” were commonly associated with “healthy” food as well including low sodium, low sugar, and low fat. Many participants perceived “healthy” food to be unpalatable.

Factors influencing the participants to consume “healthy” foods included management of health conditions (e.g., diabetes, high blood pressure, stroke), general health goals (e.g., lose weight, live longer, feel better) and how their taste and quality preferences match up with “healthy” food items. Common obstacles to consuming healthy food daily included limited time, lack of motivation to cook, cost, unwanted food waste, and limited nutritional knowledge.

Preferred Methods of Promotion. When it came to home-delivered meal program promotion, participants preferred printed information that can be easily read or kept. In-person presentations including free meal samples were also requested among participants. Word of mouth was reported as highly influential on participant reception of a meal program.

Limitations

The generalizability of our results is limited by lack of diversity in the study’s sample population. Participants were primarily white females currently utilizing older adult community services such as congregate meal sites and housing choice voucher programs. Focus group research additionally opens the opportunity for social bias and collective voice (i.e., participants tend to agree with each other more due to being nervous to go against the crowd).

Discussion

Further understanding of factors influencing aging adults' interest in home-delivered meals is key to determining solutions to increase program use by those who can benefit from the service. Utilizing the SMT as framework, feedback from aging adults can be used to revise program attributes of home-delivered meals as well as implement effective marketing strategies to peak older adult interest.

While lack of knowledge of Meals on Wheels has been reported in previous studies (Wilson & Dennison, 2011), awareness was not a barrier among our sample of older adults. More notable were the perceptions associated with Meals on Wheels including loss of independence, poor food quality and variety, and companionship. These results are consistent with Wilson & Dennison (2011), who found that older adults not receiving Meals on Wheels negatively associated the service with unattractive meals, repetitive meal choices, and loss of independence and pride (e.g., feelings of embarrassment if neighbors saw meals being delivered), while positively associating the service with social contact.

A high value on maintaining independence among our aging participants is consistent with current literature (Ahn, Kwon, & Kang, 2017; Host, McMahon, Walton, & Charlton, 2016; Rabiee, 2013). Home-delivered meal programs should put forth effort to promote themselves as a way to stay independent and destigmatize this association. This may be lessened if program materials include images and testimonials of energized, diverse older adults who are using home-delivered meals to enhance their independence in the comfort of their home.

Food preferences of aging adults are highly influential on home-delivered meal satisfaction and participation. A recent evaluation of Older Americans Act meal programs found that 25% of participants reported dissatisfaction with the food taste and variety (Mabli et. al., 2017). Our findings revealed that participants determined food quality by factors such as appearance, variety, texture, and general food preferences. Similarly, Locher et al. (2009) found that sensory appeal was a primary motivator of food choice among older adults. Yang, Buys, Judd, Gower, and Locher (2013) also suggested that gender, ethnicity, and past food habits, customs, and traditions influence food preferences among older adults.

Ongoing tasting panels and menu reviews among target audiences may help to determine meal items that meet both the nutritional needs of older adults as well as their food and taste preferences. To be effective, efforts to reduce malnutrition rates among an aging population must balance both the nutrient needs and taste preferences of older adults. Availability of unappealing food items often leads to restrictive diets in older adults, further increasing their risk of malnutrition (Song, Simon, & Patel, 2014). With taste as an influencing factor in home-delivered meal participation among this sample, community-based food and nutrition programs should be mindful of the age-associated taste declines (Giacalone et al., 2016). This can have significant implications on perception of food taste and quality, providing an additional challenge to balancing nutrient needs and taste preferences among aging adults.

