

DESCRIBING NUTRITION EDUCATION NEEDS OF OLDER ADULTS AT
CONGREGATE MEAL SITES AND COMMUNITY SETTINGS

A Thesis

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by

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ABSTRACT

The aim of this study was to identify nutrition education needs and perceptions among older adults in community settings. This investigation used a quantitative questionnaire to describe perceptions among older adults at congregate meal sites. Responses were analyzed using SPSS. Poverty, education and race groups were compared using t-tests. The majority of older adults did not consume enough fluids. Knowledge of hydration, fruit and vegetable recommendations were positively associated with meeting hydration and vegetable recommendations. Low-income and Black older adults reported experience of less social support and greater desire for education in languages other than English. Community dwelling older adults may benefit from educational approaches that address hydration knowledge, and barriers and social support experienced by older adults with incomes below 100% the federal poverty level.

BIOGRAPHICAL SKETCH

Christal graduated with a bachelor's of Science in Nutritional Sciences from Cornell University and completed Cornell's Didactic Program of Dietetics in May 2016. She continued on to Cornell's 2016-2017 Dietetic Internship and its 2017-2018 dietetic Master's program. Her graduate research concentrated on teaching nutrition to older adults in community settings. For her master's thesis, she investigated an adult teaching hypothesis, Malcolm Knowles' andragogy, in identifying the educational needs and preferences of older adults in community settings.

Christal's professional focus is promoting public health through holistic and preventative nutrition. During the Cornell University dietetic internship she developed nutrition education programs on diabetes and MyPlate food groups for congregate meal site clients, analytical reports on congregate meal site client demographics in Onondaga County, an in-service on safe food handling for a Meals on Wheels operation, and a marketing campaign for a themed food fair at UR Strong Memorial Hospital. Furthermore, Christal strengthened proficiencies in evidence-based dietetics practice and electronic medical record charting.

Her passion for nutritional sciences stems from her desire to simplify healthy eating for those without a background in nutritional sciences. She loves exploring different cultural cuisines, from which she has learned healthy eating comes in many forms. Christal looks forward to empowering clients on their journey to nutritional balance through her own nutritional education and experiences.

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CHAPTER 1: Background and Objectives

I. INTRODUCTION

The number of older Americans will likely increase from 46.3 million in 2014 to 98 million in 2060, then accounting for almost a quarter of the US population.¹ According to 2015 national survey data, approximately 9% of older adults qualified as low-income in the US.² Chronic conditions may be more prevalent among low-income and limited resource older adults in part due to food-insecurity and limited physical activity.^{3, 4} Chronic illness is by far the greatest health expense among older Americans;⁵ in particular, chronic and mental health conditions cost the US about 2.3 trillion dollars in 2014, 86% of the annual healthcare expenditure.⁶ Evidence supports that nutrition intervention is a cost effective approach for promoting healthy aging,^{7(pp2009-2013), 8, 9} and can help minimize the economic and social impact of chronic disease. Population growth among older adults suggests a need to tailor nutrition interventions to the expanding needs and preferences of this target group to maintain beneficial health outcomes.¹

The Older Americans Act (OAA) targets nutrition and other health services to limited-resource older Americans to prevent malnutrition, promote health, and maintain independence.⁸ Title III of the OAA allocates government funds to nutrition interventions such as senior congregate meal sites and Meals on Wheels. Nutrition education also is currently provided to both home-delivered and congregate meal recipients. Home-delivered meals include monthly nutrition brochures. Congregate-meal educational approaches include: table tents, announcement, didactics led by nutrition professionals, group exercise, and farmers' market demonstrations. However, monthly on-site educational modalities typically include just nutrition

announcements and table tents. Written educational materials most often include the following components: recipes, healthy sample menus, crossword puzzles, and bulleted nutrition information.¹⁰

This thesis described the knowledge, needs and expectations for nutrition education among older adults and the factors that hinder and facilitate the delivery of health education for this population. Furthermore, perceptions were contrasted between older adults from different socioeconomic (SES), and ethnic groups. Guided by the social cognitive theory and Knowles' theory of andragogy (i.e., teaching principals for adult learning), this thesis sought to identify important educational content and delivery methods based on client perceptions.

II. Review of the Literature

A. Nutrition-related Concerns among Older Adults

1. Nutrition-Related Disease

Overweight BMI, hypertension, coronary artery disease, and diabetes mellitus are relatively common among older adults who minimize physical activity due to discomfort or pain.¹¹ Older adults who live alone also report higher rates of poor health, impaired vision, lower activities of daily living (ADLs), poor diet quality, and chronic diseases in general.¹² About 13.6% of community-dwelling older adults experience some form of frailty; furthermore, the prevalence of frailty may be higher among advanced-aged persons and women.¹³

Blacks and Native Americans experience disproportionate rates of hypertension, diabetes mellitus, back pain, and vision loss compared to national averages suggesting that minority populations experience worse health outcomes than non-minority groups.^{14, 15 16, 17} Limited resource older adults who receive meals at congregate meal sites also experience high levels of chronic illness with Blacks experiencing higher rates of chronic illness and insufficient finances

for food compared to other ethnic groups.¹⁸ Furthermore, elderly Blacks and Hispanics may require more assistance to maintain physical and mental health, and social relationships due to having less social supports compared to other groups.¹⁹

2. Evidence of Poor Diet Quality

Evidence confirms poor nutrition or diet quality among older adults. Less than 50% of both men and women above 65 years of age achieve the daily recommended servings of fruits and vegetables.²⁰ For example, limited consumption of carbohydrates, protein, and monounsaturated fats, and high intakes of fat, in particular saturated fats, is common among older adults.^{21, 22} However, evidence suggests that timely nutrition intervention can improve elderly nutrition status.²³

Ethnicity or race and SES relate to diet quality among older adults. Minority persons tend to have lower daily intakes of fruits and vegetables compared to non-minorities.²⁰ Literature suggests this may be due in part to limited resources among minority populations.²⁰ Increased risk for poor diet quality among older adults has been positively associated with: food insecurity, frailty, low socioeconomic status, living alone, and being male.^{24, 25, 26, 27, 28, 29, 30, 31, 32} This project sought to contrast diet quality between SES and ethnic groups to further assess the correlation between these variables.

3. Physical Inactivity

Often, older adults are not meeting recommendations for physical activity.³³ Physical inactivity rises with age, and is higher among women than men.^{34, 35, 33} Less than 50% of older adults with diabetes mellitus are meeting the ADA 2007 and DHHS 2008 guidelines for physical activity: 150 minutes of moderate physical activity per week.³⁶ For older adults who meet recommended physical activity levels, regular walking is a major contributor.³³ Both individual-

and group- exercise programs have led to improvements in physical activity and lower body strength among the elderly.³⁷ This study assessed whether exercise trends among older adults at congregate meal sites paralleled those described above.

Non-Hispanic Black older Americans report less physical activity compared to other racial groups.³⁶ Socioeconomic status and area of residence throughout the life course may also increase a person's risk for physical inactivity across all life stages including older adulthood.³⁸ Furthermore, higher education levels are positively associated with meeting physical activity recommendations among older adults. This study aimed to describe associations between SES and race, and exercise among older adults.

B. Programs to Improve Health among Older Adults

Diet, lifestyle, and physical activity interventions help control the prevalence of nutrition related disease among older adults within the US and abroad.^{23,39-44} Evidence suggests that nutrition and exercise interventions have the potential to improve the severity and prevalence of many illnesses like: hypertension, arthritis, chronic pain, cardiovascular disease, frailty, malnutrition and diabetes mellitus.^{23,39-44} These interventions can take many forms such as physical activity programs (i.e., individual and group), nutrition and exercise didactics, cooking workshops, and nutrition brochures, newsletters, pamphlets and magazines.^{23,39-44}

Many successful interventions substantiate Malcolm Knowles' Adult Learning Hypothesis, andragogy, which distinguishes the adult learner from the child or adolescent learner. Knowles describes the adult learner as preferring to: understand their need to learn about something as it relates to their current state, focus on intrinsic motivators over external motivators, direct their own education, participate in new experiences and incorporate prior experiences (e.g. reinforce previously acquired knowledge), and engage in learning that focuses on their personal needs.⁴⁵

A. Characteristics of successful learners

When designing interventions, professionals must account for clients' readiness to change and motivation to learn. Motivation and readiness varies from student to student.^{46, 47} It is important to understand what motivates your target audience, because lack of motivation or interest is a barrier to learning.^{48, 49}

Additionally, primary motivators can vary between different demographics.^{50, 51, 47} For example, studies find that African American and Hispanic cultures may be more accepting of the “curvaceous body type”, and that maintaining independence tends to be a greater motivator than weight loss to increase physical activity.^{52, 50}

Various motivators to learn have been identified such as: cognitive, psychological, and social.⁵³ Older adults report learning information that genuinely interests them promotes engagement in formal learning (i.e. cognitive motivator). Positive emotions (i.e. psychological motivators) resulting from social and intellectual engagement also encourage older adults to participate in formal learning. Finally, socializing daily with like-minded people and finding a sense of belonging (i.e. social motivators) also increase older adults' enthusiasm to participate in educational interventions. This study sought to understand how various motivators relate to readiness to learn and behavior change among older adults.

B. Characteristics of Effective Education Components or Approaches

a. Self-directed

Research suggests that older adults experience improved behavioral and learning outcomes from self-directed interventions; this describes when older adults help select topics and approaches for intervention (e.g. deciding between individual or group study). Active participation in health plan development has led to improved nutrition status and related health

outcomes among community-dwelling older adults.⁵⁴ Evidence suggests that self-directed approaches are particularly useful to improving physical activity and physical functioning among ethnically diverse (e.g. Black, Hispanic and White), and disabled samples of older adults.^{42, 37}

However, one randomized control trial concludes that self-management interventions do not result in improved weight status and diet quality among homebound elders compared to those receiving standard care due to increased burden on client.⁵⁵ This suggests that the degree of self-directedness should be gauged by an older adults' capacity to bear the additional responsibility of self-direction for health interventions.

b. Experiential

Experiential approaches use past experiences and knowledge to inform and direct future learning experiences.⁴⁵ Experiential learning approaches have the potential to improve both physical and nutrition markers of health among older adults. For example, research finds that cooking workshops may lead to increases in knowledge and self-efficacy, which can ultimately improve consumption of fruits and vegetables, whole grains, and milk and dairy alternatives among community dwelling older adults.⁵⁶ Also, experiential exercise programs can lead to increased strength and physical activity among community-dwelling older adults, even those with disabilities (e.g. frailty or arthritis).^{57, 58} Experiential approaches also prove effective for immigrant and limited-resource elders.^{41, 59}

c. Problem-centered

Problem-centered information is helpful or relevant to the immediate needs (e.g. challenges and responsibilities) of its target audience. Problem-centered education proves useful for improving diet quality and physical activity level among older adults. For example, nutrition interventions that provide information about community resources for food and other needs are

better equipped to increase fruit and vegetable intake among lower-income seniors.⁶⁰

Additionally, individualized exercise interventions have potential to increase lower body strength among disabled, community dwelling older adults.⁶¹ This study assessed how Knowles' assumptions relate to learning outcomes and preferences among older adults.

d. Repetition or Reinforcement

Revisiting prior topics reinforces goal behavior and knowledge among older adults, which promotes behavior change. For instance, repetition leads to increased fruit and vegetable intake among older adults with limited resources.^{62, 60} This study attempted to describe how older adults perceive the use of repetition in learning.

e. Other characteristics

Other educational components that promote nutrition-related knowledge and behaviors among older adults include: tailoring education to culture,⁶³ assessing needs before designing education then assessing program satisfaction,⁶⁴ offering a variety of nutrition interventions from which to select,⁶⁵ empowering peer or lay persons to execute intervention,⁵¹ selecting expert trainers to lead skill-development workshops,⁶⁶ using SCT to develop educational programs,⁶⁷ and enabling behavior change by modeling or providing instruction on how to perform goal behaviors.⁶⁸ This investigation described how perceptions of these educational approaches related to the perceptions of older adults from different demographic groups.

