# IMPROVING FOOD LITERACY THROUGH mHEALTH (TEXT MESSAGING) TO A PREDOMINANTLY LOW-INCOME, RURAL POPULATION IN THE APPALACHIAN HIGH COUNTRY

A Thesis
by
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## Abstract

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Low income, rural dwelling individuals are at higher risk of obesity and chronic disease, in large part due to isolation from proper health education and health care. High Country Community Health (HCCH) and Appalachian State University (ASU) developed a tailored 24-week, community-based mHealth-based prevention and health risk reduction program called *My Quest in the High Country (MQHC)* to support these individuals.

From December 2019 to January 2020, HCCH patients were recruited by the HCCH Registered Dietitian (RD) using a standardized Recruitment Script. Biometric data was collected through the electronic medical record (EMR) and individualized out-patient Medical Nutrition Therapy (MNT) counseling was conducted by the HCCH RD. ASU implemented the mHealth community-based intervention. Participants received a scale, FitBit, text messages ($n = 1 - 2/\ day$), weekly eNewsletter, targeted videos, and weekly individualized physical activity feedback. At post, participants completed a post-assessment survey. Video topics included: low cost/easy-to-follow recipes, ingredient substitution to reduce sodium and sugar intake, how to prepare dried legumes and vegetables, food safety, and how to select and use seasonal produce. Participants continue to receive text messages

($n = 2 - 3/week$). Biometric data from the EMR are assessed annually for 60 months. Individual food security was assessed using the USDA Food Security Screener. Analyses included McNemar, Wilcoxon Signed Rank, and descriptives. Significance was set at $p < .05$.

Participants ($n = 14$) were female (71.4%), had an individual income less than $15,000 per year (64.2%), with a mean age of 51.36. Participant food security status did not improve significantly during the study, however, positive, and significant changes in body weight and blood pressure were observed, suggesting that mHealth interventions are impactful in a rural, low-income population. The targeted video education did not significantly change food security status or food literacy behavior; participant feedback showed that similar interventions may have a positive impact on behavior change.

## Acknowledgements

I am forever grateful to my professor and mentor, Dr. Jamie Griffin, and my entire thesis committee for their never-ending support and guidance. I would also like to express gratitude to my cohort, for all the encouragement throughout this research and writing process. Further appreciation goes to the entire Nutrition and Health Care Management Department and the graduate faculty for challenging me to be the best that I can be.

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## Foreword

Chapter 2 of this thesis will be submitted to *The Journal of Appalachian Health* an international peer-reviewed journal owned by the University of Kentucky and published by the University Press of Kentucky; it has been formatted according to the style guide for that journal.

# Chapter 1 – Introduction

## Background

Many rural communities in the United States are spread across a geographical region without adequate access to private and/or public transportation, making it difficult for individuals to commute to regular wellness visits with local physicians.[1,2] The same lack of transportation access lends itself to difficulty finding employment for many individuals. Often in rural communities, transportation, or lack thereof, is one of the many causes of a concentrated low-income population.[1] These communities have less access to employment, food resources, medical care, parks, and green spaces, placing rural populations at risk for chronic illness caused by the inaccessibility of many of these resources.[1]

Food insecurity is common in low-income communities for a variety of reasons, including a lack of financial resources for purchasing an adequate quantity of food and a lack of access to healthy food to ensure adequate diet quality.[3] Food insecure individuals often lack the confidence or skills to utilize the food resources that are available to them. These skills, commonly identified as food literacy skills, include shopping for and choosing groceries, meal planning, basic cooking skills (including preparing fruits and vegetables), and recipe modification.[4]

## Appalachian High Country Stats/Information

Communities in the Appalachian Mountain region have concentrated populations of food insecure individuals. In 2019, the median household income in Watauga County, NC was $41,541/year and in Avery County, NC it is $37,109/year.[5] Both counties median income was significantly below the state median of $50,320/year.[5] In recent health reports,

Watauga and Avery counties top health concerns included: diet/nutrition, chronic illness, health behaviors/lifestyles and access to healthcare. Healthcare providers in these counties are working to provide health literacy and nutrition related programs to address health concerns as well as addressing concerns regarding access to care.[5] Feeding America found that in 2019, 13.3% of all people in rural areas lived below the poverty line and rural communities make up 87% of US counties with the highest rates of overall food insecurity.[6] Counties located in the Appalachian Mountain region, like Watauga and Avery, make up part of this demographic struggling with food insecurity in the US. These rural communities lack many of the amenities that more urban or populated areas may have such as public transit, larger grocery store chains, and thus, access to healthier food options.

## Literature Review

### *Social Cognitive Theory*

Social Cognitive Theory (SCT) states that human behavior is the result of dynamic interactions between personal, behavioral, and environmental factors.[7] Personal factors include an individual's thoughts and feelings, behavioral factors involve health-related knowledge and skills, and environmental factors are a part of an individual's physical and social surroundings.[7] SCT provides a framework for understanding how individual behaviors are determined and the theory describes potential mediators and procedures for behavioral change.[7] Motivating behavior change in individuals using SCT includes constructing outcome expectations, which are important for giving them perceived benefits in engaging in the desired behavior.[7]

Self-efficacy is the most important construct of SCT.[7] Self-efficacy is considered a major motivator of action as well as a mediator and fundamental requirement for behavior

change. Defined as 'an individual's confidence in their capability to take a specific action or to overcome barriers to engage in a specific behavior', self-efficacy is a building block for health behavior change. Self-efficacy is at the center of a combination of factors identified by SCT that affect behavior changes in an individual.[8] Favorable outcome expectations and increased self-efficacy then lead to 'goal intentions.[7] Goal intentions then lead to individuals working towards the goals they set for themselves because they now have the self-efficacy to persevere.

If an individual has a positive attitude toward the received social support, a regulatory construct, their self-efficacy will be improved, and they are more likely to continue their healthy habits for a longer duration.[8] SCT is a well-known theory for designing nutrition education and physical activity programs.[7] SCT-based interventions focus on mindfulness and building nutrition-related skills including basic meal planning and cooking skills have been shown to create lasting behavior change in at-risk populations.[9]

*Video Education*

Health-promotion content produced and distributed through video-based intervention may increase the breadth of health education as the use of mobile technology continues to increase globally.[10] Previous research has shown, creating culturally tailored nutrition education videos can improve the quality of household food.[9]

A study in Cape Town, South Africa, used mobile Health technology (videos and tablets) to support community healthcare workers during home visits to prenatal women and mothers of young children within their community.[11] The use of tablets to deliver the video intervention was assessed during community-based home visits. Researchers created short, illustrated videos that emphasized an evidence-based health promotion curriculum. Video

content focused on themes such as nutrition in pregnancy and early childhood, breastfeeding, avoiding alcohol while pregnant, and prevention or transmission of infectious disease.[11] Results found that the healthcare workers felt the video messages helped them to build rapport with their clients and held client's attention for longer.[11] Community healthcare workers also reported that the videos created points of conversation within the community beyond the home healthcare visits.[11]

In a study conducted in Los Angeles, Latina participants were surveyed on the effects of video-based intervention on their grocery shopping habits. Participants were randomly chosen to enroll in two separate interventions for the study: a 1-video and a 2-video. Initially, individuals watched a 13-minute video *El Carrito Saludable*, which focused on grocery shopping, and the 2-video intervention participants also watched an 11-minute video *Ser Consciente* that emphasized mindfulness.[9] Both cohorts were followed for 2 months after being exposed to the intervention. Results showed that both interventions improved knowledge at the 2-month follow-up appointment. However, the 2-video group showed significant improvement in self-efficacy scores ($p < 0.05$) and preparing to grocery shop ($p < 0.05$) based on reports of increased use of shopping lists and eating before shopping for groceries.[9]

*Food Literacy*

Food literacy focuses on a person's ability to acquire food-related knowledge and to use that knowledge to achieve better dietary outcomes.[12] Food literacy includes a variety of skills such as food and nutrition knowledge, food purchasing and preparation skills, self-efficacy and confidence, and ecological influences.[4,12]

Due to a lack of emphasis on developing these skills at home and in school, most individuals in the United States are not developing adequate food literacy skills.[12] Even with an increased interest in cooking shows and other food-related information, evidence shows that adults are still cooking less.[12] In addition, a lack of cooking in the home may be impacting child cooking skills since parents have been shown to be the strongest influencer of a child's dietary habits and behavior.[12] Schools have removed home economic courses that provided students with basic life skills, including food literacy skills.[12]

In a study conducted in 2013, rural adolescents were provided with ten, 60-minute nutrition education sessions as an intervention.[13] The study found significant differences for eating behaviors and consumption frequencies after the intervention was complete. Participants reported making their own breakfast, consuming whole grains, and decreased purchasing sweetened beverages, as well as consuming sweet and salty snacks.[13] This study is one example of how theory-based nutrition education can build self-efficacy in individuals and promote dietary changes in adolescents.[13] This has important implications since dietary changes during childhood transcend into adulthood.

With the industrialization of the global food system and increased prevalence of food retail stores and fast food outlets, the food supply has shifted in terms of availability, affordability, and quality of food.[14] Availability of energy dense convenience foods and take-out meals has made learning how to purchase and prepare a variety of foods a lower priority for most individuals.[14] This shift has also been associated with poor adherence to nutrition guidelines.[15] When individuals are taught these skills, it builds resilience and the confidence to improvise and problem solve depending on their personal food situation.[16] Food literacy skills are developed through external support with access to a variety of nutritious foods and

adequate living situations. Access to learning opportunities is also key to developing food literacy skills.

*Food Insecurity*

Food insecurity is defined as the household-level condition of limited or uncertain access to adequate and nutritious food.[16] Food insecurity disproportionately influences households with children, adults living alone, and individuals from minority race/ethnicity backgrounds.[17] Food insecurity can cause nutritional inadequacy because it disrupts eating patterns and leads to compromises in favor of quantity rather than quality food.