In this study, aging adults valued attributes such as convenience, choices, and affordability in a home-delivered meal program. These results are consistent with Walker & Mesnard (2011), who noted older adults' desire to receive the best services for their

money, demand quality, and prioritize convenient food options. More specifically, Locher et al. (2009) found that the food choices of older adults who were homebound were motivated by convenience and price. Home-delivered meal programs should appeal to these factors when revising programming. Expanding consumer choices can include revisions such as broadening menu selection, offering flexible delivery times, as well as creating a variety of meal quantity and duration options. Home-delivered meal models offering increased flexibility to choose meals, food flavors, and delivery have reported high satisfaction among participants when compared to traditional meal models (Kretser et al., 2003). Alternatively, a review by Winterton, Warburton, and Oppenheimer (2012) warns of the potential disadvantages of meal models offering a wide range of meal and delivery options. More flexible models often result in decreased social contact between volunteer drivers and participants, a key component of the program equally, if not more valued by participants (Winterton et al., 2012). This decrease in social interaction has been attributed to increased time demand on volunteers to meet client preferences and reduced delivery frequency (Winterton et al., 2012).

Home-delivered meal programs may also find success in enhancing marketing messages that appeal to companionship, and include positive testimonials from current clientele, families, and drivers. As cooking motivation was low among our study participants and others (Mills et al., 2017; Wolfson, Bleich, Smith, & Frattaroli, 2016), home-delivered meals should be promoted as a quick to prepare, convenient, and tasteful meal solution. Promoting the positive experiences of home-delivered meal participants who perceive the meals as a release from the burden of cooking, noted by Meals on Wheels recipients in Evans et al. (2014), can highlight this program attribute. Providing

discounts for age, large meal quantities, and length of customer duration are also likely to be influential.

It is common for home-delivered meal programs to market meals as “healthy.” Our results indicated a poor perception of healthy meals among participants, who associated healthy food items with lack of taste. Healthy can be an ambiguous term with various interpretations. Mixed and changing messages from circulating health and nutrition information can lead to confusion and frustration among older adults (Host et al., 2016). Meal programs should market meals by nutrient content (e.g., meals containing at least 1/3 of your daily nutrient requirements) to overcome consumer confusion as to what “healthy” is.

Further research is needed to expand upon factors influencing home-delivered meal use, especially among older males. Research in this area is both limited and often includes predominantly female participants (Locher et al., 2009; Song et al., 2014). This is significant as older males often report increased barriers to meal preparation compared to females, especially after a spouse passes away (Locher et al., 2009). Other avenues for future research include looking at to what extent revisions to home-delivered meal program attributes and marketing techniques (e.g., improving food taste and quality, enhancing marketing messages promoting independent living, expanding customer control and options) impact home-delivered meal participation rates. SMT can be used as a guide for developing and evaluating such revisions.

Take-Away Points

- Aging adults value convenience, variety, affordability, companionship and quality, appealing food in a home-delivered meal program.
- HDM programs should market themselves as a way to stay independent as well as offer a variety of meal and delivery choices to destigmatize current associations with loss of independence.
- HDM programs may be able to broaden meal appeal by promoting the nutrient content of meals rather than advertising them as “healthy.” This helps avoid confusion and frustration among eligible participants over what constitutes as “healthy.”
- Further research on the food quality and taste preferences of aging adults is needed to improve the appeal of HDM program menus and minimize restrictive eating habits among older adults at risk of malnourishment.

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CHAPTER 6. CONCLUSIONS

Home-delivered meal programs, such as Meals on Wheels can have a positive impact on maintaining the health and independence of older adults. However, rising rates of nutritional risk among participants (58% of program participants) and low participation rates (25% of eligible older adults) by older adults exhibiting need for home-delivered meals warrant room for further action (HHS & ACL, 2019; Jeszeck, 2015). Therefore, this mixed-methods assessment was conducted to better understand the needs and preferences of aging adults for a local Meals on Wheels program and to enhance program promotion.

For home-delivered meal programs funded by the Older Americans Act (e.g., Meals on Wheels) to optimize the impact of their services, it is important for providers to better understand the nutritional risk of their customers. Study One, a nutritional risk assessment of newly enrolled Meals on Wheels participants, revealed a majority of local Meals on Wheels participants were “at nutritional risk” or “at possible nutritional risk,” aligning with national trends. Considering intake of dairy and lean protein were low among this sample, Meals on Wheels should encourage the consumption of these foods, which are important in the prevention of sarcopenia and bone loss in older adults. Additionally, males were found to be at a higher nutritional risk status and consume lower intakes of fruits and vegetables. These findings are consistent with previous research. Further understanding of gender-specific factors contributing to nutritional risk can help ensure programs are meeting the needs of both genders. More research is needed to assess the impact of season on the nutritional risk of home-delivered meal participants.