C. Evidence of Barriers to Nutrition Education among older adults

Addressing barriers is key to developing interventions that promote learning and behavior change among older adults.⁶² Barriers that undermine educational outcomes among older adults may be related to institutional structure, individual disposition, literacy, education level, physical disability, capacity to memorize, and race and SES differences.

a. Institutional and Dispositional Barriers

One study describes three categories of educational barriers for older adults; these include: institutional, dispositional and situational barriers.⁵³ The most frequently reported institutional barriers are limited class size (e.g. not enough seats or spots), restrictive class structure (e.g. no time to express oneself), and faulty sound systems and other aids. Dispositional barriers include complex topics, and lack of education materials in preferred language. Finally, the primary situational barrier is inconvenient timing of courses, for example, scheduling classes too late at night when older adults do not commute typically.⁵³

b. Literacy and Education Level Barriers

Lower education and literacy levels, and unfamiliar medical terminology can be major barriers to older adult learners. Additionally, negative emotions associated with prior bad experiences in school can also be a considerable barrier to education for older adults.⁴⁹ Elderly learners report more illustrations help promote understanding and acceptance of nutrition and health curricula.^{64, 49, 69}

c. Physical Disability

For older adults, the following physical ailments can be major barriers to learning or education: eye disease, impaired mobility, and pain due to chronic illness.^{48, 49} For instance, older adults with visual impairment may need education materials in large print; and those with arthritis may be less inclined to participate in exercise activities that aggravate symptoms.

d. Dementia or Impaired Memory

Impaired memory, information recall or retention are considered barriers to learning among older adults.⁴⁹ However, nutrition education using limited message content, and reinforcement or repetition prove effective for preventing weight loss among older adults with Alzheimer's, a

progressive memory impairment.⁷⁰ Reinforcement with a small number of nutrition messages helps promote retention of educational content leading to improved program outcomes among older adults.⁶⁰

e. Race and SES differences in reported barriers

Minority race and low SES groups may face additional barriers to engaging fully in nutrition or exercise programs. Also, there is potential for minority ethnicities or genders in any class or group to feel “marginalized” or “left-out”, which may discourage their participation in interventions.⁶⁵ Limited-resource groups report inadequate access to support from professionals and friends and lack of other resources (e.g. transportation) may discourage participation in health programs.^{69, 49, 59} This study aimed to illuminate how older adults across various SES and ethnicities perceived barriers to relate to audio, vision, language, and vocabulary or literacy.

D. Relatedness and Social Support

Social support is a major motivator to participate in formal learning among older adults.⁵³ Literature suggests that socialization and group learning is key to improved knowledge, memory, self-efficacy, fruit and vegetable intake, overall diet quality, and program satisfaction among limited-resource older adults that participate in health and nutrition programs.^{71, 72, 66} Furthermore, older adults who become socially active also engage in more self-care and physical activity, which in turn can improve their health risks (e.g. risk for frailty).^{73, 71}

Social support or feeling connected to one’s cohort often motivates older adults to participate in health programs, because constructive socialization promotes positive emotions (e.g. belonging or acceptance) and prevents negative emotions (e.g. loneliness). Also, creating healthful social norms, like a “culture of walking”, can lead to the broader adoption of these

norms within communities of older adults.⁴³ This investigation described the significance of social support to nutrition education for older adults at congregate meal sites.

Conceptual Framework

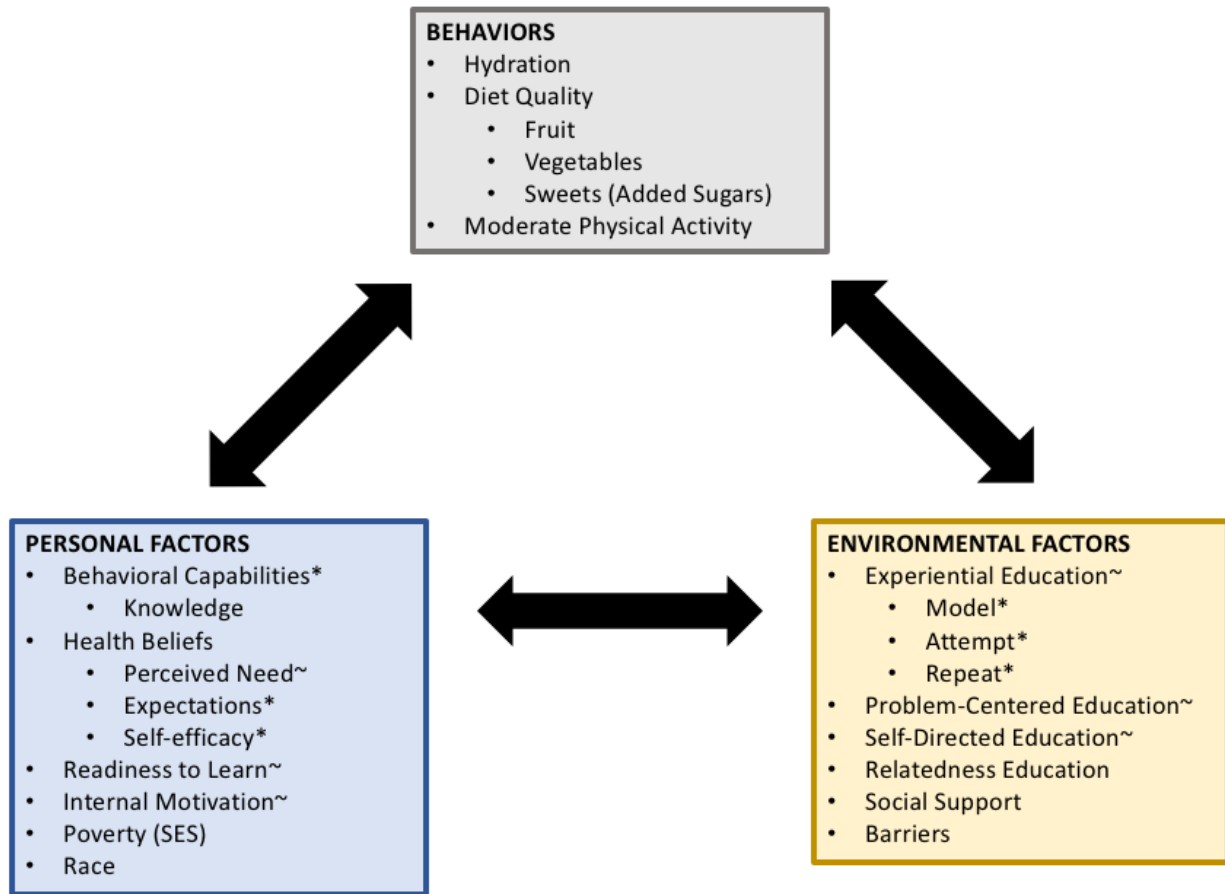


Figure 1. Conceptual framework based on * Social Cognitive Theory⁷⁴ with constructs from ~ Malcolm Knowles' Andragogy.⁴⁵ Socioeconomic factors are SES.

This study was grounded by the Social Cognitive Theory (SCT) whose constructs fell into the domains of behavioral, personal and environmental factors. The double-sided arrows between the personal (blue), environmental (yellow), and behavioral (grey) domains (**Figure 1**) represented the interdependence or reciprocal determinism between behaviors, personal factors and environmental factors. Reciprocal determinism described how two domains may influence each other, for example, how an environmental variable may affect a particular behavior and vice versa.

Several constructs from SCT informed this conceptual framework; they included: behavioral capacity, outcome expectations, self-efficacy, modeling, and reinforcing ⁷⁴. Behavioral capacity from SCT was measured as knowledge about recommended hydration, and fruit and vegetable behaviors. Outcome expectations alluded to what a person anticipates will be the actual outcome of a certain behavior. Self-efficacy referred to a person's confidence to perform a behavior and overcome barriers. "Model" described when a person learns how to perform a behavior by observing the execution and outcomes of that behavior. "Attempt" represented the practice a person must perform to strengthen a desired skill. "Repeat" described interventions that increase or decrease the recurrence of a person's behavior like revisiting or repeating prior topics. This project focused on repeating prior experiences as a learning approach, which was categorized under experiential learning described below.

Malcolm Knowles' andragogy informed the personal and environmental domains in this framework. Constructs from andragogy included: perceived need, readiness to learn, internal motivators, and experiential, problem-centered and self-directed educational approaches. Andragogy proposed that adult learners are distinct from youth learners. Specifically, andragogy asserted that adults prefer to: understand their need to know (perceived need), engage in learning that coincides with self-recognized and immediate needs (readiness to learn), prioritize internal over external motivators (internal motivators), use experiences as ground for further learning (experiential), orient learning to immediate needs or problems (problem-centered), and exercise autonomy by directing their own education (self-directed) ⁴⁵.

The behavioral domain of SCT included health behaviors such as hydration, diet quality and moderate physical activity. Hydration, these behaviors are primary nutrition concerns for older adult populations as discussed in the literature review. This investigation planned to link these

behaviors to personal and environmental factors that may be modified to promote nutrition-related outcomes.

Additional constructs considered in this study were: institutional barriers, race, and socioeconomic status as each may moderate the association between nutrition-related interventions and health behaviors. Barriers were challenges to learning due to the format of education itself, such as volume, text size, language, message complexity (i.e. the amount of information), reading level, and vocabulary ⁵³. Aforementioned constructs were analyzed in light of race and poverty to describe how these demographic factors may associate with trends in knowledge, hydration, physical activity level, diet quality, and perceptions of health and environment.

IV. Study Objective

This thesis explored the need for nutrition and health education among older adults, and sought to identify best practices for older adult education based on congregate meal site client perceptions. Furthermore, this project attempted to illuminate how race or SES may associate with educational needs and preferences among older adults. At the time of this study, there was limited research on how Knowles' andragogy may inform the development of effective education for older adults. This study also sought to contribute to literature how andragogy may be relevant to educating older adults across different ethnic and socioeconomic groups. The upcoming chapter, Chapter 2, attempted to identify needs for nutrition education among older adults by comparing race, education and poverty status. The final chapter, Chapter 3, discussed the policy, research and educational implications of findings described in Chapter 2.