Food insecurity has been associated with diet-sensitive chronic disease in low-income adults, including cardiovascular disease, type 2 diabetes, gestational diabetes, and overweight and obesity, particularly among women.[17]

Research suggests that the relationship between food insecurity and prevalence of diet-sensitive chronic disease in women may be due to an increased consumption of highly palatable foods such as sugar-sweetened beverages, salty snack foods, and desserts, through a stress-mediated pathway.[18] Excess stress related to food insecurity may have an impact on food selection and can drive the choice to consume highly palatable and gratifying foods that are lacking in nutrient density.[19]

The relationship between food insecurity and obesity may also be caused by an economic dependence on energy-dense food which is often less expensive than other options.[19] This cost difference is related to developments in agriculture and food technology that have created an inverse relationship between energy density and energy cost of foods.[19] Total energy intake can increase due to this inverse relationship and individuals can end up

eating more calories while spending less money.[20] According to Leung et. al., nutrient dense foods such as fruits and vegetables are often more expensive and less available in lower-income neighborhoods when compared with processed foods.[16] Processed foods are generally inexpensive and highly accessible. These factors lead to higher rates of overweight and obesity in food insecure individuals compared to individuals who are food secure.[16]

In a 2014 systematic review, researchers tested 170 associations in adults between food insecurity and dietary intake and 50 of these suggested an adverse association.[17] The review found that food insecure adults were less likely to consume a well-balanced diet than food secure adults and that food insecurity was also associated with a lower intake of vitamins A and B-6, calcium, magnesium and zinc. Results also showed food insecurity is adversely associated with dietary quality in adults, and that food insecure adults were less likely to consume nutrient-rich foods that promote good health.[19] As previously mentioned, this inverse relationship has been associated with the overall low cost of energy dense foods when compared to nutrient dense foods.[16]

In an analysis of the 2011-2014 NHANES data, researchers found that food insecure adults reported a lower Healthy Eating Index score. Specifically, the score was lower among non-Hispanic whites and adults of Asian or other races/ethnicities. Food insecurity among non-Hispanic whites was associated with lower scores for total protein foods, seafood and plant proteins, and added sugar. Among Asian individuals, food insecurity was associated with lower scores for whole fruit.[18]

*mHealth Initiatives*

Mobile health (mHealth) uses portable electronic devices, like cell phones, to allow healthcare professionals to provide care to patients remotely.[20] Research shows that continuous development of mHealth initiatives could potentially change how data is used in health programs. Data from mobile health programs could be used for data collection and reporting on trends in patient behavior. Using cell phones to communicate with patients allows researchers and health professionals to collect real-time data from participants in mobile health programs quickly and effectively.[21]

With the onset of the COVID-19 pandemic, mHealth has caught the attention of the public.[21] Using text-messaging and phone applications to provide public health messaging regarding the pandemic has simplified the dissemination of information during the past year.[22] These efforts have ranged from texts reminding individuals to wear a mask and wash their hands to applications developed to track the spread of the virus. mHealth was already increasing in popularity prior to the pandemic due to the increased efficiency it often adds to health care practices.[20] With the emphasis on limiting person-to-person contact during the COVID-19 pandemic, mHealth allows providers to practice remotely when needed.[21]

*My Quest*, a 2015 study conducted in 55 rural Alabama counties, showed that mHealth initiatives in the form of a low-cost text messaging program could promote weight loss and improve health behaviors.[23,24] Participants in the study included a sample of low-income, primarily overweight or obese women. They were sent 2-3 daily text messages as well as a weekly newsletter via email all sharing health tips, reminders, goal-setting prompts, and recipes. Results from this study showed significant ($p < 0.05$) improvement in health behaviors, food environment, and reduction in body weight.[23,24]

Cell phone ownership is common in the United States. As of 2019, 96% of Americans own a cellphone with 81% owning a smartphone.[25] This percentage is reflected in rural America as well with 95% of rural individuals owning a cell phone and 71% owning a smartphone.[25]

Evidence shows that there is great potential for mHealth to be used to deliver increased and enhanced healthcare services to individuals and communities.[20] Documented results of mobile health, or mHealth, initiatives serving low income populations are minimal. Programs using mHealth most commonly operate by one-way text messaging and phone reminders that encourage follow-up appointments with physicians, healthy behaviors, and data gathering.[20,21]

## Methodology

### *Participants*

From December 2019 to February 2020, the High Country Community Health registered dietitian (HCCH RD) recruited patients using a standardized Recruitment Script to participate in *MQHC.* Patients that were interested in participation then took the online pre-assessment survey during their initial clinic meeting with a registered dietitian employed by the clinic. Informed Consent was embedded within the online survey, and participants that completed the survey provided consent to participate in *My Quest in the High Country*. Patients (n=14) who provided consent to participate completed the pre-assessment survey. Participants recruited during this time were assigned to Group 3 of the on-going *My Quest in the High Country* intervention.

*Intervention*

*Text Message Education*

Participants in *My Quest in the High Country* Group 3 received 1-2 short SMS text messages per day. The text messages were scheduled for delivery in the morning, lunch, or evening. Delivery time of each text message was randomized to ensure participants did not become complacent nor habitualized to receiving text messages at a specific time. Morning text messages were scheduled for delivery between 7:00 am and 8:00 am. Lunch text messages were scheduled between 11:00 am and 1:30 pm. Evening text messages were scheduled between 6:30 pm and 8:30 pm.

Text messages included tips, reminders and questions about exercise, healthy eating, and goal setting. Body weight prompts and self-monitoring prompts were also scheduled during the week. The text messages were developed based on one of twelve secondary predictors of behavior change of Social Cognitive Theory (Food Journaling, Know Your Calories, Portion Control, Exercise Journaling, Increasing Steps, Increasing Intake of Water, Reducing Intake of Sugar Sweetened Beverages, Meal Planning, Increasing Intake of Fruits and Vegetables, Smart Snacking, Increasing Physical Activity, and Reducing Screen Time).[24,25]

*eNewsletter*

Participants in *My Quest in the High Country* Group 3 received a weekly eNewsletter that focused on nutrition and physical activity behavioral goals and objectives (Appendix E). The eNewsletters were developed based on one of twelve secondary predictors of behavior change of Social Cognitive Theory (Food Journaling, Know Your Calories, Portion Control, Exercise Journaling, Increasing Steps, Increasing Intake of Water, Reducing Intake of Sugar

Sweetened Beverages, Meal Planning, Increasing Intake of Fruits and Vegetables, Smart Snacking, Increasing Physical Activity and Reducing Screen Time).[24,25] Each eNewsletter provided tips, reminders and a low-cost healthy recipe.

*Targeted Videos*

Participants in *My Quest in the High Country* Group 3 received 1 targeted video highlighting a food literacy skill every other week during the 24-week trial for a total of 12 videos targeting different attributes of food literacy. Videos were developed using the identified food literacy attributes and inspiration from popular web-based recipe video format. The targeted videos topics covered the following topics: easy-to-follow, low cost recipes, how to substitute ingredients to reduce sugar and sodium intake, how to prepare legumes and vegetables, food safety, and how to select and use seasonal produce. Videos were produced with the intention of being short, attention grabbing, and delivering an easily digestible message.

Videos were linked within the text messaging component of the trial and were scheduled to arrive at random times every two weeks so that participants did not expect the videos to arrive at a specific time. After the video was sent via text, participants received two video surveys for that specific video during the week to collect participant feedback on the topic and its effectiveness.

*Data Collection*

A Qualtrics-based survey was used to collect pre- and post- assessment data for the study. Participants were asked to provide their phone numbers in each survey which allowed for their enrollment in the text message program as well as to pair pre- and post- assessment

data for analysis. All participant information was kept confidential in password protected files.

Both survey tools (located in the appendices) include 81 items from previously validated survey tools.[24,25] Items included in the surveys were developed to determine changes in participant behaviors and self-efficacy between the pre- and post- assessment.[24,25]

*Statistical Analysis*

Descriptive statistics were used to analyze demographic and physical characteristics. SCT construct analyses included McNemar test (dichotomous data), paired *t*-test (continuous data), or Wilcoxon Signed Rank Test (ordinal data). Body weight change, step counts, and physical activity over time were analyzed by repeated-measures ANOVA, using pre-midpoint and post-intervention data. Statistical analyses were performed with SPSS software (version 25, IBM Corp, Armonk, NY, 2017). Body weight response rates were analyzed using Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA). A $p < .05$ is considered statistically significant.

**Research Purpose and Questions**

There is not a significant amount of research on how food literacy programs impact food insecure populations. These populations are often located in rural areas such as the Appalachian Mountains and are isolated from larger towns with adequate food options to support a healthy diet. Improving food literacy in a rural population may encourage individuals to use resources, such as money and food, more effectively. By implementing a food literacy component within the pre-existing mHealth initiative, *My Quest in the High*

*Country*, the hope is to improve food literacy-based self-efficacy and food literacy skills as well as food security status within the participating population.

*Study Objectives*

1. Promote weight loss of 5% from baseline body weight.
2. Increase water intake, fruit/vegetable intake, health snacking, meal planning, daily steps and physical activity, knowledge and adherence to personal calorie requirement, food and exercise journaling, and reduced sugar-sweetened beverage intake and sedentary time.
3. Increase food literacy skills: shopping and choosing groceries, meal planning, basic cooking skills (including preparing fruits and vegetables), and recipe modification.
4. Produce targeted nutrition education videos that address the above attributes of food literacy.
5. Design a web-based survey that measures participant self-efficacy and ability to demonstrate food literacy skills pre- and post- intervention.
6. Obtain feedback on effectiveness of video intervention, weekly eNewsletter, and text messages from participants who participate in *My Quest in the High Country* to use in data analysis.

Research Questions

1. Can providing short video demonstrations targeting different food literacy attributes improve participant food literacy-based self-efficacy and food literacy skills in a low-income, rural dwelling population?
2. Can including food and nutrition knowledge, nutrition literacy, nutrition self-efficacy, food self-efficacy, cooking self-efficacy, and food attitude into video demonstrations improve food security in a low-income, rural dwelling population?

## Significance of Study

This study is significant because it observes the impact of a targeted video intervention on individual food literacy and food security in a rural community. Previous video interventions have been targeted to a general audience. By focusing on low-cost, accessible ingredients as well as quick, easy-to-follow tutorials, this study aims to encourage participants and promote self-efficacy while improving food literacy and food security status. Using personal cell phones to interact with participants during *My Quest in the High Country*, and deliver the video intervention, may further reveal the strength of mobile health programs in promoting health behaviors within rural communities.