While low participation among eligible older adults may be related to a variety of factors (e.g. limited funding, low awareness, limited program access, negative appeal of meals), the work in this thesis focused on factors relating to the participant. Study Two, a qualitative focus group design conducted among aging adults not currently receiving Meals on Wheels, highlighted the factors influencing older adult interest in participating in a home-delivered meal program. Overall, an ideal home-delivered meal program offers aging adults affordable costs, variety, choice, quality food, and convenience. Perception was also shown to have an influence on participation, as older adults in our study associated Meals on Wheels with companionship, loss of independence, and low food quality. These findings can be utilized to tailor future program modifications and marketing materials to increase awareness and interest among older adults who can benefit from home-delivered meals. Utilizing the social marketing theory framework, such materials can be developed, implemented, assessed, and revised to ensure their effectiveness. Ideas include conducting tasting panels and menu reviews to enhance program food quality; offering more menu choices and variety; creating marketing materials promoting independence, companionship, and convenience; and offering discounts/incentives.

Due to the flexible design of the home-delivered meal program, which allows states to set their own criteria and procedures aside from a few nutritional and cost requirements, home-delivered meal programs operating under the Older Americans Act are uniquely positioned to cater to the needs of their customer population. While it is evident more work is needed to address rising rates of nutritional risk and low participation among older adults in need of these services, data and a theoretical

framework can help ensure that future strategies to alleviate these issues are effective.

The combined findings of these two studies highlight areas home-delivered meal programs can focus on to mitigate factors influencing nutritional risk and influence desire to participate in a home-delivered meal program. Future work is needed to assess the impact of program changes to areas such as menu, marketing, and interventions encouraging consumption of a nutrient dense dietary pattern on home-delivered meal participation and the nutritional risk status of home-delivered meal participants.

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APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVAL FORMS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4366
FAX 515 294-4267

Date: 7/2/2015

To: Dr. Sarah L Francis
1104 HNSB

From: Office for Responsible Research

Project Title: Nutritional Risk Assessment of Meals-on-Wheels participants

The Co-Chair of the ISU Institutional Review Board (IRB) has reviewed the project noted above and determined that the project:

- Does not meet the definition of research according to federal regulations.
- Is research that does not involve human subjects according to federal regulations.

Accordingly, this project does not need IRB approval and you may proceed at any time. We do, however, urge you to protect the rights of your participants in the same ways you would if IRB approval were required. For example, best practices include informing participants that involvement in the project is voluntary and maintaining confidentiality as appropriate.

If you modify the project, we recommend communicating with the IRB staff to ensure that the modifications do not change this determination such that IRB approval is required.