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CHAPTER 2: Nutrition education informed by andragogy is suitable for older adults at congregate meal sites, but multi-lingual materials and enhanced social support may be needed

INTRODUCTION

The number of older Americans will increase from 46.3 million in 2014 to 98 million in 2060.¹ According to 2015 national survey data, approximately 9% of older adults qualify as low-income in the US.² Chronic conditions are more prevalent among low-income and limited resource Americans in part due to food-insecurity and limited physical activity.^{3,4} Chronic illness is by far the greatest health expense among older Americans.⁵ Evidence supports that nutrition interventions are cost effective approaches to promoting healthy aging among older adults.⁵⁻⁷

The Older Americans Act (OAA) targets nutrition and other health services to limited-resource older Americans to prevent malnutrition, promote health, and maintain independence.⁶ Title III of the OAA allocates government funds to nutrition interventions such as senior congregate meal sites and Meals on Wheels. Congregate meal sites are community locations where older adults are provided regular meals meeting at least one-third the dietary reference intakes (DRI).⁸ In addition, congregate meal sites address some health-related needs of older adults by offering nutrition education.

This study described the knowledge, needs, and expectations for nutrition education among older adults, and the mediators of meaningful information delivery to older audiences. This investigation was guided by Social Cognitive Theory and Malcolm Knowles' andragogy. Social Cognitive Theory modeled the reciprocal determinism between personal and environmental factors, and behaviors. Knowles' andragogy proposed major principles for educating older adults: internal motivation, readiness to learn; and problem-centered, self-

directed, and experiential learning approaches. According to our knowledge, this was the first application of andragogy to a community nutrition education study describing the learning needs of older adults. The objective of this investigation was to characterize the learning needs specific to older adults in community settings. Research questions were:

1. What do nutrition behaviors among older adults reveal about the relevance of certain nutrition education topics?
2. How do personal factors among older adults relate to hydration, diet, and moderate physical activity behaviors?
3. How do older adults perceive environmental factors relevant to nutrition education?
4. How do poverty, education, and race indicators relate to personal and environmental factors and health behaviors among older adults?

Background/Setting:

In 2016, 69.6 million older Americans (i.e., 60 years and older) made up 21.3% of the US population.⁹ Among US residents 65 years and older from 2013 to 2014: 29.4% had heart disease; 23.4% had cancer; 55.9% had hypertension; 20.8% had diabetes; and 49.0 % had arthritis.¹⁰ New York residents (2016) were 21.4% older adults, 68.5% non-Hispanic White or Caucasian, 12.3% non-Hispanic Black, 11.4% Hispanic, and 11.7% low income (i.e., incomes below 100% federal poverty level (FPL)),¹¹ Eighty percent of New York state residents 60 years and older had one or more chronic disease like arthritis, heart disease, diabetes, and cancer.¹²

The county Area Agency on Aging (AAA) managed Title III-C funds from the Older Americans' Act (OAA). Title-III-C funds were used for congregate meal sites. The county AAA also managed OAA funds for other nutrition services like meals on wheels (i.e. meal home delivery), walk-with ease (i.e., exercise program), and nutrition education programs. The county

AAA typically targeted services to older adults who were: advanced age (i.e. >75 years old); living alone, frail, low-income, high nutritional risk, from a minority group, or disabled, but it also served other demographics. In 2016, there were 2.8 million nationally registered Title III-C clients; these clients were: 69.7% non-Hispanic White or Caucasian, 12.3% African American, 10.9% Hispanic, and 32.9% low income.⁹ In New York state, 2016, there were 0.3 million Title III-C clients; these clients were 63.7% non-Hispanic White and Caucasian, 12.2% non-Hispanic African American, 12.6% Hispanic, and 32.0% low income.¹¹

There were 63 AAA in New York state (2018).¹³ This study was conducted in collaboration with an AAA in one upstate New York county. In this county (2017), there were 5,243 title III-C clients; 70.0 % and 94.3% of these clients were female and at least 60 years of age, respectively.¹⁴ In this county, there were 35 congregate meal sites located in urban, suburban, and rural settings. Congregate meal sites were located in YMCAs, churches, senior housing and assisted living facilities, and other community locations¹⁵. County congregate meal (i.e., title III-C1) clients were 77.7% White, 16.1% Black or 2.1% Hispanic older adults; additionally, 48.2% of county clients had incomes below the 100% federal poverty level.¹⁴ County residents 65 years and older reported Alzheimer's disease, dementia, and memory loss as high community planning priorities.¹⁶ In addition to federal food assistance through the Supplemental Nutrition Assistance Program (SNAP) and Senior Farmers' Market Nutrition Program (SFMNP), this county had charitable food assistance for older adults including 63 food pantries (mobile and stationary) and 8 fresh food programs (i.e., fresh produce, milk and bread donated by local grocers) supported by a regional food bank.¹⁷

Congregate meal programs connected older adults to more than just food. For instance, dining site managers and neighborhood advisers helped older adults connect to community

services like subsidized public transportation, Home Energy Assistance Program (HEAP), Medicare, and accessible health care providers.¹⁸ Some congregate meal sites were located conveniently in assisted living facilities, and senior or retirement communities, which provided transportation to their non-resident congregate meal clients.¹⁵ Higher SES sites often had transportation services, but transportation was a major concern for older adults who desired to participate in congregate meal programs not providing transportation. Finally, congregate meal sites also provided a social outlet to older adults. In addition to nutrition services, congregate meal sites in this county offered group exercise, farmers' market and farm field trips, and outdoor picnics or potlucks to help with feelings of isolation among their clients.

METHODS

This study aimed to contrast perspectives among older adults based on race, education, and poverty status in a quantitative cross-sectional study. This study was reviewed by the Cornell University Institutional Review Board and deemed exempt due to the only human involvement being completion of an anonymous survey.

Sampling

The sample was drawn in two stages. First, sampling locations were selected from one Area Agency on Aging's client database in upstate New York. Eight congregate meal sites were selected purposively, because at least 47.2% of their meal clients had incomes below or equal to 100% FPL (\leq \$12,060 for an adult living alone) or greater than 185% FPL ($>$ \$22,311 for an adult living alone).¹⁹ Second, the principal investigator recruited respondents from these sites on eight separate days between December 28th, 2017 to February 23rd, 2018, and convenience sampled respondents. Clients gave their consent by reading and completing a paper

questionnaire, then returning the survey to a manila folder or directly to the principal investigator. The questionnaire was prepared solely in English; therefore, only older adults that read English or received assistance were able to participate.

A power analysis using pilot study data and these assumptions -- (alpha: 0.05, power: 0.8, medium effect size (0.5 standard deviations)) -- suggested approximately 50 clients from each group was sufficient to detect significant differences in perceptions of self-directed education approaches between groups, or approximately a 0.25 point difference on a 5-point Likert-type scale. However, sampling targets were slightly larger than this estimate, because client income distribution was unknown prior to data collection. Thus, this study recruited 170 respondents.

Measures

All measures were grounded in Social Cognitive Theory, Malcolm Knowles' Andragogy, and existing survey instruments. The questionnaire was piloted with 43 respondents in 2016 then refined for final data collection. Age was measured using a single open-ended response in years. Respondent sex was measured with two response categories: male and female. Respondents could indicate (yes or no) to one or more food assistance categories among 'SNAP', 'CSFP foods', 'coupons', 'food pantry items', and 'none of the above'. There were six response variables for living situation: own single-family house; own apartment, condo, or townhouse; live in senior or retirement community; live with family; live with friends; and other. Three measures of socio-demographics were collected for use in comparative analyses. Race and ethnicity response options included: Hispanic or Latino; White or Caucasian; Asian; Polynesian or Pacific Islander; Black or African American; Native American or Alaskan; or other. Due to low numbers of respondents in all categories except 'White or Caucasian' and 'Black or African America,' only these two race categories were compared. Annual income data was collected by

an ordinal variable ranging from ‘less than \$12,000’ to ‘more than \$74,999’; also including ‘I don’t know’, and ‘I’d rather not say’ response options.²⁰ Household size response categories ranged from ‘1’ to ‘5 or more’.²¹ Income and household size were used together to create a dichotomous poverty variable that approximated income below 100% the federal poverty level (FPL); for example, the following households were categorized as below 100% FPL: one-person households with incomes less than \$12,000; two-person households with incomes below \$15,999; three-person households with incomes below \$19,999; four-person households with incomes below \$23,999; and five-person households with incomes below \$27,999. Respondents that reported “I don’t know” and “I’d rather not say” were excluded from poverty status bivariate analysis. Education was asked as highest level of school attained, and responses included ‘less than high school’, ‘high school diploma or equivalent’, ‘bachelor’s degree’, and ‘graduate degree’.²² A dichotomous variable was created subsequently to indicate education completed beyond high school or not, which were used in comparative analyses.

Behaviors included hydration, diet quality, and physical activity. Hydration was measured with one item describing total intake of water, other unsweetened fluids, and 100% fruit juice ranging from ‘one to two cups’ to ‘more than eight cups’ per day.²³ The midpoints of response categories selected by clients were summed then divided by the total number of observations to calculate mean fluid intake. Also, an indicator for met hydration recommendation was created in which seven or more cups was considered to have met the recommendation (1) and any smaller quantity had not (0).

Diet quality was collected with six ordinal variables: cakes, pastries, low fat deserts, ice cream, vegetables and fruits. Intake of foods with added-sugars included four types of sweet foods (i.e., cake, pastry, low fat dessert, and ice cream) in helpings per week ranging from ‘never

or less than one time per week' to 'more than four times per day'.²⁴ The weekly measures for sweets were divided by seven to yield daily measures for final response categories: 0.00, 0.14, 0.43, 0.79, 1.00, 2.50, and 4.00+ times of sweets daily. Total daily intakes of sweets equaled individual respondents' summed intakes of cake, pastry, low fat dessert, and ice cream for final analysis. Daily intake of sweets were included in bivariate comparisons of poverty, education and race. Vegetable and fruit intakes were collected separately in cups per day ranging from 'zero' to 'greater than seven cups'; response categories were given in half-cup increments.²⁵ The following respondents met vegetable recommendations: female reporting ≥ 2 -cup vegetable intake, and males reporting ≥ 2.5 -cup vegetable intake. The following respondents met the fruit recommendation: females reporting ≥ 1.5 -cup fruit intake, and males reporting ≥ 2 -cup intake.