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## Chapter 2: Article

### Introduction

Low income, rural dwelling individuals are at a higher risk of becoming obese or developing a chronic disease.[1,2] Increased health risks in rural populations are primarily related to the isolation that these communities experience which results from a lack of proper health care or health education. Other disadvantages such as a lack of job opportunities or access to adequate transportation also lend to this on-going public health issue. These resource disparities have also been associated with decreased food literacy and a higher risk of food insecurity.[1,2]

Food insecurity in rural communities is often related to a lack of financial resources for purchasing adequate amounts of food and/or a lack of access to a variety of food that would ensure adequate diet quality.[3] Food insecurity has been associated with diet-sensitive chronic disease in low-income adults, including cardiovascular disease, type 2 diabetes, gestational diabetes, and overweight and obesity, particularly among women.[3] Research suggests that excess stress related to food insecurity may impact food selection and can drive the choice to consume highly palatable and gratifying foods that lack nutrient density.[4] The relationship between food insecurity and obesity may also be caused by an economic dependence on energy-dense processed foods which is often easily accessible and less expensive than more healthful options.[4] Nutrient-dense foods such as fruits and vegetables are often more expensive and less available in lower-income neighborhoods when compared with processed foods.[3] These factors lead to higher rates of overweight and obesity in food insecure individuals compared to individuals who are food secure.[3]

Food literacy focuses on a person's ability to acquire food-related knowledge and to use that knowledge to achieve better dietary outcomes.[5] Food literacy includes a variety of skills such as food and nutrition knowledge, food purchasing and preparation skills, self-efficacy and confidence, and ecological influences.[5,6] There is a lack of emphasis on developing these skills at home and in school and this has led to the majority of Americans not acquiring adequate food literacy skills. [5] Evidence shows that adults are cooking less and a lack of cooking in the home may be impacting child cooking skills as parents have been shown to be the strongest influencer of a child's dietary habits and behavior.[5] Schools have also turned away from teaching home economic courses that provide students with basic life skills, including food literacy skills.[5] Studies have shown that providing students with nutrition education can have a significant impact on eating behaviors such as eating breakfast more consistently, consuming more whole grains, and decreased consumption of sugar-sweetened beverages and processed snacks.[6] The development of food literacy skills has short term and long term benefits for students, including food skills (ex: ingredient preparation, recipe modification), confidence to improvise and problem-solve, and the ability to access and share information.[5]

Use of personal technologies to provide health care and health education is becoming more common practice. Mobile health (mHealth) programs are one way that health providers are choosing to reach their patient population. This mode of delivery uses portable electronic devices, like personal cell phones, to allow health care providers to connect remotely with patients remotely.[7] The use of tablets and video education was found to improve the scope and quality of the services that community health workers offered, providing evidence that mHealth technologies offered support to community health workers.[7] Mobile health has been

found to be effective in the self-management of weight and improving other health indicators.[8,9,10]

The purpose of this study was to improve food security status by improving food literacy- based self-efficacy and food literacy skills within the population participating in the pre-existing behavior change-based mobile health (mHealth) initiative, *My Quest in the High Country (MQHC)*. My Quest in the High Country is a community-based 24-week pre- to posttest weight-loss and dietary and physical activity behavior change intervention developed using Social Cognitive Theory (SCT).[11] Social Cognitive Theory constructs emphasized goal setting, self-efficacy, behavioral factors and self-monitoring.

Primary outcomes included improved food literacy, food security and health behaviors. Secondary outcomes included significant changes in body weight, blood pressure (systolic or diastolic) and body mass index.

**Methods**

Prior to data collection, the Appalachian State IRB approved this human subject study.

*Participants*

From December 2019 to February 2020, the High Country Community Health registered dietitian (HCCH RD) recruited patients using a standardized Recruitment Script to participate in *MQHC*. Patients ($n = 14$) interested in participating then took the online pre-assessment survey during their initial meeting with the dietitian. Authorization to Release Private Health Information and Informed consent was embedded within the online survey and participants that completed the survey provided consent to participate in *MQHC*. Patients ($n = 14$) who provided consent and completed the pre-assessment survey, received a Fitbit

to wear during the 24-week intervention, and a bathroom scale to self-monitor weekly body weight. Participants recruited during this time were assigned to Group 3 of the on-going *MQHC* intervention, identified as *MQHCG3*.

*Intervention*

*My Quest in the High Country* was modified from *My Quest*[9,10] to meet the unique needs of the Appalachian High Country. Modifications included using a FitBit for activity tracking, expanding content to include targeted video education to increase food literacy, and use of a two-way text message program for feedback. Participants had the opportunity to receive individualized medical nutrition therapy counseling with the HCCH RD.

Body weight, height, and blood pressure (systolic and diastolic) measures were provided from the electronic medical record.

Text message and eNewsletter education materials were developed based on one of twelve secondary predictors of behavior change of SCT (Food Journaling, Know Your Calories, Portion Control, Exercise Journaling, Increasing Steps, Increasing Intake of Water, Reducing Intake of Sugar Sweetened Beverages, Meal Planning, Increasing Intake of Fruits and Vegetables, Smart Snacking, Increasing Physical Activity, and Reducing Screen Time).[9,10]

*Text Message Education*

Participants in *MQHCG3* received short SMS text messages ($n = 1 - 2/day$). The text messages were scheduled for delivery in the morning, lunch, or evening. Delivery time of each text message was randomized to ensure participants did not become complacent nor habitualized to receiving text messages at a specific time. Morning text messages were

scheduled for delivery between 7:00 am and 8:00 am. Lunch text messages were scheduled between 11:00 am and 1:30 pm. Evening text messages were scheduled between 6:30 pm and 8:30 pm.

The text messages included tips, goal setting, reminders and questions about exercise and healthy eating (ex: #MQHC3: Cook once, eat twice. Make extra vegetables and save some for later. Use them in a stew, soup or pasta dish.); weblinks to simple, easy, low-cost recipes or exercises (ex: #MQHC3: Get in a quick cardio workout today with this 10 minute total body workout. https://bit.ly/2x2NUAC); and, body weight and self-monitoring prompts, including weekly individualized physical activity feedback (ex: #MQHC3: You are a rockstar! You've hit all your marks this week. Keep up the great work with your physical activity!).

*eNewsletter*

Participants in *MQHCG3* received a weekly eNewsletter ($n = 24$) that focused on nutrition and physical activity behavioral goals and objectives. Each eNewsletter provided tips, reminders and a low-cost healthy recipe.

*Targeted Videos*

Twelve education videos were developed with a goal to improve food literacy skills (Table 3). Participants in *MQHCG3* received a targeted video every other week during the 24-weeks for a total of 12 videos targeting different attributes of food literacy. Videos were linked within the text messaging component of the trial and were scheduled to arrive at random times so that participants do not expect the videos to arrive at a specific time.

*Data Collection*

Data were collected through electronic medical record, participant text message responses and a pre- and post-intervention online survey. The online survey was developed from previously validated survey tools.[9,10]

*Statistical Analysis*

Descriptive statistics were used to analyze demographic and physical characteristics. SCT construct analyses included McNemar test (dichotomous data), paired *t*-test (continuous data), or Wilcoxon Signed Rank Test (ordinal data). Body weight change, step counts, and physical activity over time were analyzed by repeated-measures ANOVA, using pre-midpoint and post-intervention data. Statistical analyses were performed with SPSS software (version 25, IBM Corp, Armonk, NY, 2017). Body weight response rates were analyzed using Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA). A $p < .05$ is considered statistically significant.

**Results**

*Participant Demographics*

Patients ($n = 14$) who completed the preassessment were female (70%), white (100%), employed full-time (43%), some college education (42.9%), income < $15,000/year (64%), and a mean age of 51.4 (±11) years. At post, 10 participants completed the 24-week MQHC intervention (71.4% retention).

*Food Insecurity*

Table 2 shows results from the pre- and post- assessment for variables used to assess food security indicators. At pre-assessment, approximately half of participants reported that they 1) worried about not having enough money to buy food, or 2) had altered the size of meals due to not having enough money for food. At post-assessment, results did not indicate significant change in food security status (Table 2).

*Food Literacy*

Table 2 shows results from the pre- and post- assessment for SCT variables used to assess food literacy-based behaviors. Participants exhibited significant ($p < .05$) improvement from pre- to post-assessment for planning meals ahead of time. No significant change was observed in other variables related to food literacy-based behaviors (Table 2).

Participants ($n = 10$) who completed *MQHCG3* reported that they found the education videos *a little helpful* (50%) or *very* helpful (50%). The 'Breakfast Eggs – 3 Ways' and 'Seasonal Vegetable Recipe Ideas' were the two most popular videos among participants.

*Anthropometrics*

*MQHCG3* participants had positive and significant changes in body weight ($p = .04$), systolic blood pressure ($p = .005$), and diastolic blood pressure ($p = .004$).

**Implications**

While the results of *MQHCG3* did not show a significant change in food security or most food literacy behaviors, participant feedback showed that the targeted video education

may have a positive impact on behavior change dependent on the population. Participants reported that they found the targeted videos helpful, favoring recipe videos such as the Breakfast Egg Video and Seasonal Produce Video.

There was a significant change in planning meals ahead of time from pre- to post-assessment. Participants also had positive and significant changes in body weight and blood pressure. This suggests that mHealth interventions are impactful in a rural, low-income population.

Retention for the current study was near that of previously mHealth studies to promote weight loss and behavior change (71.4% compared to 68%-96%).[10] Participants were provided a FitBit (fitness tracker) and a bath scale to self-monitor their physical activity and body weight. The ability to provide this equipment to individual participants enabled researchers to individualize feedback throughout the study to promote participant engagement and retention. Minimal cost was incurred by both researchers and participants due to the nature of the remote delivery of the program. This also allowed the program to continue even with the onset of the COVID-19 pandemic because the majority of interactions throughout the study were conducted via text message or email.

The study was not without limitations. First, is the very small sample size (n=10). Second is racial homogeneity (100% Caucasian). Both of which limit generalizability to other populations. The study was also impacted by suboptimal participant engagement. Participant response rate to video surveys average 33.9% which made it difficult to assess behavior change related to the video intervention.

The onset of the COVID-19 pandemic may have negatively impacted the study outcomes due to a change in routine behaviors related to the 'Stay-At-Home' order put in place in North Carolina. Participants reported that this impacted their food and health behaviors during the study. When asked at post-assessment how the pandemic affected their progress, participants reported that 1) they were eating more comfort/snack foods (50%), 2) their food budget was impacted (30%), 3) they weren't able to afford foods that they wanted (30%), and 4) they purchased less healthy foods because healthier options were out of stock (30%).

Further studies should more closely research the impact that a video intervention has on food security when delivered via text message.