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 10/24/2017

To: Catherine Rudolph
c/o: Sarah Francis
220 MacKay

CC: Dr. Sarah L Francis
220 MacKay

From: Office for Responsible Research

Title: Meals on Wheels Needs Assessment

IRB ID: 17-498

Study Review Date: 10/24/2017

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX B. DIETARY SCREENING TOOL (DST) QUESTIONNAIRE

Please answer the following questions about your dietary intake.	<i>Office Use Only</i>
1. How often do you usually eat fruit as a snack? <input type="checkbox"/> Never (0) <input type="checkbox"/> Less than once a week (2) <input type="checkbox"/> 1 or 2 times a week (4) <input type="checkbox"/> 3 or more times a week (5)	PRDST 1
2. How often do you usually eat whole grain <u>bread</u>s? <input type="checkbox"/> Never or less than once a week (0) <input type="checkbox"/> 1 or 2 times a week (3) <input type="checkbox"/> 3 or more times a week (5)	PRDST 2
3. How often do you usually eat whole grain <u>cereals</u>? <input type="checkbox"/> Never or less than once a week (0) <input type="checkbox"/> 1 or 2 times a week (3) <input type="checkbox"/> 3 or more times a week (5)	PRDST 3
4. How often do you usually eat candy or chocolate? <input type="checkbox"/> Never (4) <input type="checkbox"/> Less than once a week (3) <input type="checkbox"/> 1 or 2 times a week (2) <input type="checkbox"/> 3 or more times a week (0)	PRDST 4
5. How often do you eat crackers, pretzels, chips, or popcorn? <input type="checkbox"/> Never (4) <input type="checkbox"/> Less than once a week (3) <input type="checkbox"/> 1 or 2 times a week (2) <input type="checkbox"/> 3 or more times a week (0)	PRDST 5
6. How often do you eat cakes or pies? <input type="checkbox"/> Never (4) <input type="checkbox"/> Less than once a week (3) <input type="checkbox"/> 1 or 2 times a week (2) <input type="checkbox"/> 3 or more times a week (0)	PRDST 6
7. How often do you eat cookies? <input type="checkbox"/> Never (4) <input type="checkbox"/> Less than once a week (3) <input type="checkbox"/> 1 or 2 times a week (2) <input type="checkbox"/> 3 or more times a week (0)	PRDST 7
8. How often do you eat ice cream? <input type="checkbox"/> Never (4) <input type="checkbox"/> Less than once a week (3) <input type="checkbox"/> 1 or 2 times a week (2) <input type="checkbox"/> 3 or more times a week (0)	PRDST 8
9. How often do you eat cold cuts, hot dogs, lunchmeats or deli meats? <input type="checkbox"/> Never or less than once a week (5) <input type="checkbox"/> 1 or 2 times a week (3) <input type="checkbox"/> 3 or more times a week (0)	PRDST 9
10. How often do you eat bacon or sausage? <input type="checkbox"/> Never or less than once a week (5) <input type="checkbox"/> 1 or 2 times a week (3) <input type="checkbox"/> 3 or more times a week (0)	PRDST 10

<p>11. How often do you eat carrots, sweet potatoes, broccoli, or spinach?</p> <p><input type="checkbox"/> Never (0)</p> <p><input type="checkbox"/> Less than once a week (2)</p> <p><input type="checkbox"/> 1 or 2 times a week (6)</p> <p><input type="checkbox"/> 3 or more times a week (8)</p>	PRDST 11
<p>12. How often do you eat fruit (not including juice)? Please include fresh, canned or frozen fruit.</p> <p><input type="checkbox"/> Never or Less than once a week (0)</p> <p><input type="checkbox"/> 1 or 2 times a week (2)</p> <p><input type="checkbox"/> 3 to 5 times a week (4)</p> <p><input type="checkbox"/> Every day or almost every day (5)</p>	PRDST 12
<p>13. How often do you eat hot or cold breakfast cereal?</p> <p><input type="checkbox"/> Never (0)</p> <p><input type="checkbox"/> Less than once a week (1)</p> <p><input type="checkbox"/> 1 or 2 times a week (3)</p> <p><input type="checkbox"/> 3 to 5 times a week (4)</p> <p><input type="checkbox"/> Every day or almost every day (5)</p>	PRDST 13
<p>14. How often do you drink some kind of juice at breakfast?</p> <p><input type="checkbox"/> Never or Less than once a week (0)</p> <p><input type="checkbox"/> 1 or 2 times a week (2)</p> <p><input type="checkbox"/> 3 to 5 times a week (4)</p> <p><input type="checkbox"/> Every day or almost every day (5)</p>	PRDST 14
<p>15. How often do you eat chicken or turkey?</p> <p><input type="checkbox"/> Never or less than once a week (0)</p> <p><input type="checkbox"/> 1 or 2 times a week (3)</p> <p><input type="checkbox"/> 3 or more times a week (5)</p>	PRDST 15
<p>16. How often do you drink a glass of milk?</p> <p><input type="checkbox"/> Never or Less than once a week (0)</p> <p><input type="checkbox"/> 1 or 2 times a week (1)</p> <p><input type="checkbox"/> 3 to 5 times a week (3)</p> <p><input type="checkbox"/> Every day or almost every day (4)</p> <p><input type="checkbox"/> More than once every day (5)</p>	PRDST 16
<p>17. Do you usually add butter or margarine to foods like bread, rolls, or biscuits?</p> <p><input type="checkbox"/> Yes (0)</p> <p><input type="checkbox"/> No (1)</p>	PRDST 17
<p>18. Do you usually add fat (butter, margarine or oil) to potatoes and other vegetables?</p> <p><input type="checkbox"/> Yes (0)</p> <p><input type="checkbox"/> No (1)</p>	PRDST 18
<p>19. Do you use gravy (when available) at meals?</p> <p><input type="checkbox"/> Yes (0)</p> <p><input type="checkbox"/> No (1)</p>	PRDST 19
<p>20. Do you usually add sugar or honey to sweeten your coffee or tea?</p> <p><input type="checkbox"/> Yes (0)</p> <p><input type="checkbox"/> No (1)</p>	PRDST 20