Moderate physical activity was measured with three questions on transportation, recreation, and chores.²⁶ Ten minutes of moderate physical activity for transportation was captured with a dichotomous (i.e., 'yes', or 'no') measure. Moderate physical activities for recreation and chores were collected in hours and minutes for a typical week, were corrected for likely reporting errors using procedures adapted from the International Physical Activity Questionnaire (IPAQ) scoring instructions,²⁵ and were transformed into minutes of activity. All three measures of physical activity were summed in a composite value of total minutes of weekly moderate PA. Visual assessment of boxplot for weekly moderate PA composites revealed no outliers. Moderate PA composites were used to determine the percent of respondents who met weekly moderate PA recommendations. Composite PA scores of at least 150 minutes counted as meeting the moderate PA recommendation.²⁷

Personal factors included: knowledge, general health beliefs, self-efficacy, outcome expectations, and motivation. Knowledge (i.e., behavioral capacity) was measured with two

ordinal variables testing knowledge of recommended daily fluid intake for older adults, with response choices identical to the behavioral question. Knowledge of recommended servings of fruit and vegetables was asked using the MyPlate Method,^{23,28} with four response choices between ‘1/8 of a dinner plate’ to ‘3/4 of a dinner plate’. Seven to 8 cups or greater than 8 cups of fluids;²⁹ and 1/2 or 3/4 of a plate^{27,30} were considered correct responses to hydration, and fruit and vegetable recommendation knowledge measures, respectively.

General health beliefs, self-efficacy, outcome expectations, and motivations were measured using 5-point Likert-type scales with response categories: ‘strongly disagree’, ‘disagree’, ‘neither agree or disagree’, ‘agree’, and ‘strongly agree’. General health belief measures included four items: ‘nutrition is important’; ‘care about my health’; ‘good for me to eat healthy’; and ‘good for me to exercise’.³¹ Self-efficacy measures reflected a respondent’s confidence in ability to: ‘drink enough fluids’, ‘eat a healthy diet’, and ‘do challenging exercise’.³² Outcome expectations measured two separate beliefs that diet and exercise can ‘decrease risk for stroke and heart attack’.³² Motivations of behavior included four measures of internal (i.e., eating unhealthy undermines my personal goals; and eating unhealthy does not matter much to my health), external (i.e., I feel others judge me when I eat unhealthy) and introjected regulation (i.e., I feel guilty when I eat unhealthy) adapted from self-determination theory.^{33,34}

Environmental factors included perceptions of experiential learning approaches problem-centered education, self-directed education, relatedness in education, social support, and institutional barriers. Environmental factors were measured using 5-point Likert-type scales identical to those reflecting personal factors. Problem-centered education approaches were measured by asking respondents to rank problem-centered and subject centered topics in order of

interest from ‘1’ (i.e., highest) to ‘6’ (i.e., lowest). However, this was difficult for the respondents to complete, and the measure was discarded due to low response rate.^{35–38}

This study calculated composite means of experiential, self-directed and relatedness education approaches; and social support characteristics of congregate meal sites. The experiential composite averaged the means for ‘observe demonstration carefully’ (model), ‘try new thing out for myself’ (attempt), and ‘connect with my past experiences’ (repeat).^{35,39} The self-directed composite averaged the means for ‘find own relevant information’, ‘choose own topic of interest’, ‘rely on own critical thinking’, and ‘investigate questions on my own’.^{39,40} The relatedness composite averaged means for ‘talk about new facts with others’, ‘prefer to learn in a group’, and ‘prefer to learn alone’.^{39,41} The measure for ‘prefer to learn alone’ was reverse coded to calculate the composite mean for relatedness, but not reverse coded for individual reporting. The social support composite averaged responses to: ‘connected with lunch site peers’, ‘close to lunch site companions’, and ‘not know lunch site peers’.³² Responses to ‘not know lunch site peers’ were reverse coded for composite calculation, but not reverse coded for individual reporting.

Response options for Likert-type scales concerning institutional barriers were ‘never’ (1), ‘seldom’ (2), ‘sometimes’(3), ‘often’(4), and ‘always’ (5). The measure for institutional barriers asked how often they wanted ‘printing to be bigger’; ‘speak louder or use a microphone’; ‘use less medical or technical language’; and ‘nutrition information in languages other than English’.⁴² During the pilot phase, respondents were asked only to indicate barriers with a yes or no response. Most respondents denied barriers to nutrition education despite anecdotal complaints about these issues noted by principal investigator.

3. Analysis

Descriptive statistics were produced for all variables. No outliers for fruit and vegetable intakes, and moderate PA were detected upon visual inspection of boxplots for each measure. Percentages of respondents who met fruit, vegetable, hydration, and moderate physical activity recommendations; and percentages of respondents with knowledge of hydration and FV recommendations, were tested for significant paired differences using McNemar tests. Within the personal domain, paired t-tests detected significant differences between items within health beliefs, self-efficacy, outcome expectations, and motivations. Within the environmental domain, paired t-tests were used to detect differences between composite scores, as well as between items within experiential, self-directed and relatedness education approaches, social support, and institutional barriers.

Differences in means between dichotomized socio-demographic groups were assessed using independent sample t-tests for Likert-type scales measuring health beliefs, self-efficacy, outcome expectations, motivations, self-directed and experiential learning approaches, social support, and barriers. Cross tabulations, and Pearson's chi-squared tests were used to detect significant differences in percent of respondents that met fruit, vegetable, hydration, and moderate PA recommendations, and knew recommended fruit, vegetable and fluid intakes for older adults for the following comparison groups: income, education, race, and knowledge of recommendations for hydration, and fruit and vegetable intakes.

RESULTS

Respondent Characteristics

The mean age of respondents was 72 years (sd: 10 years) (**Table 1**). The minimum and maximum ages of respondents were 52 and 99 years, respectively. The majority of respondents were female (75.7 %). About fifty-five percent of respondents identified as White or Caucasian (55.1%); or Black or African American (38.9%). Seventy-one percent of clients reported living alone (71.2 %). Forty and thirty-three percent of respondents lived in a senior community (40%) or owned a single-family home (33.3%), respectively.

The majority of respondents reported incomes above 100% FPL (55.2%), with few above 200% FPL (16.4%). The remainder of respondents reported incomes at or below 100% FPL (44.8%). About 56.2% of respondents reported use of food assistance, which was most often Supplemental Nutrition Assistance Program (SNAP) (45.1%). About 70% of respondents had an education level less than or equal to a high school diploma (68.9%), and eleven percent reported graduate degrees.

Response Rate

The eight congregate meal sites served 479 clients in total according to site records. The response rate average was 34.45% (i.e., 165/479). The lowest and highest response rates for individual sites were 9.6% (i.e., 12/125) and 100% (i.e., 33/33).

Table 1: Sample Characteristics				
		Study Sample		
		N	Mean/ %	sd
Age				
	Years, mean	168 ^a	72.0	10.0
	≥60 years, %	168 ^a	91.1	
Sex, Female, %		169 ^a	75.7	
Race, %		167 ^a		
	White or Caucasian		55.1	
	Black or African American		38.9	
	Hispanic/Latino		4.8	
	Polynesian or Pacific Islander		0.6	
	Native American or Alaskan Native		0.6	
Live Alone, %		163 ^a	71.2	
Income, %		153 ^a		
	< \$12,000		36.6	
	\$ 12,000 - 15,999		13.1	
	\$16,000 - 19,999		8.5	
	20,000-23,999		13.1	
	24,000 - 27,999		2.6	
	28,000 - 31,999		2.0	
	32,000 - 39,999		5.9	
	40,000 - 74,999		5.2	
	>74,999		2.0	
	Do not know		4.6	
	Will not say		6.5	
Poverty Indicator		134 ^a		
	≤ 100% FPL (Below FPL)		44.8	
	>100% FPL (Above FPL)		55.2	
Food Assistance		162 ^a		
	Any Food Assistance		56.2	
	SNAP		45.1	
	Senior Farmers' Market Nutrition Program		3.7	
	Food Pantry		6.8	
	Commodity Supplemental Food Program		0.6	

Table 1 continued: Sample Characteristics			
Study Sample			
	N	Mean/ %	sd
Living Situation	162 ^a		
Senior Community		40.1	
Own Single family home		33.3	
Other (e.g. rent)		13.6	
Own Apartment, condo or townhouse		8.6	
With Family		4.3	
Education	164 ^a		
< High school		9.8	
High school diploma or Equivalent		59.1	
Bachelors, Technical School or Associate's		20.1	
Graduate Degree		11.0	

^a The number of respondents that completed respective survey question

⁺ Title III-C1 county client data (2017) taken from demographic report with unduplicated client counts from 1/1/2017 to 12/31/2017.

⁺⁺ ACL New York State client data (2015) from

<https://agid.acl.gov/StateProfiles/Profile/Pre/?id=34&topic=0&years=2015>.

<https://agid.acl.gov/StateProfiles/Profile/Pre/?id=109&topic=0> (2015, national, ACL client stats)

Behaviors

About one-third of respondents consumed only 1-2 cups (12.3%) or 3-4 cups (23.4%) of liquids daily. Few respondents (35.1 %) consumed sufficient liquids to meet daily hydration recommendations (**Table 2**). Respondents reported typically eating sweets 1.4 times per day (sd: 3.8): mostly cake (0.5 times per day (sd: 0.7)). On average, respondents ate 2.1 cups of fruits and 2.5 cups of vegetables, and significantly more vegetables than fruits ($p<0.050$). More than half of respondents met recommendations for fruits (56.0%) and vegetables (52.8%). On average, respondents engaged in moderate physical activity (PA) for 280 minutes per week (about 4 and 2/3 hours). More than half of respondents met moderate PA recommendations for older adults (63.2%). Significantly fewer older adults reported meeting hydration recommendations than recommendations for fruits, vegetables, and moderate PA (all $p<0.050$). There were no significant differences in percentage of respondents that reported meeting recommendations for fruit, vegetables, and moderate PA.

Table 2: Behaviors

		n		Recommendation	
Hydration (daily)					
Cups of water, tea, coffee and juice, mean	154	5.8			
1 to 2, %		12.3			
3 to 4, %		23.4			
5 to 6, %		29.2			
7 to 8, %		19.5	8 cups~		
> 8, %		15.6			
Met Recommendation, %	154	35.1 ^a			
Dietary Intake (daily)					
Sweets, mean (sd)					
All	169	1.08	(1.33)	Small Amount ⁺	
F&V Intake					
Fruit (cups), mean (sd)	167	2.1 ^c	(1.8)	1.5-2.5 cups ⁺	
Met recommendation for fruit, %	166	56.0 ^b			
Vegetables (cups), mean (sd)	164	2.5 ^d	(2.0)	2-3.5 cups ⁺	
Met recommendation for vegetables, %	163	52.8 ^b			

Table 2 continued: Behaviors

	n		Recommendation	
PA (weekly)				
10 min. PA for transportation, %	165	53.3		
Recreation (minutes), mean (sd)	156	112.1	(145.6)	
Chores (minutes), mean (sd)	154	177.1	(163.4)	
Total moderate PA (minutes), mean (sd)	163	280.0	(225.9)	150 minutes ⁺⁺
Met recommendation for moderate PA, %	163	63.2 ^b		

^{a, b} Are significantly different percentages of respondents reported meeting recommendations for hydration compared to recommendations for fruits, vegetables, and moderate PA according to McNemar tests.

^{c, d} Are significantly different means between reported daily fruit and vegetables intakes according to paired t-tests.

[~] Recommendation taken from <https://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/water/art-20044256>.

⁺ Recommendation taken from <https://www.nia.nih.gov/health/serving-and-portion-sizes-how-much-should-i-eat>.

⁺⁺ Recommendation taken from <https://www.choosemyplate.gov/older-adults>.