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**Table 1.** Pre- and post- survey results (n=10) for Food Insecurity & Food Literacy Questions

| Question | Pre [Mean(SD)] | Post [Mean(SD)] | P-value |
|---|---|---|---|
| **Do you ever worry that you do not have enough money to buy food?[b,d]** | 0.67(0.50) | 0.56(0.53) | 1.00 |
| **In the past month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?[b,d]** | 0.44(0.53) | 0.44(0.53) | 1.00 |
| **In the past month, did you ever eat less than you felt you should because there wasn't enough money for food?[b,d]** | 0.33(0.50) | 0.44(0.53) | 1.00 |
| **I do not have enough money to buy food.[b,d]** | 0.56(0.53) | 0.44(0.53) | 1.00 |
| **I do not know how to purchase food.[b,d]** | 0.11(0.33) | 0.22(0.44) | 1.00 |
| **I do not know how to prepare or cook food.[b,d]** | 0.11(0.33) | 0.33(0.50) | 0.63 |
| **How often do you plan your meals ahead?[c,e]** | 4.20(1.87) | 5.20(1.99) | 0.03* |
| **How often do you have fruits and vegetables ready to eat as a snack?[c,e]** | 5.00(2.26) | 4.80(2.44) | 0.48 |
| **How often do you eat fruits and vegetables as a snack?[c,e]** | 4.90(1.97) | 5.40(1.84) | 0.16 |
| **How often do you eat canned vegetables with salt?[c,e]** | 3.90(1.79) | 3.30(1.57) | 0.30 |
| **How often do you eat canned vegetables with low sodium/NSA?[c,e]** | 2.80(1.99) | 2.80(1.55) | 0.89 |
| **How often do you eat frozen vegetables with salt or sauce added?[c,e]** | 3.70(1.95) | 3.40(1.78) | 0.52 |
| **How often do you eat frozen vegetables with no salt or sauce added?[c,e]** | 3.30(2.21) | 3.40(2.27) | 0.66 |
| **How often do you eat fresh vegetables?[c,e]** | 5.20(1.55) | 5.70(1.16) | 0.24 |

*p<.05; **p<.01; [a] Paired T-test; [b] McNemar; [c] Wilcoxson Signed Rank; [d] Response Scale 0= No 1= Yes; [e] Response Scale= 1= Never, 2= Less than once a month, 3= Once a month, 4= 2-3 times a month, 5= Once a week, 6= 2-3 times a week, 7= Daily

**Table 2.** Targeted Video Intervention Development

| Video Title | Objective | Text Message |
|---|---|---|
| **Breakfast Eggs 3 Ways** | Improve self-efficacy by developing food preparation skills. | #MQHC3: Don't have enough time to make breakfast each day? Try one of these quick egg recipes to fuel your morning: https://bit.ly/2SoMTut |
| **How to Cook Dried Beans** | Improve self-efficacy by developing food preparation skills | #MQHC3: Try preparing a pot of beans at the start of your week for an easy way to add protein to meals. Click the link for a quick how-to: bit.ly/2UoE0CM |
| **Low Sugar Iced Coffee Options** | Increase awareness of sugar in popular coffee drinks and offer a budget friendly, easy-to-make alternative | #MQHC3: Try making sweetened iced coffee at home and ditch the extra cost and calories. Click the link for a quick how-to: http://bit.ly/2OzsWyX |
| **Oatmeal 2 Ways** | Improve self-efficacy by developing food preparation skills | #MQHC3: Ditch sugary instant oatmeal and buy oats in bulk for a healthier, budget-friendly breakfast. To learn more, follow the link: https://bit.ly/2V68nfT |
| **How to Choose Seasonal Produce** | Provide education on affordability and availability of seasonal produce | #MQHC3: Shopping for in-season produce can save you a lot at the grocery store and add color to your meals! Check out this video to learn more: https://bit.ly/2XKJxW5 |
| **Easy Sweet Potato Chili** | Improve self-efficacy by developing food preparation skills | #MQHC3: Warm up with a pot of Sweet Potato Chili! Click the link for an easy recipe: http://bit.ly/32GKyPt |
| **Roasted Frozen Vegetables** | Improve self-efficacy by developing food preparation skills | #MQHC3: Making one batch of vegetables at the beginning of the week makes it easy to throw them into dishes all week long. Follow the link to watch a quick video on a simple way to prepare frozen veggies! https://bit.ly/2yb6LdB |
| **Picnic Food Safety** | Provide education on food temperature and storage safety | #MQHC3: Enjoy the summertime with a picnic and remember these safety tips when preparing your favorite outdoor foods: https://bit.ly/3e3PfXu |
| **How to Choose a Healthy Yogurt** | Increase awareness of sugar content in popular sugar brands, offer alternative options | #MQHC3: Do you often have yogurt for a quick, healthy breakfast? Many yogurts have extra sugar in them, find out how much by clicking the link: https://bit.ly/3b5Um8q |

**Table 2.** Targeted Video Intervention Development

| Video Title | Objective | Text Message |
|---|---|---|
| **Low Sugar Desserts** | Encourage viewers to substitute sugar alternatives as needed to reduce sugar intake | #MQHC3: Are you trying to cut back on how much sugar you eat? Swap your usual dessert for one of these quick low-sugar options: https://bit.ly/2AV6Sef |
| **Easy Hummus Recipe** | Improve self-efficacy by developing food preparation skills | #MQHC3: Looking for a healthy snack that's easy to throw together? Follow the link for some inspiration: https://bit.ly/2XVxPaJ |
| **How to Wash Produce** | Demonstrate methods of washing variety of produce, improve self-efficacy | #MQHC3: Food safety starts with cleaning the produce we purchase thoroughly before preparing it in our favorite recipes. Click the link for a quick video how-to: https://bit.ly/2APXkBH |

## Chapter 3: Summary of Findings and Limitations

### Results

Participants ($n = 14$) who completed the preassessment were female (71%), white (100%), married (50%), employed full-time (43%), 2-year degree/some college education (43%), income < $15,000/year (64%), and a mean age of 51.4 (±11) years. At post, 10 participants completed the 24-week MQHC intervention (71.4% retention).

From the pre- and post- assessment food security was assessed with six questions. Participants were asked, “Do you ever worry that you do not have enough money to buy food?”, “In the past month, did you ever cut the size of your meals or skip meals because there wasn’t enough money for food?”, “ In the past month, did you ever eat less than you felt you should because there wasn’t enough money to buy food?”, “I do not know how to purchase food.”, “I do not know how to prepare or cook food.” Responses were either *yes* or *no.* At pre-assessment, 57.1% of participants reported that they were worried about not having enough money to buy food and 42.9% reported that they were not worried. 35.7% of participants reported altering the size of meals due to not having enough money for food and 64.3% of participants reported that they had not altered the size of meals. At post-assessment, results did not indicate significant change in food security status.

From the pre- and post- assessment food literacy-based behaviors were assessed with 8 questions. Participants were asked, “How often do you plan your meals ahead?” Participants exhibited significant ($p < .05$) improvement from pre- to post-assessment for planning meals ahead of time. No significant change was observed in other variables related to food literacy-based behaviors (Table 1).

Participants ($n = 10$) who completed *MQHCG3* reported that they found the education videos *a little helpful* (50%) or *very* helpful (50%). The 'Breakfast Eggs – 3 Ways' and 'Seasonal Vegetable Recipe Ideas' were the two most popular videos among participants.

*Anthropometrics*

*MQHCG3* participants had positive and significant changes in body weight and blood pressure.

**Research Purpose and Questions**

There is not a significant amount of research on how food literacy programs impact food insecure populations. These populations are often located in rural areas such as the Appalachian Mountains and are isolated from larger towns with adequate food options to support a healthy diet. Improving food literacy in a rural population may encourage individuals to use resources, such as money and food, more effectively. By implementing a food literacy component within the pre-existing mobile health (mHealth) initiative, *My Quest in the High Country*, the hope is to improve food literacy-based self-efficacy and food literacy skills as well as food security status within the participating population. [1-5]

*Study Objectives*

1. Promote weight loss of 5% from baseline body weight.
2. Increase water intake, fruit/vegetable intake, health snacking, meal planning, daily steps and physical activity, knowledge and adherence to personal calorie requirement, food and exercise journaling, and reduced sugar-sweetened beverage intake and sedentary time.
3. Increase food literacy skills: shopping and choosing groceries, meal planning, basic cooking skills (including preparing fruits and vegetables), and recipe modification.

4. Produce targeted nutrition education videos that address the above attributes of food literacy.
5. Design a web-based survey that measures participant self-efficacy and ability to demonstrate food literacy skills pre- and post- intervention.
6. Obtain feedback on effectiveness of video intervention, weekly eNewsletter, and text messages from participants who participate in *My Quest in the High Country* to use in data analysis.

Research Questions

1. Can providing short video demonstrations targeting different food literacy attributes improve participant food literacy-based self-efficacy and food literacy skills in a low-income, rural dwelling population?

   *Findings were not significant, but participants reported that they found targeted videos either 'a little helpful' or 'very helpful' and specifically liked the recipe videos that were provided.*

2. Can including food and nutrition knowledge, nutrition literacy, nutrition self-efficacy, food self-efficacy, cooking self-efficacy, and food attitude into video demonstrations improve food security in a low-income, rural dwelling population?

   *There was a significant difference in participants reporting planning meals ahead of time ($p < 0.05$). Other responses to food literacy questions did not show a significant change over the 24-week study period, however more participants reported eating fruits and vegetables as a snack and eating fresh vegetables at post-assessment than at the beginning of the study.*

## Limitations

This study was not without limitations. First, is the very small sample size which can limit generalizability to other populations. Next, the majority of the intervention occurred during the COVID-19 pandemic. Participants reported that this impacted their food and health behaviors during the study. When asked at post-assessment how the pandemic affected their progress, participants reported that 1) they were eating more comfort/snack foods, 2) their food budget was impacted, 3) they weren't able to afford foods that they wanted, and 4) they purchased less healthy foods because healthier options were out of stock.

The study was also impacted by suboptimal participant engagement. Participant response rate to the video surveys averaged 33.9%, making it difficult to assess behaviour change related to the video intervention.

## Conclusions

While the results did not show a significant change in food security or food literacy behaviors, participant feedback showed that the targeted video education may have a positive impact on behavior change dependent on the population. The onset of the COVID-19 pandemic may have negatively impacted the study outcomes due to a change in routine behaviors as reported by participants, which were related to the North Carolina 'Stay-At-Home' order.

Further studies should more closely research the impact that a video intervention has on food security when delivered via text message.