21. Do you usually drink wine, beer or other alcoholic beverages? <input type="checkbox"/> Yes (0) <input type="checkbox"/> No (1)	PRDST 21
22. How often do you eat fish or seafood that <u>IS NOT</u> fried? <input type="checkbox"/> Never (0) <input type="checkbox"/> Less than once a week (1) <input type="checkbox"/> Once a week (3) <input type="checkbox"/> More than once a week (5)	PRDST 22
23. How many servings of milk, cheese, or yogurt do you usually have each DAY? <input type="checkbox"/> None (0) <input type="checkbox"/> One (3) <input type="checkbox"/> Two or more (5)	PRDST 23
24. How many different vegetable servings do you usually have at your main meal of the day? <input type="checkbox"/> None (0) <input type="checkbox"/> One (1) <input type="checkbox"/> Two (5) <input type="checkbox"/> Three or more (7)	PRDST 24
TOTAL SCORE_____	PRDST 26
DST CLASSIFICATION _____ < 60 points: "at risk;" 60-75: "possible risk;" > 75: "not at risk"	PRDST 27

APPENDIX C. MEALS ON WHEELS FOCUS GROUP QUESTIONNAIRE

The below questions are intended to help us better understand who is attending today's focus group session. The completion of this is voluntary. No names will be associated with these questionnaires.

1. **How old are you?** _____ (years)
2. **Are you male or female?**
 - Male
 - Female
3. **Which one or more of the following would you say is your race?**
 - American Indian or Alaska Native
 - Asian
 - Black
 - Hispanic
 - Native Hawaiian or other Pacific islander
 - White
 - Other, please describe:
4. **What is the highest degree of school you completed?**
 - Less than High School
 - High School/GED
 - Some College
 - Associates
 - Technical School
 - Bachelor's
 - Graduate
5. **Are you...?**
 - Divorced
 - Married
 - Separated
 - Single, never married
 - Widowed
6. **In what county do you reside?** (please print).

7. On average, how many hours do you work weekly?

- Retired
- 10-20 hours weekly
- 21-30 hours weekly
- 31-40 hours weekly
- >40 hours weekly
- I do not work outside the home

8. On average, how many hours do you volunteer weekly?

- None
- <10 hours weekly
- 10-20 hours weekly
- > 40 hours weekly

9. What is the primary source of your monthly income?

- Full-time work
- Part-time work
- Retirement Funds
- Social Security
- Spouse/partner
- Stock Portfolio
- Other (e.g. Pension)

10. What is your primary mode of transportation?

- Friend or Family
- Personal Vehicle
- Public Transportation
- Senior Van
- Taxi/Uber
- I do not travel at all.

11. In the past 12 months, have you used any of the following to receive food items?

- Commodity Supplemental Food Program
- Congregate Meal Program
- Family/Friends
- Food Pantries
- Supplemental Nutrition Assistance Program (i.e. food stamps, food assistance)
- Other Community Food and Nutrition Programs (please list):

12. Which statement best describes your status for purchasing meals/grocery items?

- I can take care of all my meal purchasing needs independently.
- I can shop independently for small purchases.
- I need to be accompanied while purchasing meal items.
- I need someone else to do all my purchasing.