Personal Factors

More than half of respondents knew correct recommendations for hydration as well as fruit and vegetable intakes, (i.e. 59.8% and 63.8%, respectively) (**Table 3**). Respondents reported positive general health beliefs (4.2 to 4.4 of 5): nutrition is important (4.4); care about their health (4.4); and eating healthy (4.2) and exercise (4.2) are good for them. Respondents more often reported that “Nutrition is important” compared to “[it is] Good for me to eat healthy” ($p < 0.050$). Older adults reported self-efficacy for staying hydrated (4.0), eating healthy (4.0) and performing physically challenging exercises (3.6). Respondents reported significantly greater self-efficacy for keeping adequately hydrated and eating healthy compared to self-efficacy for performing personally challenging exercises ($p < 0.050$). Regarding outcome expectations, older adults thought both diet (4.1) and PA (4.0) helped improve health outcomes like chances of having a heart attack or stroke. Regarding motivations, older adults reported being significantly more internally motivated (i.e. matters: 3.5; father: 3.4) than externally motivated (i.e. guilty: 3.0; judge: 2.8; $p < 0.050$ for all four comparisons).

Table 3: Personal Factors

Knowledge of recommendations	n	%	
Hydration	169	59.8	
FV intake	127	63.8	
Health Beliefs		Mean	sd
General Health Beliefs			
Nutrition is important	162	4.4 ^a	0.8
I care about my health	164	4.4 ^{ab}	0.6
Good for me to eat healthy	168	4.2 ^b	1.0
Good for me to exercise	164	4.2 ^{ab}	0.9
Self-Efficacy			
Able to drink enough liquids	164	4.0 ^a	1.0
Able to maintain healthy diet	165	4.0 ^a	0.9
Able to do challenging exercise	167	3.6 ^b	1.0
Outcome Expectations			
Diet decreases disease risk	168	4.1	0.9
Exercise decreases disease risk		4.0	1.0
Motivations			
Internal Motivations			
Treats do not matter much to health	165	3.5 ^a	1.3
Treats undermine personal goals	159	3.4 ^a	1.0
External Motivations			
Feel guilty when I eat unhealthy	162	3.0 ^b	1.2
Feel judged when I eat unhealthy	164	2.8 ^b	1.1

^{a,b} Are significant differences between variables within constructs: general health beliefs; self-efficacy; and motivations.

Knowledge versus Behavior

The relationships between *knowing* recommendations for fluid, fruit and vegetable intakes and *meeting* recommendations for fluid, fruit and vegetable intakes are shown in **Table 4**. Knowing the recommendation for daily fluid intake was positively associated with meeting the recommended fluid intake among older adults ($p < 0.050$). Knowing the “My Plate” fruit and vegetable intake recommendation was positively related to meeting the recommended intake of vegetables ($p < 0.050$), but not fruits, among older adults.

Table 4: Compare Knowledge to Behavior

Hydration Test, % (n)				
	n	Correct	Incorrect	p-value [#]
Met Hydration Recommendation	154	51.6 (95)	8.5 (59)	0.000
FV Test, % (n)				
	n	Correct	Incorrect	p-value [#]
Met Vegetable Recommendation	124	61.3 (80)	40.9 (44)	0.030
Met Fruit Recommendation	125	58.8 (80)	46.7 (45)	0.193

[#] Results from Pearson's Chi-squared test.

Environmental Factors:

Respondents reported preference for experiential learning approaches: attempt (try new things: 4.0); repeat (connect new information to old knowledge: 3.9); and model (observe others perform behavior of interest: 3.9) (**Table 5**). Older adults reported abilities consistent with self-directed learning: find relevant information when they need it (3.9), choose the topics they learn about (3.8), rely on their own critical thinking (3.8), and investigate a question on their own (3.7). Older adults reported finding relevant information and choosing topics were more relevant to their learning preferences compared to critical thinking and investigating questions on their own. Respondents preferred to talk about new information with others (3.9) and learn in a group (3.4) significantly more than learning alone (3.0; both $p<0.050$). Respondents prioritized experiential and self-directed education approaches significantly more than relatedness education approaches (both $p<0.050$).

The majority of respondents were connected with others at their congregate meal sites (3.9), and were close to their companions in these settings (3.7). Significantly fewer respondents did not know others at congregate meal sites (2.5) compared to feeling connected with and close to peers at congregate meal sites (both $p<0.050$). Respondents prioritized social support characteristics of congregate meal sites over relatedness education approaches ($p<0.050$), but prioritized experiential learning approaches over social support characteristics ($p<0.050$). On average, older adults reported sometimes or often wanting: louder speaker or microphone use (3.5), less medical or technical language (3.4), and bigger print (3.4). Respondents less often wanted nutrition information in languages other than English (2.7; $p<0.050$).

Table 5: Environmental Factors

Education Approaches			
Experiential (composite)	161	3.9^d	0.6^d
Try new things out for myself (attempt)	157	4.0	0.7
Connect with my past experiences (repeat)	157	3.9	0.7
Observe demonstration carefully (model)	158	3.9	0.8
Self-directed (composite)	163	3.8^{df}	0.6
Find own relevant information	159	3.9 ^a	0.9
Choose own topics of interest	160	3.8 ^{ab}	0.8
Rely on own critical thinking	155	3.8 ^b	0.8
Investigate questions on my own	160	3.7 ^b	0.9
Relatedness (composite)	164	3.5^e	0.8
Talk about new facts with others	158	3.9 ^a	0.7
Prefer to learn in a group	133	3.4 ^b	1.3
Prefer to learn alone	115	3.0 ^c	1.3
Social Support (composite)	164	3.7^f	0.7
Connected with lunch site peers	163	3.9 ^a	0.9
Close to lunch site companions	163	3.7 ^b	0.9
Not know lunch site peers	160	2.5 ^c	1.2
Barriers	N	Mean	sd
Desire louder speaker or microphone	156	3.5 ^a	1.2
Desire less medical or technical language	158	3.4 ^a	1.1
Desire bigger printing on materials	159	3.4 ^a	1.1
Desire non-English language information	153	2.7 ^b	1.5

^{a, b, c} Significant differences between variables within environmental constructs: self-directed and relatedness education approaches; social support; and barriers.

^{d, e, f} Significant differences between environmental construct composites: experiential, self-directed, and relatedness education approaches; and social support.

Comparisons across Socio-demographic measures:

There were very few significant differences detected in behavior and personal factors among the sociodemographic comparisons by poverty, education, and race. Among environmental factors, patterns of results for sub-groups defined by poverty and race often paralleled one another. Significantly more respondents with incomes below 100% FPL reported the need for education materials in other languages (3.1) compared to older adults with incomes above 100% FPL (2.5, $p < 0.050$). More ethnic-minority older

adults reported the need for education materials in other languages compared to non-ethnic minority older adults (2.9; 2.4; $p<0.050$).

More respondents with incomes below 100% FPL reported not knowing others at congregate meal sites (2.8; 2.4; $p<0.050$). Significantly more ethnic-minority older adults reported not knowing peers at congregate meal sites compared to non-ethnic minority older adults (2.7; 2.3; $p<0.050$).

Significantly fewer older adults with incomes below 100% FPL reported feeling close to peers at congregate meal sites (3.4; 3.8; $p<0.050$) (**Table 6**). Additionally, significantly fewer ethnic minority older adults reported feeling close to peers at congregate meal sites compared to non-ethnic minority older adults (3.5; 3.9; $p<0.050$).

Table 6: Two-groups comparisons: poverty, education, and minority status indicators

	Poverty Indicator			Education Indicator			Minority Status Indicator		
	<= 100% FPL (n=44)	> 100% FPL (n=58)	p- value	<= HS (n=87)	>= College (n=36)	p- value	Black/ African- American (n=49)	White/ Caucasian (n=70)	p- value
BEHAVIORS									
Hydration (daily)									
Cups of water, tea, coffee, and juice, mean	5.7	6.1	0.358	5.7	6.0	0.409	5.7	5.9	0.721
Met recommendation (8 cups), %	35.7	36.8	0.904	35.2	38.6	0.694	32.2	37.6	0.502
Dietary Intake									
Sweets (daily), mean									
All	1.3	1.0	0.191	1.1	1.3	0.399	0.8	1.3	0.018
Cake	0.6	0.4	0.314	0.5	0.5	0.740	0.3	0.6	0.012
Pastry	0.3	0.2	0.398	0.2	0.3	0.550	0.2	0.3	0.056
Low fat dessert	0.1	0.1	0.772	0.1	0.2	0.776	0.1	0.2	0.241
Ice cream	0.3	0.2	0.358	0.2	0.2	0.947	0.2	0.2	0.817
F&V Intake (daily)									
Vegetables, mean (cups)	2.8	2.4	0.303	2.8	2.0	0.014	2.8	2.4	0.188
Met recommendation for vegetables, %	52.5	50.7	0.835	54.4	41.2	0.056	58.1	50.6	0.363
Fruits, mean (cups)	2.2	2.0	0.495	2.2	2.1	0.795	2.5	1.9	0.043
Met recommendation for Fruit, %	58.3	46.6	0.177	54.1	60.7	0.423	65.1	51.6	0.098
PA (weekly)									
10 min. PA for transportation, %	71.2	44.6	0.002	54.1	57.1	0.717	53.2	51.6	0.848
Recreation, mean (minutes)	121.3	119.8	0.956	109.6	113.8	0.867	139.2	97.9	0.103
Chores, mean (minutes)	186.4	179.5	0.818	167.2	213.0	0.120	164.5	193.3	0.303
Total moderate PA, mean (minutes)	299.4	290.6	0.831	268.8	313.5	0.265	297.4	277.8	0.601
Met recommendation for moderate PA, %	65.0	63.9	0.894	61.3	68.8	0.368	67.7	61.4	0.423

Table 6 continued: Two groups comparison

	Poverty Indicator			Education Indicator			Minority Status Indicator		
	<= 100% FPL (n=44)	> 100% FPL (n=58)	p- value	<= HS (n=87)	>= College (n=36)	p- value	Black/ African- American (n=49)	White/ Caucasian (n=70)	p- value
PERSONAL FACTORS									
Knowledge of Recommendations									
Hydration, %	66.7	51.4	0.074	59.3	62.7	0.676	62.5	59.8	0.732
FV Intake, %	63.6	67.2	0.704	65.5	63.9	0.863	71.4	62.9	0.330
Health Beliefs									
General Health Beliefs									
Nutrition is important	4.3	4.4	0.774	4.4	4.4	0.916	4.4	4.4	0.933
I care about my health	4.5	4.3	0.056	4.4	4.3	0.222	4.5	4.3	0.026
Good for me to eat healthy	4.0	4.4	0.010	4.2	4.2	0.681	4.2	4.2	0.995
Good for me to exercise	4.1	4.4	0.061	4.2	4.2	0.944	4.3	4.2	0.612
Self-Efficacy									
Able to drink enough liquids	3.9	4.1	0.304	4.1	3.8	0.107	4.2	3.9	0.134
Able to maintain healthy diet	3.9	4.0	0.272	4.0	3.8	0.121	4.0	3.9	0.523
Able to do challenging exercise	3.5	3.8	0.159	3.6	3.7	0.710	3.8	3.5	0.064
Outcome Expectations									
Diet decreases chronic disease risk	4.1	4.2	0.531	4.1	4.0	0.343	4.1	4.1	0.951
Exercise decreases chronic disease risk	4.0	4.0	0.954	3.9	4.2	0.029	4.0	4.0	0.660