*My Quest in the High Country* participants had positive and significant changes in body weight and blood pressure. This suggests that mHealth interventions are impactful in a rural, low-income population.

## References


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## Appendix A: Project Timeline

Recruitment period for Group 3: December 17, 2019 – February 28, 2020

Group 3 Start Date: February 1st, 2020

Group 3B Start Date: March 1st, 2020

Group 3 End Date: July 18th, 2020

Group 3B End Date: August 15th, 2020

Post-Assessment: July 19th – August 1st, 2020

Data Analysis: August 2020 - December 2020

Conclusions and final development of thesis document: January 2021-March 2021

Thesis Defense and pursuit of manuscript publication: April 2021

## Appendix B: Recruitment Script

### Recruitment Script

*"My Quest* in the High Country: Augmenting nutrition standard care with a text message-based health behavior intervention to improve clinical biometric markers and health behaviors in Appalachia."

Are you trying to lose weight? Do you want support losing weight? Do you like getting text messages? If so, we invite you to participate in a research study that will determine if text messaging is a good way to help men and women trying to lose weight. For this study, we are looking for patients aged 18-69 years who are trying or want to lose weight.

To be in this study you must be:

- An active patient of High Country Community Health (seen by a provider in the past 6 months)
- Age 18-69
- Have a cell phone with text messaging
- Have an active email address
- Have a low risk for medical complications as determined by the Physical Activity Readiness Questionnaire (PAR-Q) or provide signed medical clearance from your primary care provider
- Not pregnant or planning to become pregnant during the study

Being in this study is completely voluntary. If you decide to be in this study, you will be asked to read and sign an Informed Consent form and complete a Physical Activity Readiness Questionnaire (PAR-Q) to determine if you can safely complete this program. When you sign the Informed Consent form you will receive an email to complete an online survey and a short code to opt-in to the text message program.

You will be asked to take three online surveys. These will be sent to the email address you write down on your Informed Consent form. Each survey should take no longer than 15 minutes to finish. Everything will be kept private and confidential.

You will need a cell phone that can receive and send text messages. You will get a short text message each day with tips, reminders or questions about exercise and healthy eating, or your body weight.

You will get a weekly eNewsletter that contains tips and recipes. Each newsletter will have links to web pages. Click on the blue web links for helpful websites to visit. You will get a Fitbit to wear each day of the study.

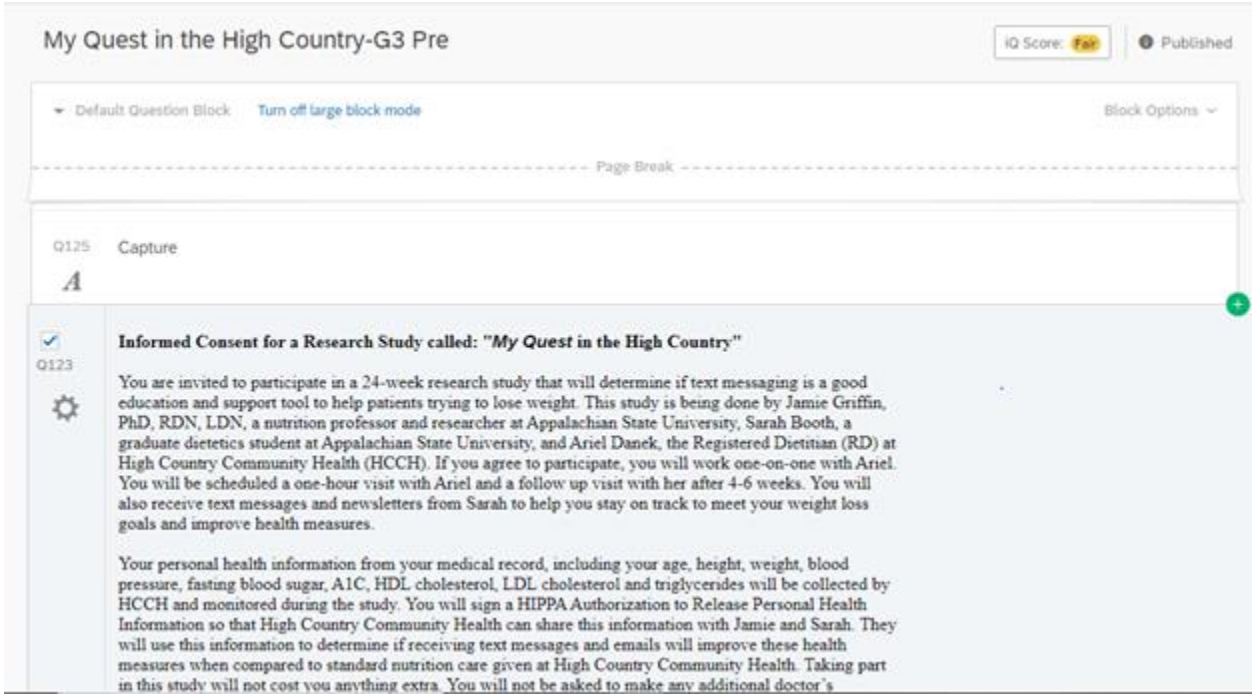
Participating in the study is completely voluntary. Even if you decide to participate now, you can change your mind and stop at any time. Participating in this study will not make a difference in how you are treated by the High Country Community Health medical staff, Jamie Griffin and researchers at Appalachian State University, or Appalachian State University.

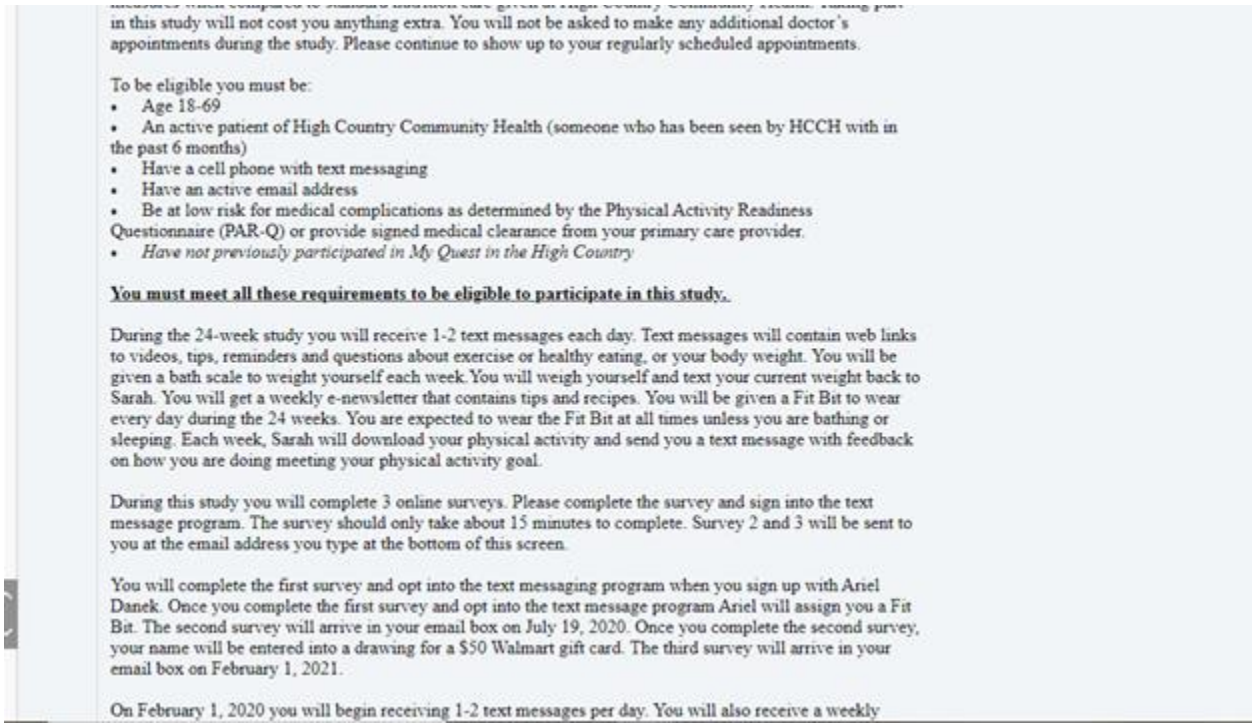
Reasons not to participate: there is a slight risk of mild discomfort in the beginning of this study as you start being more physically active. This discomfort usually gets better as physical endurance and lung capacity improve.

If you have questions or want to sign up to participate in this study, contact Ariel Danek, HCCH Registered Dietitian, at 828-262-3886 ext. 125 or arieldanek@hcchmail.org, or Dr. Jamie Griffin, Researcher and Assistant Professor at Appalachian State University, at 828-262-8534 or griffinjb@appstate.edu.

## Appendix C: Pre- and Post-Assessment Tool

### Pre-assessment Survey Tool



On February 1, 2020 you will begin receiving 1-2 text messages per day. You will also receive a weekly eNewsletter. You will get a Fit Bit to wear during the study. You will return the Fit Bit to Ariel at High Country Community Health after July 19, 2020. You will continue to receive 2-3 text messages each week to help keep you on track.

Your personal health information will be monitored each February from February 2020 to February 2025 to see if the text message program helps you continue to stay on track to meet your weight loss goals and improve health measures.

The benefits of this research study may include improved body weight, A1c, fasting blood glucose, blood pressure, and blood lipids (HDL, LDL and triglycerides).

Reasons not to participate: There is a slight risk of mild discomfort in the beginning of this study as you start being more physically active. This discomfort usually gets better as physical endurance and lung capacity improve.

Confidentiality: Everything will be kept confidential. Your personal identifying information will be kept in a HCCH HIPPA compliant, password protected spreadsheet. Identifiers will be removed from the identifiable private information and after such removal it will be used for the research study. The information will not be used or distributed for future research studies without additional informed consent. Even though strict measures are in place to protect confidentiality, there is a slight risk for loss of confidentiality.

Participating in the study is completely voluntary. Even if you decide to participate now, you can change your mind and stop at any time by responding "STOP" to any text message. Participating in this study will not make a difference in how you are treated by the High Country Community Health medical staff, Jamie Griffin and researchers, or Appalachian State University.

If you choose to opt-out of the text message program, you are choosing to opt-out of the entire study. The Fit Bit will need to be returned to Ariel at HCCH within seven days of opting-out of the program.

We will use information from the surveys and text message responses for the study. Your answers are important. There are no right or wrong answers. Everything will be kept confidential. The survey should take about 15 minutes to complete.