13. Which statement best describes your status for preparation of meals on most days?

- a) I can plan, prepare, and serve nutritious meals independently.
- b) I can prepare adequate meals if supplied with ingredients.
- c) I can heat and serve my meals.
- d) I can prepare my meals but I do not maintain a nutritious diet.
- e) I can plan and prepare my meals, but choose not to. I prefer to frozen meals or eating out.
- f) I need to have my meals prepared and served.

14. Do you follow any special dietary practices? (mark all that apply)

- Dairy-free
- Gluten-free
- Lacto Vegetarian (no animal products except dairy)
- Ovo Vegetarian (no animal products except eggs)
- Pescatarian (restricts meat consumption to seafood only)
- Restrict red meat or pork
- Vegan (no animal products of any kind)
- Heart healthy diet (i.e., low fat, low cholesterol, low sodium)
- Diabetes diet
- Other

15. In general, how would you describe your health?

- Very poor
- Somewhat poor
- Average
- Somewhat good
- Very good

16. **Have you been diagnosed with any of the following? Mark all that apply.**

- Cancer
- Diabetes
- Heart attack, high blood pressure, and/or high cholesterol
- Kidney Disease
- Stroke
- Other (please describe)

17. **How many members of your household, including yourself, are 18 years of age or older?**

18. **How many children less than 18 years of age live in your household?**

19. **What is your estimated annual household income?**

- \$ _____
- I'd rather not say.

For the below statements, please indicate if the statement was often true, sometimes true or never true for you/your household in the last 12 months.

20. **I/We worried whether my/our food would run out before I/we got money to buy more.**

- Often true
- Sometimes true
- Never true
- Don't know

21. **The food that I/we bought just didn't last and I/we didn't have money to get more.**

- Often true
- Sometimes true
- Never true
- Don't know

APPENDIX D. FOCUS GROUP SCRIPT AND QUESTIONS

Introduction (to be read by moderator)

Before we begin today, I would like for each of us to state our first names only. These will not be recorded.

The general purpose of this focus group is to capture your thoughts about home-delivered meal services. This discussion is expected to take about 90 minutes to two hours. Before we begin, there are a few guidelines and ground rules. These will help us hear everyone's thoughts while allowing us to complete the discussion on time.

- a. Everyone's participation is valuable and we want you to feel free to say whatever you think.
- b. Please speak one at a time and not in side conversations. It is okay to agree, but it is also okay to disagree.
- c. There are no right or wrong answers. Your best responses are those that are true for you.
- d. Keep in mind that we are just as interested in negative experiences and perspectives as positive ones.
- e. We must all agree to a very strict level of confidentiality to the information presented during this discussion. Some quotes from this discussion may be shared in presentations and publications, but the quotes will not be linked to any specific person.

To make sure we get everyone's comments, the discussion will be audio -taped and then transcribed at a later time by an independent party who will not know who participated in today's session. _____ will also be taking notes. You can refuse to answer or respond to any question, and you can choose to stop participating in the focus group discussion at any time. I will be reading the questions from my notes because we want to ask the same questions to our focus groups. However, where we go with responses to questions is pretty much up to all of you.

Are there any questions?

1. In general, what influences your choices when buying foods?
2. When you hear the term "healthy food," what comes to mind?
3. What influences you to choose to eat "healthy food?"
4. When you hear the term "unhealthy food," what comes to mind?
5. What influences you to choose foods you consider to be "unhealthy?"
6. Discuss the obstacles that may prevent you from eating "healthy foods" on a daily basis?
7. When you hear "Meals on Wheels" what comes to mind?
8. Describe the factors that would likely influence your decision to receive Meals on Wheels or another home-delivered meal service.

9. Describe other home-delivered meal or food programs with which you are familiar.
10. If given an option, which program would you likely choose and why? (MOW, Mom's Wheels, Freshly, Metabolic Meals, Sister's Home Style Entrees, BistroMD, Magic Kitchen)
11. What components would you like to see in a home-delivered meal program? (Optional prompts: Food specifications? Frequency? Ease of preparation?)
12. How much would you be willing to spend on a home-delivered meal program? What meal (i.e., breakfast, lunch, dinner) would you like provided? How frequently?
13. How would you best like to hear about a home-delivered meal program?