Table 6 continued: Two groups comparison

	Poverty Indicator			Education Indicator			Minority Status Indicator		
	<= 100% FPL (n=44)	> 100% FPL (n=58)	p- value	<= HS (n=87)	>= College (n=36)	p- value	Black/ African- American (n=49)	White/ Caucasian (n=70)	p- value
PERSONAL FACTORS (cont'd)									
Motivations									
Internal Motivations									
Treats do not matter much to health	3.5	3.5	0.937	3.4	3.8	0.061	3.6	3.4	0.442
Treats undermine personal goals	3.4	3.4	0.741	3.5	3.4	0.682	3.4	3.4	0.790
External Motivations									
Feel guilty when I eat unhealthy	3.0	3.0	0.888	3.0	2.8	0.171	3.1	2.8	0.143
Feel judged when I eat unhealthy	2.8	2.7	0.550	2.8	2.7	0.559	2.7	2.8	0.692
ENVIRONMENTAL FACTORS									
Education Approaches									
Experiential									
Try new things out for myself (attempt)	4.0	4.0	0.889	3.9	4.1	0.079	4.0	4.0	0.493
Connect with my past experiences (repeat)	3.9	3.8	0.698	3.8	4.0	0.259	3.8	3.9	0.182
Observe demonstration carefully (model)	4.0	3.8	0.201	3.8	4.0	0.196	3.8	3.9	0.614
Self-directed									
Find own relevant information	3.9	3.9	0.917	3.9	4.0	0.510	3.8	3.9	0.543
Choose own topics of interest	3.9	3.8	0.368	3.8	3.9	0.851	3.6	4.0	0.028
Rely on own critical thinking	3.8	3.8	0.837	3.8	3.7	0.297	3.7	3.9	0.214
Investigate questions on my own	3.8	3.7	0.605	3.7	3.7	0.955	3.8	3.6	0.197
Relatedness									
Talk about new facts with others	4.0	3.9	0.238	3.9	4.0	0.279	3.8	4.0	0.156
Prefer to learn in a group	3.4	3.4	0.910	3.5	3.3	0.345	3.4	3.5	0.538
Prefer to learn alone	3.0	3.0	0.750	3.8	3.6	0.574	2.8	2.9	0.658

Table 6 continued: Two groups comparison

	Poverty Indicator			Education Indicator			Minority Status Indicator		
	<= 100% FPL (n=44)	> 100% FPL (n=58)	p- value	<= HS (n=87)	>= College (n=36)	p- value	Black/ African- American (n=49)	White/ Caucasian (n=70)	p- value
ENVIRONMENTAL FACTORS (cont'd)									
Social Support									
Connected with lunch site peers	3.6	3.9	0.191	3.9	3.8	0.488	3.8	4.0	0.265
Close to lunch site companions	3.4	3.8	0.030	3.8	3.6	0.332	3.5	3.9	0.025
Not know lunch site peers	2.8	2.4	0.028	2.5	2.6	0.711	2.7	2.3	0.032
Barriers									
Desire louder speaker or microphone	3.4	3.6	0.622	3.6	3.4	0.313	3.5	3.6	0.519
Desire less medical or technical language	3.5	3.4	0.785	3.5	3.4	0.943	3.3	3.5	0.408
Desire bigger printing on materials	3.4	3.4	0.769	3.4	3.4	0.732	3.5	3.3	0.259
Desire non-English language information	3.1	2.5	0.033	2.8	2.4	0.168	2.9	2.4	0.026

DISCUSSION

Overall, this study provided mixed results in regard to factors that may support healthy dietary and physical activity behaviors among older adults. Specifically, older adults possessed positive general health beliefs and outcome expectations relating to diet and exercise and their role in health. Most older adults knew the recommended amounts of fruits and vegetables, and the majority consumed quantities of fruits and vegetables that met or exceeded recommendations. Most literature suggests less than half of older adults, 37% of men and 45% of women at most, achieve recommended fruit and vegetable intakes.⁴³ Brewer et al. (2017) found nutrition education at congregate meal sites increased fruit and vegetable intakes among older adults.⁴⁴ Monthly nutrition education and meals meeting one-third the daily RDA for fruits and vegetables were provided at congregate meals sites in this investigation. Additionally, older adults were connected to other food assistance programs (e.g., Meals on Wheels) by congregate meal site managers and neighborhood advisors. These nutrition services may have contributed to the higher fruit and vegetable intakes observed among this sample of older adults.

However, not all reported behaviors were consistent with their health beliefs. For example, most older adults consumed less than the daily hydration recommendation, consistent with evidence suggesting older adults are at greater risk for dehydration compared to younger adults.⁴⁵ Yet older adults possessed self-efficacy for staying hydrated. This incongruence may have been most apparent among older adults unknowledgeable of the actual hydration recommendation for older adults. In particular, fewer older adults knew daily recommendations for hydration than for fruits and vegetables. Knowing the hydration recommendation was positively associated with adequate fluid intake. Together these findings suggest that accurate knowledge of this recommendation is important to adequate hydration, and that individuals

without this knowledge may over-estimate their self-efficacy to perform the behavior. Regarding sweets, older adults also consumed sweets more than once per day even though it is recommended to consume sweets in small amounts.³⁰ Most older adults in America consume foods high in added sugar.⁴⁵ Strategies for reducing excess consumption of sweets should be incorporated into diet interventions for older adults to help control intake of excess sugar.

On average, older adults had positive health beliefs (i.e., means greater than 3 on Likert-type scale) and outcome expectations regarding PA, and most reported PA in quantities that met recommendations. However, older adults reported lower self-efficacy for performing personally challenging exercises than for adequate hydration and FV intake recommendations. Hallal et al. (2012) found physical activity decreased with age with less than half of adults meeting PA recommendations.⁴⁶⁻⁴⁸ Lower socioeconomic status, and exercise self-efficacy, and more frailty and disability were associated with lower levels of PA.^{47,49} Bowen et al. (2015) found health conditions like cardiovascular disease, obesity, and osteoarthritis were perceived barriers to physical activity among Black female older adults.

Older adults exhibited greater internal motivation than external motivation for learning healthy habits, consistent with Knowles' theory of andragogy.⁵⁰ Older adults desired experiential education approaches such as observing new behaviors (i.e., modeling), repetition of tasks (i.e., reinforcement), and attempting tasks for oneself suggested by Social Cognitive theory to be essential components of behavior change.⁵¹ Prior research suggests nutrition education using these approaches may increase fruit and vegetable consumption among older adults, which is particularly important for older adults who have low fruit and vegetables intakes.⁵² Older adults also valued self-directed approaches, which suggests they were motivated to learn information deemed personally interesting. Therefore, nutrition curricula that incorporate reflective

discussion, observation of new behaviors, and skill development; recognize the agency of older adults; and appeal to personal interests may be most appropriate for older adults.^{52–55}

Older adults sometimes desired louder speakers or microphone use; less technical language; larger print on informational handouts; and more nutrition information in languages other than English, like Spanish or Vietnamese. These findings agreed with other studies, which suggested older adults experience barriers to education.^{56,57} However, low-income and Black subgroups more often desired information in languages other than English. Pot et al. (2018) found ethnic minority older adults, Turkish migrants, experienced poorer health outcomes relative to native speakers due to lower language proficiency undermining access to healthcare services.⁵⁸

Most older adults experienced social support at congregate meal sites, which is consistent with the aims of congregate meal programs. Wunderlich and Piemonte (2011) suggested participating in social activities at congregate meal sites helped older adults maintain overall health. Chicago congregate meal site clients mentioned socialization and social support were benefits of congregate meal services.⁵⁹ However, low-income and Black subgroups experienced less social support than higher-income and White subgroups. Most literature suggests older adults with lower socio-economic status experience reduced social support.^{60–62} Nicklett and Kadell (2013) found African American older adults experienced greater social isolation and less social support, which correlated to lower fruit and vegetable intakes.⁴³ Nutrition interventions should consider these challenges when targeting audiences with low-income and Black subgroups.

The number of low-income and racial minority clients varied across congregate meal sites, and certain sites served larger percentages of these at-risk subgroups. Congregate meal

sites requested contributions from clients of higher socio-economic status; therefore, sites serving larger proportions of higher income older adults likely possessed greater financial resources which supported the provision of additional services. For instance, certain sites provided regular transportation to clients, which enabled regular meal attendance and socialization among clients. Differences in the personal, environmental and behavioral factors of older adults by education were no greater in number than would be expected by chance, and did not suggest tailoring nutrition education offerings by educational attainment was necessary.

Strengths

Most sites served meals only 4 times per week or less; this suggests fruit and vegetable contributions from congregate meals were unlikely to contribute greatly to fruit and vegetable intakes since only a small portion of respondents' nutrition came from congregate meals. Measures of knowledge, attitudes and preferences used in the study questionnaire were all previously validated, but not necessarily in an older adult population.

Limitations

This investigation possessed several limitations. Older adults with an education equal to or less than a high school diploma consumed more vegetables than older adults with at least some college schooling. Also, Black older adults consumed fewer sweets than White older adults. Prior research suggests people with less educational attainment are at greater risk for not meeting fruit and vegetable recommendations.^{63,64} This study found the opposite; older adults with less education reported greater fruit and vegetable intakes. Recall bias may explain part of this contradiction since visual aids were not provided for the measurement of vegetable consumption. Literature also suggests racial minority older adults consume more added sugars

than other groups.⁶⁵ Ethnicity or food culture may explain this contradiction to the literature. For instance, foreign-born Hispanics consume more fruits and vegetables than US-born Hispanics.^{66–70} Therefore, other components like added-sugar may also deviate notably from trends observed in the literature. Since we omitted ethnicity or culture specifics from the research instrument, this theory cannot be further investigated. Therefore, these results may not be generalizable to typical older adults within respective race and education groups.

This cross-sectional survey can only describe the observed associations between measures of socio-demographics and other factors; it cannot establish causal relations between variables. There were likely biases in the measurement of behaviors. Three separate validated measures of physical activity were used to calculate the total minutes of physical activity. However, due to social desirability bias, older adults likely over reported the minutes of moderate PA performed in a typical week. The mean moderate PA reported in this investigation was likely an overestimate of mean moderate PA among respondents.

Data from validated measures for vegetable and fruit consumption⁵⁶ may also be susceptible to social desirability bias. Congregate meal sites provide nutritious meals and nutrition education to clients. Some respondents may have over-reported their actual fruit and vegetable intakes considering this health-conscious setting. Therefore, it is likely that fewer older adults met recommended fruit and vegetable intakes than determined in this study.