If you have any questions, contact Dr. Jamie Griffin (griffinjb@appstate.edu; 828-262-8534) or Sarah Booth (boothsm@appstate.edu). If you feel you have been harmed by this research, or if you have questions regarding the protection of human subjects, contact the IRB administrator, Research Protections, Appalachian State University, Boone, NC 28607, (828)262-2692, irb@appstate.edu. Refer to IRB Study #19-0304.

Q124 Please type your full name below to acknowledge you have read the informed consent.

**Authorization to Disclose Protected Health Information**

I authorize High Country Community Health to release protected health information to the following individual/organization.

Jamie B. Griffin, PhD, RDN, LDN, Assistant Professor and Primary Investigator, Appalachian State University, Boone, North Carolina 28607.

I understand that I am authorizing the following information from my medical record to be released by High Country Community Health.

- Age
- Height
- Weight
- Blood pressure
- Fasting blood glucose
- A1C
- Triglycerides
- HDL Cholesterol/LDL Cholesterol

I understand that authorizing the disclosure of this information is voluntary. I can refuse to sign this authorization. I have the right to cancel this authorization at any time. I understand that it is my responsibility to notify High Country Community Health if I wish to cancel this authorization. I further understand that High Country Community Health is not responsible for disclosures made based on this authorization prior to date of cancellation. This authorization will expire July 1, 2025.

Q112 By continuing to the survey questions, you acknowledge that you:

Are between the ages 18-69

Page Break

Q5 For these questions, think about your feelings towards exercise. How much do you agree with the following statements?

Q4 Exercise lets me have contact with friends and people I enjoy.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q3 Exercise makes me feel better physically.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q2 Walking an extra 500 steps each day will help me lose weight.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q6 For these questions, think about your feelings towards exercise. How much do you agree with the following statements?

Q7 It costs too much to exercise.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q8 Exercise is an activity I enjoy doing.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q9 Exercise improves my ability to perform daily activities (such as cooking, shopping or light cleaning).

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q10 For these questions, think about your feelings towards exercise. How much do you agree with the following statements?

Q11 I want to exercise 30 minutes or more each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q12 I can exercise 30 minutes or more each day when I'm tired, upset or stressed.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q13 I want to walk 10,000 steps each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q14 Now, think about the foods you eat. How much do you agree with the following statements?

Q15 I have control over what foods are served in my home.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q16 Writing down the foods I eat will help me lose weight.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q18 My family members think I should offer fruits and vegetables more often.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q19 I want to eat more fruits and vegetables each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q20 It is mostly up to me what to make for meals.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q21 Eating fruits and vegetables is enjoyable.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q22 Now, think about the foods you eat. How much do you agree with the following statements?

Q23 I want to write down my foods each day to know how many calories I am eating.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q24 I can eat fruits and vegetables each day when I am nervous, upset or stressed.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q25 Replacing one sugar-sweetened beverage (such as sweet tea, soft drinks, fruit drinks or sports drinks) a day with water will help me lose weight.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q26 Eating fruits and vegetables is needed for good health.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q27 For the next few questions, think about how sure you are of the following statements.

Q28 I know how to set goals to increase my physical activity.

(Not sure at all, Not sure, Neither not sure nor sure, Sure, Extremely sure)

Q29 I can have fruits and vegetables when I am in a rush.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q30 I can eat 5 servings of fruits and vegetables most days.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q31 I can eat high fiber foods.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q32 I know how many calories I should eat each day to manage my weight.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q33 I can select foods from all food groups that are rich in nutrients and lower in calories (such as fruits and vegetables, whole grains, lean meats, low-fat dairy).

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Page Break

Q34 For the next few questions, think about how sure you are of the following statements.

Q35 I can control my food portions to control my weight.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q36 I know what a single serving is for my favorite food.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q37 I know how to read food labels to pick foods lower in calories.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q38 I know I can make small changes in my eating to make my health better.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Page Break

Q40 How often do you do the following?

Q41 Make a grocery shopping list?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q43 Plan your meals ahead?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q47 Have fruits and vegetables ready to eat as a snack?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Page Break

Q46 How often do you do the following?

Q45 Have sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks) in your home?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q48 Eat fruits and vegetables as a snack?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q49 Drink water instead of sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks)?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Page Break

Q39 Respond "Yes" or "No" to the following questions.

Q42 Yesterday, I exercised for 30 or more minutes.

(Yes, No)

Q50 Next week, I will exercise 30 minutes or more each day.

(Yes, No)

Page Break

Q51 Respond "Yes" or "No" to the following questions.

Q52 I know the number of steps I walked yesterday.

(Yes, No)

Q53 Next week, I will walk 500 more steps each day.

(Yes, No)

Q54 Next week, I will write down my steps each day.

(Yes, No)

Page Break

Q55 Respond "Yes" or "No" to the following questions.

Q56 Yesterday, I wrote down what I ate and drank.

(Yes, No)

Q57 Next week, I will write down what I eat and drink each day.

(Yes, No)

Page Break

Q60 Now, think about the foods you usually eat and drink.

Q61 How many servings of fruits do you eat each day?A serving of fruit is an apple or banana, a small bowl of grapes, or 3 tablespoons of canned fruit

Q58 Fruit serving

Q59 How many servings of vegetables do you eat each day?A serving of vegetables is 3 heaped tablespoons of green or root vegetables like peas, baked beans, or sweet corn; or a medium bowl of salad (lettuce, tomatoes, etc.)

Q62 Vegetable serving

Page Break

Q96 Now, think about the foods you usually eat. How often do you eat the following?

Q97 Canned vegetables (with salt)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q98 Canned vegetables (with low sodium or no salt added)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q99 Frozen vegetables (with salt or sauce added)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q100 Frozen vegetables (with no salt or sauce added)

Q100 Frozen vegetables (with no salt or sauce added)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q101 Fresh vegetables

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Page Break

Q63 Now, think about the foods you usually eat and drink.

Q64 How many sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks) do you drink each day?

(None, Less than 1 per day, 1-2 per day, 3-4 per day, 5 or more per day)

Page Break

Q67 Think about the foods you usually eat and drink.

Q66 How often do you eat high-fat meats (such as hot dogs, bologna, bacon, sausage, pepperoni, BBQ or fried chicken)?

(None, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 or more each day)

Q68 How often do you eat refined grains (such as white bread, white rice or pasta)?

(None, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 or more each day)

Page Break

Q65 Think about the time you spend sitting (such as at work, home or traveling).

Q69 In a typical day, how much time do you usually spend sitting (in hours)?

Page Break

Q70 Think about the time you spend sitting (such as at work, home or traveling).

Q71 How much time do you usually spend sitting watching television, playing video games or searching the internet (computer, tablet or cell phone)?

(None, Less than 1 hour per day, 1-2 hours per day, 3-4 hours per day, 5-6 hours per day, 7-8 hour...)

Page Break

Q72 In the next week, how many hours do you plan to do the following?

Q73 Strenuous exercise (heart beats rapidly)Ex: biking fast, hiking, running, jogging, swimming laps, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Q74 Moderate exercise (not exhausting)Ex: walking quickly, dancing, team sports, weight lifting, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Q75 Mild exercise (little effort)Ex:walking slowly, gardening, cleaning house, vacuuming, golf, fishing, yoga, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Page Break

Q121 Respond "Yes" or "No" to the following questions:

Q114 Do you ever worry that you do not have enough money to buy the foods you wish to buy?

(Yes, No)

Q115 In the past month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

(Yes, No)

Q116 In the past month did you ever eat less than you felt you should because there wasn't enough money for food?

(Yes, No)

Q117 Respond "Yes" or "No" to the following questions:

Q118 I do not have enough money to buy food.

(Yes, No)

Q119 I do not know how to purchase food.

(Yes, No)

Q120 I do not know how to prepare or cook food.

(Yes, No)

Page Break

Q76 You are almost finished. This is the last set of questions. Make sure to complete the survey.

Page Break

Q77 What is your age?

Page Break

Q78 What is your height? (in inches)Example: If you are 5 feet and 6 inches, you will enter 66"

Q79 What is your weight? (in pounds)

Page Break

Q80 Are you?

(Male, Female)

Page Break

Q81 Are you?

(Married, Widowed, Divorced, Separated, Never married)

Page Break

Q82 Are you Hispanic or Latino?

(Yes, No)

Page Break

Q83 What is your race? (Check all that apply)

(White/Caucasian, Black/African American, Native American/Alaska Native, Native Hawaiian or Other ...)
(Yes, No)

Page Break

Q84 Including yourself, how many adults (over 18 years old) live with you?

Q85 How many children (17 years or younger) live with you?

Page Break

Q86 How much education do you have?

(Less than High School, High School Graduate/GED, 2 Year Degree/Some college, 4 Year Degree or More)

Page Break

Q87 For work, are you employed?

(Full-time, Part-time, Unemployed, Retired)

Page Break

Q88 What is your income?

(Less than $15,000 per year, $15,001 to $25,000 per year, $25,001 to $50,000 per year, $50,001 to ...)

Q102 Have you tried to lose weight within the past three months?

(Yes, No)

Page Break

Q104 Have you been in a weight loss program such as Weight Watchers, NutriSystem, etc. in the past three months?

(Yes, No)

Page Break

Q103 Have you lost weight within the past three months?

(Yes, No)

Page Break

Q91 Have you had an initial consult visit with Ariel Danek, Registered Dietitian at High Country Community Health?

(Yes, No, No, but I have an appointment scheduled)

Q92 If you answered yes, how many appointment visits have you had with Ariel Danek, Registered Dietitian at High Country Community Health clinic?

(1 appointment visit, 2 appointment visits, 3 appointment visits, 4 appointment visits)

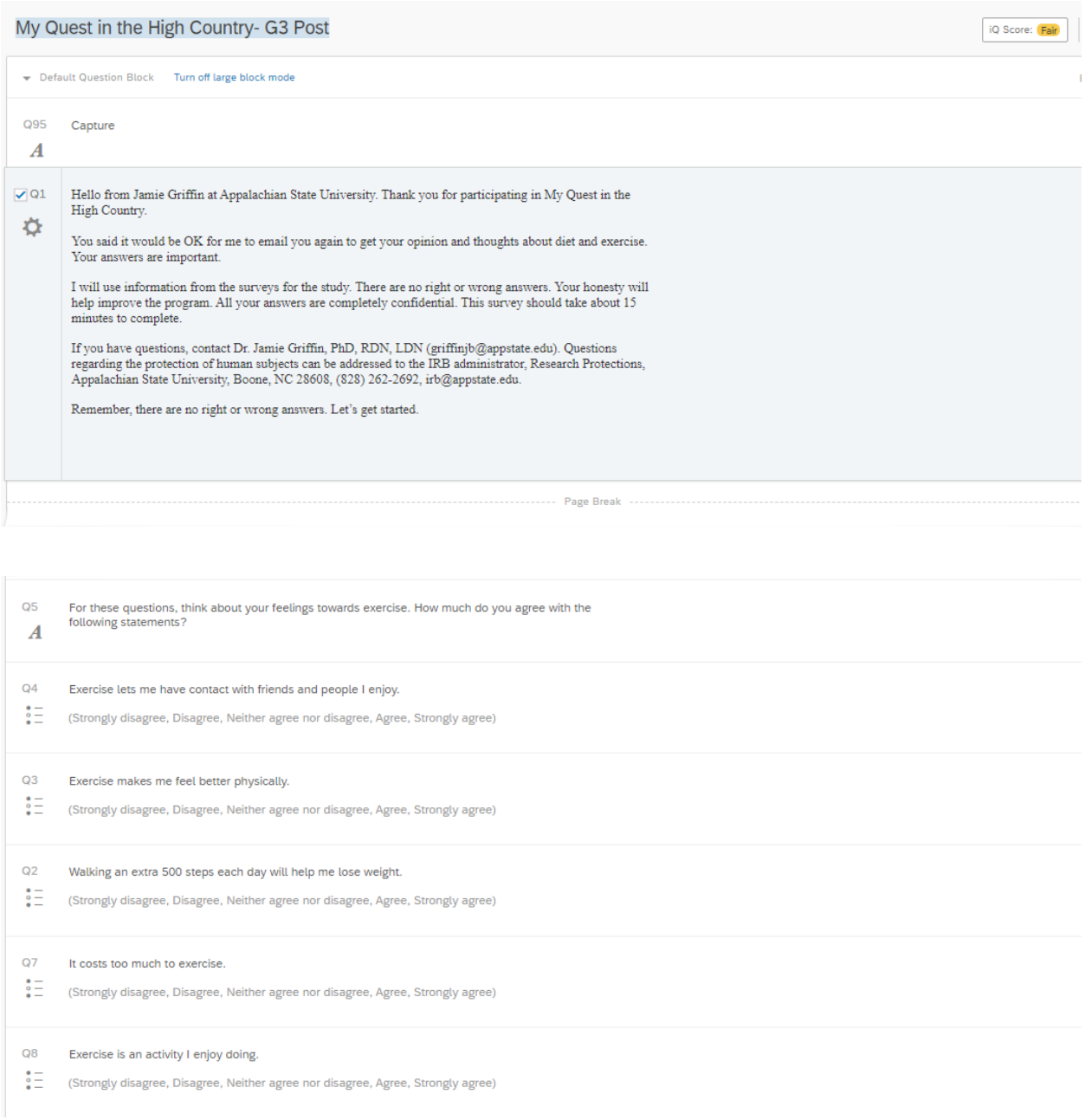
Page Break

Q89 What is your cell phone number?Ex: 828-262-8534Please note: Your phone number will not be shared with anyone. This information will be used to ensure you have successfully opted-in to the text message program.

Q90 Thank you for your time. You will get another email in December with a link to a new survey. Be sure to complete the second survey. You must complete both surveys to be entered into a drawing for a $50 Walmart gift card. The next survey will be much shorter than the one you just finished.

If you have any questions, please contact Dr. Jamie Griffin, researcher, at 828-262-8534 or griffinjb@appstate.edu.

## Post-assessment Survey Tool



Q9 Exercise improves my ability to perform daily activities (such as cooking, shopping or light cleaning).

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q10 For these questions, think about your feelings towards exercise. How much do you agree with the following statements?

Q11 I want to exercise 30 minutes or more each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q12 I can exercise 30 minutes or more each day when I'm tired, upset or stressed.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q13 I want to walk 10,000 steps each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q14 Now, think about the foods you eat. How much do you agree with the following statements?

Q15 I have control over what foods are served in my home.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q16 Writing down the foods I eat will help me lose weight.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q18 My family members think I should offer fruits and vegetables more often.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q19 I want to eat more fruits and vegetables each day.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q20 It is mostly up to me what to make for meals.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q21 Eating fruits and vegetables is enjoyable.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Page Break

Q22 Now, think about the foods you eat. How much do you agree with the following statements?

Q23 I want to write down my foods each day to know how many calories I am eating.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q24 I can eat fruits and vegetables each day when I am nervous, upset or stressed.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q25 Replacing one sugar-sweetened beverage (such as sweet tea, soft drinks, fruit drinks or sports drinks) a day with water will help me lose weight.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q26 Eating fruits and vegetables is needed for good health.

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Q27 For the next few questions, think about how sure you are of the following statements.

Q28 I know how to set goals to increase my physical activity.

(Not sure at all, Not sure, Neither not sure nor sure, Sure, Extremely sure)

Q29 I can have fruits and vegetables when I am in a rush.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q30 I can eat 5 servings of fruits and vegetables most days.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q31 I can eat high fiber foods.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q32 I know how many calories I should eat each day to manage my weight.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q33 I can select foods from all food groups that are rich in nutrients and lower in calories (such as fruits and vegetables, whole grains, lean meats, low-fat dairy).

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Page Break

Q34 For the next few questions, think about how sure you are of the following statements.

Q35 I can control my food portions to control my weight.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q36 I know what a single serving is for my favorite food.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q37 I know how to read food labels to pick foods lower in calories.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q38 I know I can make small changes in my eating to make my health better.

(Not sure at all, Not sure, Neither not sure nor Sure, Sure, Extremely sure)

Q40 How often do you do the following?

Q41 Make a grocery shopping list?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q43 Plan your meals ahead?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q47 Have fruits and vegetables ready to eat as a snack?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q45 Have sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks) in your home?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q48 Eat fruits and vegetables as a snack?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q49 Drink water instead of sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks)?

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Page Break

Q39 Respond "Yes" or "No" to the following questions.

Q42 Yesterday, I exercised for 30 or more minutes.

(Yes, No)

Q50 Next week, I will exercise 30 minutes or more each day.

(Yes, No)

Q52 I know the number of steps I walked yesterday.

(Yes, No)

Q53 Next week, I will walk 500 more steps each day.

(Yes, No)

Q54 Next week, I will write down my steps each day.

(Yes, No)

Q56 Yesterday, I wrote down what I ate and drank.

(Yes, No)

Q57 Next week, I will write down what I eat and drink each day.

(Yes, No)

Page Break

Q60 Now, think about the foods you usually eat and drink.

Q61 How many servings of fruits do you eat each day?A serving of fruit is an apple or banana, a small bowl of grapes, or 3 tablespoons of canned fruit

Q58 Fruit serving

Q59 How many servings of vegetables do you eat each day?A serving of vegetables is 3 heaped tablespoons of green or root vegetables like peas, baked beans, or sweet corn; or a medium bowl of salad (lettuce, tomatoes, etc.)

Q62 Vegetable serving

Page Break

Q133 Now, think about the foods you usually eat. How often do you eat the following?

Q97 Canned vegetables (with salt)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q98 Canned vegetables (with low sodium or no salt added)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q99 Frozen vegetables (with salt or sauce added)

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Q101 Fresh vegetables

(Never, Less than once a month, Once a month, 2-3 times a month, Once a week, 2-3 times a week, Daily)

Page Break

Q67 Think about the foods you usually eat and drink.

Q64 How many sugar-sweetened beverages (such as sweet tea, soft drinks, fruit drinks or sports drinks) do you drink each day?

(None, Less than 1 per day, 1-2 per day, 3-4 per day, 5 or more per day)

Q66 How often do you eat high-fat meats (such as hot dogs, bologna, bacon, sausage, pepperoni, BBQ or fried chicken)?

(None, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 or more each day)

Q68 How often do you eat refined grains (such as white bread, white rice or pasta)?

(None, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 or more each day)

Q65 Think about the time you spend sitting (such as at work, home or traveling).

Q69 In a typical day, how much time do you usually spend sitting (in hours)?

Q71 How much time do you usually spend sitting watching television, playing video games or searching the internet (computer, tablet or cell phone)?

(None, Less than 1 hour per day, 1-2 hours per day, 3-4 hours per day, 5-6 hours per day, 7-8 hour...)

Page Break

Q72 In the next week, how many hours do you plan to do the following?

Q73 Strenuous exercise (heart beats rapidly)Ex: biking fast, hiking, running, jogging, swimming laps, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Q74 Moderate exercise (not exhausting)Ex: walking quickly, dancing, team sports, weight lifting, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Q75 Mild exercise (little effort)Ex:walking slowly, gardening, cleaning house, vacuuming, golf, fishing, yoga, etc.

(None, Less than 1 hour per week, 1-2 hours per week, 3-4 hours per week, 5-6 hours per week, 7-8 ...)

Page Break

Q76 You are almost finished. This is the last set of questions. Make sure to complete the survey.

Page Break

Q78 What is your height? (in inches)Example: If you are 5 feet and 6 inches, you will enter 66"

Q79 What is your current weight? (in pounds)

Page Break

Q125 Have you had your blood pressure checked in the past 30 days?

(Yes, I have had my blood pressure checked and I can tell you the result., Yes, I have had my bloo...)

Q126 If yes, can you tell us what it was? My blood pressure was:

Page Break

Q91 Did you schedule and attend an initial consult visit with Ariel Danek, Registered Dietitian at High Country Community Health?

(Yes, No, No, but I have an appointment scheduled)

Q92 If you answered yes, how many appointment visits have you had with Ariel Danek, Registered Dietitian at High Country Community Health?

(1 appointment visit, 2 appointment visits, 3 appointment visits, 4 or more appointment visits)

Page Break

Q109 Did you set goals for yourself?

(Yes, every week, Yes, some weeks, No, I did not set goals)

Q110 If yes, was it helpful to set goals?

(Yes, extremely helpful, Yes, a little helpful, No, it was not helpful)

Q111 Did you keep a food diary or food log?

(Yes, every week, Yes, some weeks, No, I did not keep a food diary or food log)

Q108 If yes, was it helpful to keep a food diary or food log?

(Yes, extremely helpful, Yes, a little helpful, No, it was not helpful)

Q112 Did you wear the FitBit?