Investigators measured solid foods with added sugars (e.g., cakes and cookies) but not sugar-sweetened beverages (SSBs). Therefore, we cannot comment on total added sugars consumed by older adults. Literature suggests that most added sugars in the American diet comes from SSBs.⁴ Also, older adults tend to over consume added-sugars related to altered taste

perception.⁴⁵ However, reported consumption of sweets was high even without SSBs, and suggests an important area for practice intervention.

Some measures, like fruit and vegetable knowledge, had relatively large amounts of missing data, which can also be a limitation leading to more random error. During pilot testing, an overall positive response bias was detected for most Likert-type measures.⁷² Certain questionnaire items may have been more susceptible to positive response bias (e.g. health beliefs, and self-efficacy), because older adults that chose to participate may possess more positive perceptions of services and personal health. After the pilot, modifications were made to the questionnaire with the aim to minimize positive response bias.

Measures of self-efficacy for exercise, hydration, and healthy eating may have been most affected by social desirability bias. In particular, most respondents reported self-efficacy for staying hydrated, yet the majority of respondents did not meet recommended fluid intakes. This contradiction points at the possibility for attribution bias across all three measures of self-efficacy. Therefore, respondents may have reported more self-efficacy than they actually possessed.

The quantitative questionnaire was provided only in English, so all respondents spoke and read English aside from the few who received assistance from the primary investigator or their English-speaking peers at congregate meal sites. Therefore, the desire for non-English nutrition education materials among older adults at congregate meal sites was likely underestimated notably.

External generalizability of findings from this study may be limited by sample selection procedures. Clients were recruited at eight congregate meal sites in upstate New York, so

findings may not be generalizable to other populations of older adults. In particular, older adults at these sites may be more health conscious and therefore engage in PA and seek out healthy meal services, or they may consume more fruits and vegetables as a result of congregate meal participation. Respondents were convenience sampled suggesting those who completed the survey were more motivated than those who did not participate. Older adults who chose to participate may be systematically different from those who chose not to participate. Nutrition may be more important to respondents compared to non-respondents on average. The investigator sampled from sites that served meals ranging from once per month to 4 times per week; sites that served meals more than 4 days per week may have older adult populations that report greater fruit and vegetable intakes, or social support. Finally, there were too few Hispanic respondents to compare meaningfully to other ethnic groups; therefore, results may not generalize to congregate meal sites with substantial Hispanic populations.

Implications

Nutrition education for older adults should prioritize issues of hydration and excess sugar consumption and may be accepted and effective if it incorporates experiential learning approaches. Experiential learning approaches like hydration workshops that demonstrate adequate fluid intakes may help older adults know and meet their hydration recommendation. For instance, nutrition educators should make older adults identify recommended fluids intakes by pouring water into cups or identifying pictures reflecting the correct fluid intake. Nutrition educators should identify healthy alternatives acceptable to older adults, and provide opportunities to practice making alternatives to replace added-sugars with 100 % fruit-vegetable smoothies, and other fruit- and vegetable-based desserts.

Low-income and Black older adults reported less social support compared to other groups in this investigation. Some studies found social support leads to increased fruit and vegetable consumption, self-efficacy, greater knowledge, healthier social norms, and higher levels of physical activity among older adults.^{53,73–76} The primary investigator noted sites with higher-income older adults, also offered resources like transportation, and recreational facilities (e.g., YMCA) that promote social support. The environmental factor of transportation enables regular congregate meal site attendance allowing older adults more time to establish meaningful relationships with peers at congregate meal sites. Therefore, nutrition education should include organized social activities to promote socialization, knowledge of recommendations, fruit and vegetable intakes, and physical activities among older adults.

Congregate meal sites also differ by voluntary contributions from clients. Under Consumer Contribution 315(b) (4) of the OAA, voluntary contributions are encouraged from individuals with incomes above 185% FPL. Voluntary contributions are used at the site of collection to supplement government funding. Therefore, congregate meal sites serving larger numbers of higher income clients will likely receive more supplemental funds to finance relatively more services. Non-residential congregate meal sites that serve lower income clients will likely benefit from access to additional services like regular transportation. Consistent transportation may encourage greater participation and perception of social support at sites requiring clients to travel like churches and community centers. AAA may considered how to raise or allocate more funds for transportation at lower income sites that may benefit from regular transportation.

Older adults desired nutrition education with higher volume of verbally delivered education, less technical language, and larger font size. Therefore, educators should design

workshops and lessons that aim for higher speaking volumes by using microphones and other audio amplification systems; readability below sixth-grade reading levels using Flesch reading tests; and nutrition education materials tailored to major language groups in local areas. There are large Bhutanese, Vietnamese, and Hispanic immigrant populations in upstate New York. The local AAA hires neighborhood advisors to communicate with these language subgroups, but further environmental structures promoting interactions with clients who do not speak English were largely missing. In particular, monthly nutrition education were only available in English, and should be offered in additional languages like Spanish.

Neighborhood advisers (NA) are language and cultural liaisons between the AAA and minority groups (e.g., Vietnamese, and Hispanic); they translate messages, and educational and marketing materials from the AAA for older adults at congregate meal sites. When NA positions become vacant, this undermines considerably communications between the AAA and its non-English speaking clients either for the long- or short-term while new staff are hired. Languages most prevalent among clients should determine nutrition education languages available to older adults in addition to English. For instance, Spanish-speaking educators and education materials should be available at sites with large Hispanic populations. To ease implementation, AAA in upstate New York can translate nutrition education curricula into one additional major language with each passing year. After several years, the majority of nutrition education would be translated to most relevant languages improving access to diverse audiences.

This study attempted to characterize how older adults prioritize current versus future nutrition or health needs relating to readiness to learn, but these questions were not completed for most respondents. Andragogy asserts adults possess greater readiness to learn information relevant to current needs instead of future needs. Future research should distinguish how older

adults prioritize needs to inform the perspective nutrition educators should use when targeting older adults. Only small samples of Hispanic and Asian subgroups were recruited; future research should recruit larger samples of racial and ethnic subgroups to characterize how their educational preferences and needs compare to Black and Caucasian subgroups. Additionally, future research should collect nationality and ethnicity data since they are known to moderate fruit and vegetable consumption. Finally, future research should gather specific language data to characterize languages most spoken in local areas and provide language-tailored materials to these language groups.

Conclusion

Older adults reported generally positive health beliefs, and outcome expectations. More older adults knew FV recommendations than hydration recommendation. Older adults had greater self-efficacy to eat healthy and drink enough fluids than perform personally challenging exercise. Generally, older adults did not consume enough fluids; therefore, older adults were at greater risk for dehydration.⁴⁵ Knowledge of hydration recommendations may reflect better than self-efficacy hydration maintenance among older adults. Older adults who were knowledgeable of hydration, fruit and vegetable recommendations were more likely to meet hydration and vegetable recommendations. More older adults met fruit and vegetable and moderate PA recommendations than hydration recommendations.

Overall, older adults desired experiential, self-directed, and relatedness learning approaches; experienced social support at congregate meal sites; and desired nutrition interventions with higher volume or larger font size. Low-income and Black older adults experienced less social support, and more often desired nutrition education in languages other than English.

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CHAPTER 3: Conclusions and Implications

Older adults from congregate meal sites in upstate New York expressed generally positive health beliefs and outcome expectations across income, race and education subgroups. Despite older Americans reporting lower self-efficacy for doing personally challenging exercises compared to eating healthy and maintaining hydration, fewer older people met hydration than fruit-vegetable (FV), and moderate physical activity recommendations. Missing knowledge of recommendations contributes to this discrepancy: fewer older adults knew hydration recommendations than FV recommendations.

Diminished thirst signals and generational hydration norms among older adults are essential components of hydration status within this target population.¹ Perception of thirst compels people to consume fluids. Biological thirst signals often grow weaker with age; therefore, people who depend primarily on thirst signals to regulate fluid intake may be at greater risk for dehydration with increasing age.¹ This suggests older adults need to adapt their methods to ensure adequate hydration.

Generational norms relating to fluid intake may inform hydration among older adults.² Current American culture stresses water intake more than several decades ago. For example, Millennials, born from 1981 to 1996, carry water bottles more often relative to older generations like the Silent Generation, born from 1925 to 1941.² Older adults may consume less water, because water consumption was emphasized less during their formative years. Older adults may struggle to increase their water consumption, because the habits they developed in earlier years may be difficult to reverse. For example, some older adults may perceive carrying a water bottle to be inconvenient.

Congregate meal site managers may help water consumption among older adult clients by offering more accessible and diverse hydration options during meal programs. Older adults who struggle with mobility may benefit from greater access to fluid during meal times. For instance, meal site volunteers may offer hydration refills to clients during and after meals have been served; water pitchers may be placed at each table and refilled by volunteers; and meal sites may provide bottled fluid to clients to take and drink later. Additionally, congregate meal sites may offer different hydration options in addition to water. More attractive hydration options may include: popsicles, water-rich fruit (e.g., melon, citrus, etc.), and lemonade.³ Making these diverse options accessible is also important; for instance, jugs of lemonade may be placed at each table and refilled when appropriate. Finally, congregate meal site volunteers may increase awareness to hydrate among older adults by surveying and encouraging fluid consumption among clients.³

Nutrition interventions that give diverse visual and real life representations of adequate fluid intakes may help older adults grasp actual hydration recommendations.³ The hydration recommendation is eight cups per day, but older adults can meet this recommendation with intake of various beverages and fluid-rich foods.⁴ Nutritionist may provide hydration demonstrations that display multiple sources of fluids and quantify their contribution to daily fluid intake.⁵ For instance, nutritionists may provide the fluid content of a watermelon slice, a cup of grapes, and a cup of tea. These approaches to nutrition education may help older adults internalize how to meet hydration recommendations.⁶

Missing knowledge may explain the discrepancy between self-efficacy for performing personally challenging exercises and meeting moderate physical activity recommendations.⁷ According to our findings, older adults seem able to meet moderate physical activity

recommendations, but are less confident in their ability to do personally challenging exercises. The definition of appropriate exercises changes across the lifespan for many, which can make it difficult to know what is appropriate. Furthermore, if you feel no exercise is safe for you, then you are likely to avoid exercise.⁸ For instance, older adults with hip disability and limited mobility may want to limit standing exercises, but there are various sitting exercises.⁹ However, older adults must know exercise alternatives before they can perform them. Therefore, nutrition programs could provide instructions and examples of appropriate exercise for different levels of mobility. Furthermore, interventions should help older adults identify the activities they are doing currently that count as sources of moderate physical activity. This investigation provided older adults with examples of chore- and recreation- physical activities, which some may not consider exercise initially. Once knowledge of moderate physical activity improves (e.g., descriptions, examples), we may see older adults expressing more self-efficacy for exercise.¹⁰

Older adults consume too much added-sugar.¹ Changing taste perceptions causes some older persons to gravitate towards stronger flavors from added sugars, fats and sodium.¹ Additionally, immobility and weakness or frailty increase with age in general; therefore, preparing whole foods from less processed foods may be more labor intensive than quick foods with high sugar, fat and salt contents.^{1, 9} Therefore, bold flavors and ease of preparation may help manage these trends among older adults. Nutrition programs should introduce older adults to healthy and acceptable alternatives that require little time, skill, and effort to prepare.^{11, 12} Foods and snacks with these qualities should be prioritized in nutrition education for older learners. For instance, nutrition topics may include refined sugar alternatives and best uses, and quick, healthy, and palatable plant-based desserts. What is considered acceptable is defined by the

individual, so educators must incorporate the perspectives of target audiences when identifying acceptable substitutes.^{8,13}

Malcolm Knowles' andragogy is likely a helpful education guide for teaching older adults. Andragogy explains that adult learners want to: (1) understand their need to know (perceived need); (2) engage in learning related to present, and personal needs (readiness to learn); (3) prioritize internal over external motivators (internal motivators); (4) use past experiences for further learning (experiential); (5) orient learning to personal problems (problem-centered); and (6) direct their own education (self-directed).¹⁴ Older adults report: internal motivators are more relevant than external motivators to health behaviors; and experiential and self-directed approaches are desired education qualities.^{15,16} Therefore, nutrition education for older learners should: address internal motivators specific to audience; present opportunities to attempt desired behaviors; reinforce goal behavior with reflective discussion, progress tracking, and visual reinforcement; provide demonstrations of healthy diet, hydration, and exercise; and follow the personal interests of students.^{6,17} Future research may consider how older adults prioritize future versus present needs related to readiness to learn since this project was unable to satisfactorily characterize the associations between these variables. Additionally, research may investigate best approaches for self-directed education adding minimally to student burden.

Black and low-income older adults desired more nutrition materials in different language options; and reported less social support at congregate meal sites.^{18,19} This project did not recruit sufficient numbers of racial subgroups to make statistically significant comparisons aside from Black and African American compared to White and Caucasian, and these two subgroups do not provide a complete picture of older American racial diversity. Therefore, future investigations should recruit more clients from racial subgroups to identify barriers and social supports specific

to these persons. This project suggested older adults may benefit from thoughtful consideration of barriers and social supports existing at each congregate meal site.

Finally, this project compared respondents from different income levels, but characterizing low-income sites against high-income sites may also identify useful interventions for congregate meal sites. For instance, some sites provided free transportation to clients, group exercise, and additional recreational activities.²⁰ Future studies should characterize how site differences interact with other factors like social support and nutrition-related behaviors to promote related health and behavioral outcomes.

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APPENDIX

A. Final data collection instrument

Lifestyle and Education Survey

Overview:

I am asking you to participate in an anonymous research study on the lifestyle habits, perceptions, and interests among older adults at senior lunch sites. This study is led by Christal Greenlaw, a graduate student in the Division of Nutritional Sciences at Cornell University. The Faculty Advisor for this study is Karla Hanson, also in the Division of Nutritional Sciences at Cornell University. Your feedback will help me explore how nutrition education at senior lunch sites might be improved. There is no direct benefit or payment for taking part in this study.

Guidelines:

We would like to keep your responses anonymous. **Please do NOT write your name** or other personal information on this survey. I am asking that you fill out the attached survey. It should take you about 16 minutes to complete. You may use a pen or pencil. Please complete and return the survey. You will receive \$5 for returning your completed survey on the day you get it. If you complete your survey after the researcher has left your senior lunch site, then please return your completed survey to the manila folder labeled "Research Surveys" before December 1st. This manila folder will be collected by the researcher on December 1st at the latest. **Your input is voluntary.** You may refuse to contribute, stop at any time, or skip any questions that make you feel uncomfortable. If you decide to take part in this study, **your input will help most if you answer all the questions.** By filling out the survey, you agree to participate in this study. I do not anticipate any risks from participating in this study.

Contact Information:

Please ask me any questions you have now. If you have any questions later, you may contact Christal Greenlaw at clg229@cornell.edu. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255- 6182, or access their website at <http://www.irb.cornell.edu>. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866- 293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.

For each question below, **please circle or check mark** the option that best describes what you think or do.

1. In an average day, how many cups of water, unsweetened tea or coffee, or 100% fruit juice do you drink?

☐ 1-2 cups ☐ 3-4 cups ☐ 5-6 cups ☐ 7-8 cups ☐ >8 cups

2. During the past week, on average, how many times did you eat the following foods?	Never or < 1 per week	1 per week	2 - 4 per week	5 - 6 per week	1 per day	2 - 3 per day	4 + per day
Cookies, brownies, pies and cakes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Doughnuts or other breakfast pastries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low or nonfat frozen desserts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regular ice cream & milkshakes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. How many vegetables (*in cups*) do you eat in an average day? One cup of vegetables equals 1 large bell pepper or ear of corn, 1 medium potato or large sweet potato, 1 cup cooked greens, 2 cups of raw greens (lettuce, spinach, etc.), 2 medium carrots or 12 baby carrots, or 2 stalks of celery.

☐ 0 ☐ 0.5 ☐ 1 ☐ 1.5 ☐ 2 ☐ 2.5 ☐ 3
☐ 3.5 ☐ 4 ☐ 4.5 ☐ 5 ☐ 5.5 ☐ 6 ☐ 6.5
☐ 7 ☐ >7

4. How much fruit (*in cups*) do you eat in an average day? One cup of fruit equals 1 large banana or orange, 1 cup of unsweetened applesauce, 1 medium pear or grapefruit, 1 small apple, 8 large strawberries, 15 grapes, or a 1/2 cup of raisins.

☐ 0 ☐ 0.5 ☐ 1 ☐ 1.5 ☐ 2 ☐ 2.5 ☐ 3
☐ 3.5 ☐ 4 ☐ 4.5 ☐ 5 ☐ 5.5 ☐ 6 ☐ 6.5
☐ 7 ☐ >7

5. Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously for leisure or to get to and from places?

☐ Yes ☐ No

The next questions relate to moderate-intensity activities, which are activities that require moderate physical effort and cause small increases in breathing or heart rate.

6. In a typical week, how much time do you spend doing moderate-intensity recreational (leisure), sports, or fitness activities such as brisk walking, cycling, swimming, or volleyball? Please specify in the following blanks: _____ hours and _____ minutes

7. In a typical week, how much time do you spend doing moderate-intensity activities such as household chores, and paid or unpaid work. Please specify in the following blanks: _____ hours and _____ minutes

The next set of questions ask for your thoughts and perceptions.

8. How many cups of water or other unsweetened beverages do you think an adult should drink each day?

☐ 1-2 cups ☐ 3-4 cups ☐ 5-6 cups ☐ 7-8 cups ☐ >8 cups

9. When you have dinner, how much of your plate do you think should be full of fruits and vegetables?



☐ 1/8 plate

☐ 1/4 plate

☐ 1/2 plate

☐ 3/4 plate

10. I feel confident...	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
That increasing my exercise will decrease my chances of having a heart attack or stroke.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
That eating a healthy diet will decrease my chances of having a heart attack or stroke.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In my ability to perform personally challenging exercise(s).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In my ability to maintain a healthy diet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In my ability to drink enough liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am doing something good for myself when I exercise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am doing something good for myself when I eat healthy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. When I eat desserts or fried foods I feel ...	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
That it is a well-deserved treat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
That I am getting farther from my personal health goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Happy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
That others will judge me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
That it doesn't matter to my health that much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Guilty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The next section asks about your **interests and learning style**.

12. How often do you think the following about nutrition services? I would like...	Never	Seldom	Some-times	Often	Always
Printing to be bigger on nutrition table tents, brochures or handouts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presenters to speak louder or use a microphone during nutrition announcements or programs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nutrition presenters, pamphlets or brochures to use less medical or technical language.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More nutrition information in a language other than English, such as Spanish or Vietnamese.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. I learn best when...	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I investigate my questions on my own	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facts connect to something I have already done or thought about in the past	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I talk about new facts with others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I observe a person carefully	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I try new things out for myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I rely on my own critical thinking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a say in choosing the topics about which I learn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can find additional information when I need it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. I feel that I ...	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Care about my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Don't really know anyone at the senior lunch sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Am connected to people I interact with at senior lunch sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Am close to my companions at senior lunch sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Believe nutrition is important	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefer to learn in a group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefer to learn alone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Please rank the following educational aspects in order of interest with 1 being the highest and 6 the lowest. I am most interested in nutrition lessons that...

- ☐ Clarify general nutrition concepts.
- ☐ Explain the logic behind “healthy” eating.
- ☐ Are useful to my **current** health barriers.
- ☐ I can use to avoid **future** nutrition problems.
- ☐ Provide real life solutions to my day-to-day health concerns.
- ☐ Have realistic worth to my personal nutrition goals.

The next set of questions asks about your characteristics. **Please remember, I do not know your name and you will not be connected to your responses.**

16. What is your age? _____

17. What is your sex? ☐ Male ☐ Female

18. What is your race or ethnicity? Please check as many as apply.

- | | | |
|--|---|---|
| <input type="checkbox"/> Hispanic or Latino | <input type="checkbox"/> White or Caucasian | <input type="checkbox"/> Native American or Alaska Native |
| <input type="checkbox"/> Asian | <input type="checkbox"/> Polynesian or Pacific Islander | <input type="checkbox"/> Other (please specify): _____ |
| <input type="checkbox"/> Black or African American | | |

19. Including yourself, how many people currently live in your household?

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

20. What is your annual household income from all sources including wages, salaries, and Social Security or retirement benefits?

- | | | |
|--|--|--|
| <input type="checkbox"/> Less than \$12,000 | <input type="checkbox"/> \$12,000 - \$15,999 | <input type="checkbox"/> \$16,000 - \$19,999 |
| <input type="checkbox"/> \$20,000 - \$23,999 | <input type="checkbox"/> \$24,000 - \$27,999 | <input type="checkbox"/> \$28,000 - \$31,999 |
| <input type="checkbox"/> \$32,000 - \$39,999 | <input type="checkbox"/> \$40,000 - \$74,999 | <input type="checkbox"/> More than \$74,999 |
| <input type="checkbox"/> I don't know | <input type="checkbox"/> I'd rather not say. | |

21. What is the highest degree or level of school you have completed?

- | | |
|--|--|
| <input type="checkbox"/> Less than high school | <input type="checkbox"/> High School Diploma or Equivalent |
| <input type="checkbox"/> Bachelor's Degree | <input type="checkbox"/> Graduate Degree |

22. Which types of food assistance do you receive? (Please check all that apply.)

- | | |
|---|--|
| <input type="checkbox"/> Supplemental Nutrition Assistance Program (SNAP) benefits | <input type="checkbox"/> Commodity Supplemental Food Program (CSFP) foods |
| <input type="checkbox"/> Seniors Farmers' Market Nutrition Program (SFMNP) coupons | <input type="checkbox"/> Food pantry items |
| | <input type="checkbox"/> None of the above |

23. We would like to get a better idea of your living situation. (Please check and fill-in all that apply.)

- | | |
|---|---|
| <input type="checkbox"/> I own a single family house. | <input type="checkbox"/> I live with friends. |
| <input type="checkbox"/> I own an apartment, condo, or townhouse. | <input type="checkbox"/> I live with family. |

☐ I live in a senior or retirement community.

☐ Other: _____