(Yes, everyday, Yes, some days, No, I did not wear the FitBit)

Q113 If no, why didn't you wear the FitBit?

Page Break

Q114 Did you use the FitBit to record your physical activity and/or step counts?

(Yes, every day, Yes, some days, No, I did not use the FitBit to record physical activity and/or s...)

Q123 If no, was it due to the following?

(FitBit was uncomfortable to wear, FitBit was too hard to operate, I did not have access to intern...)

Q120 Other (please explain)

Page Break

Q115 How helpful did you find the weekly eNewsletter?

(Extremely helpful, A little helpful, Not helpful at all, I did not read the eNewsletter)

Q116 How helpful did you find the text messages?

(Extremely helpful, A little helpful, Not helpful at all)

Q117 Was the number of text messages received...

(Too many, About right, Not enough)

Q118 How many text messages would be effective?

(Once a day, 2 times a day, 4-6 times a day, 2-3 times a week, Once a week)

Q134

Which of the following videos did you find helpful? Select all that apply.

- [ ] How to Cook Dried Beans
- [ ] Low Sugar Iced Coffee Ideas
- [ ] Sweet Potato Chili
- [ ] How Much Sugar is in Popular Yogurts?
- [ ] Oatmeal - 2 Ways
- [ ] Seasonal Vegetable Recipe Ideas
- [ ] Breakfast Eggs 3 Ways
- [ ] How to Roast Frozen Vegetables
- [ ] Low Sugar Desserts
- [ ] Easy Pantry Hummus
- [ ] How to Wash Produce
- [ ] Picnic Food Safety

Q135

Overall, how would you rate the My Quest in the High Country videos with respect to helping develop healthier habits?

(Extremely helpful, A little helpful, Not helpful at all)

Q136

Do you have any other suggestions or comments about the My Quest in the High Country videos that can help improve the program for future participants?

Q119

Overall, how would you rate the My Quest in the High Country program with respect to helping develop healthier habits?

(Extremely helpful, A little helpful, Not helpful at all)

Page Break

Q132

Did you participate in any other structured weight loss programs during the past 6 months? (Weight watchers, employee weight loss challenge, weight loss clinic, Nutrisystem, Beach Body, etc.)

(Yes, No)

Q131

How did the COVID 19-pandemic affect your progress towards your weight loss goals? (Please choose all that apply).

- [ ] I had more time in my schedule to exercise and meal prep
- [ ] My gym membership was put on hold
- [ ] I found myself eating more comfort/snack foods
- [ ] I used COVID-19 as an excuse to why I could not make healthy choices
- [ ] My food budget was impacted and I could not afford the foods I wanted to buy
- [ ] I purchased less healthy foods because healthy foods were out of stock
- [ ] I ate more home cooked meals at home with my family
- [ ] I mostly relied on to-go/fast food during the pandemic
- [ ] I tried new healthy recipes with my extra time at home
- [ ] I was able to try new at home workouts/exercise videos
- [ ] My food and exercise choices were not impacted during the pandemic

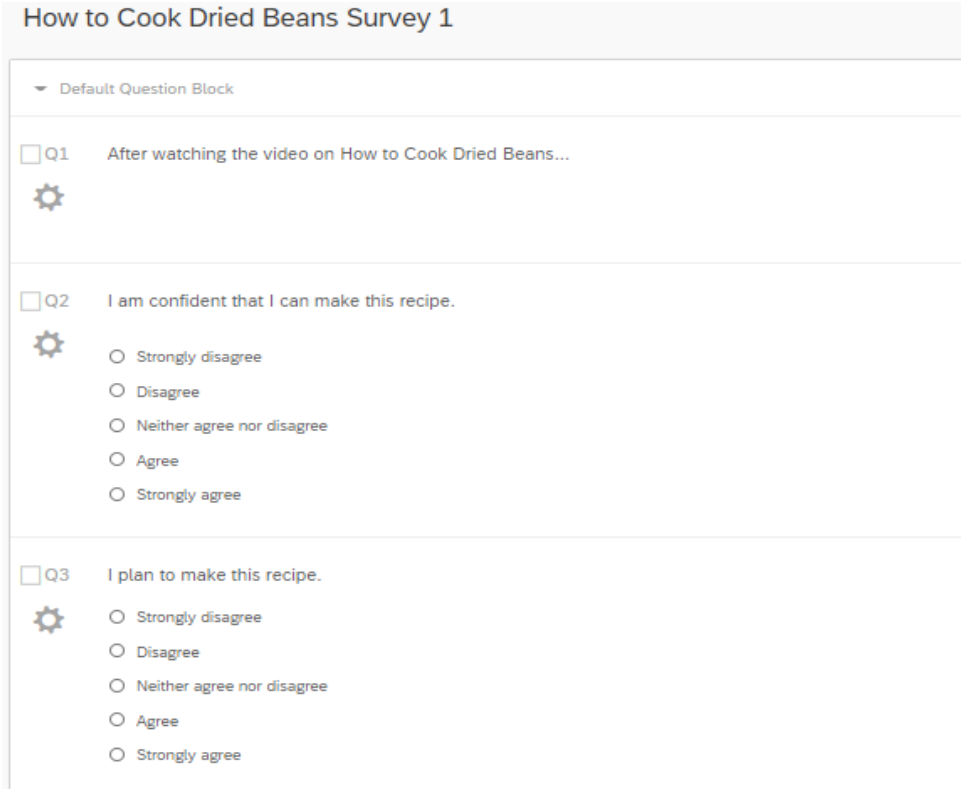
Q124 Your feedback is valuable to us. Do you have any other suggestions or comments about the My Quest in the High Country program that can help improve the program for future participants?

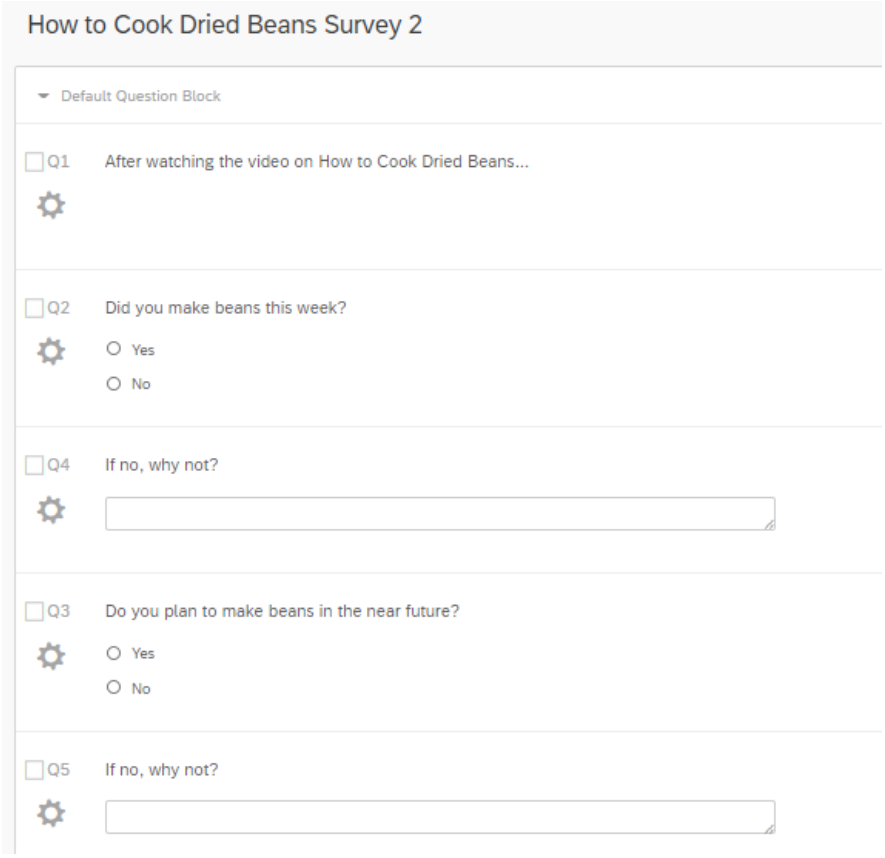
Page Break

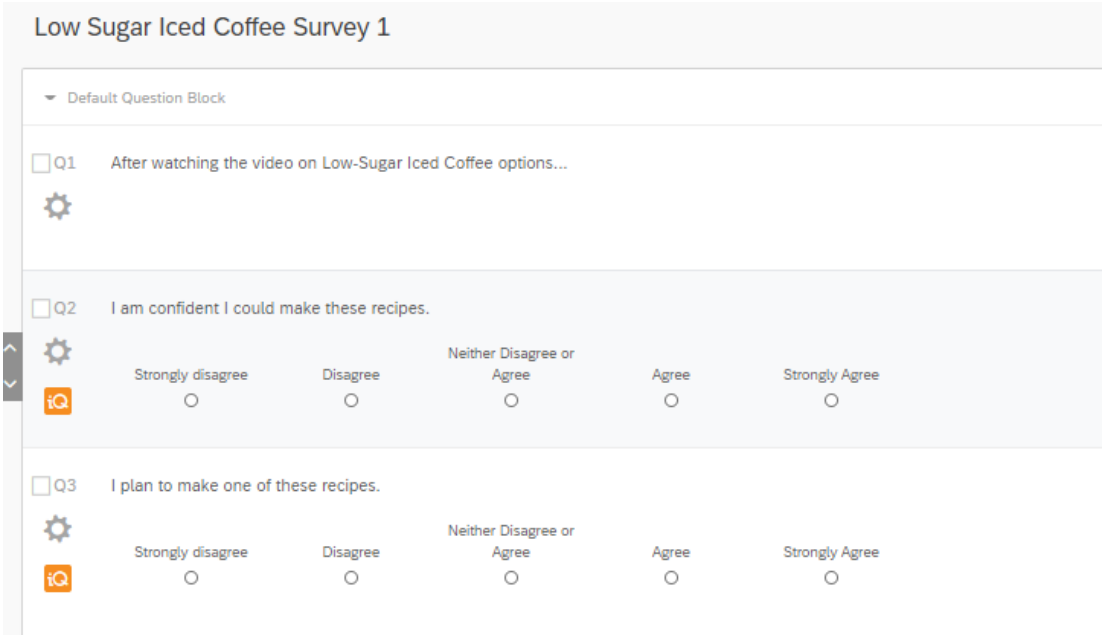
Q89 What is your cell phone number?Ex: 828-262-8534Please note: Your phone number will not be shared with anyone. This information will be used to ensure you have successfully completed both surveys.

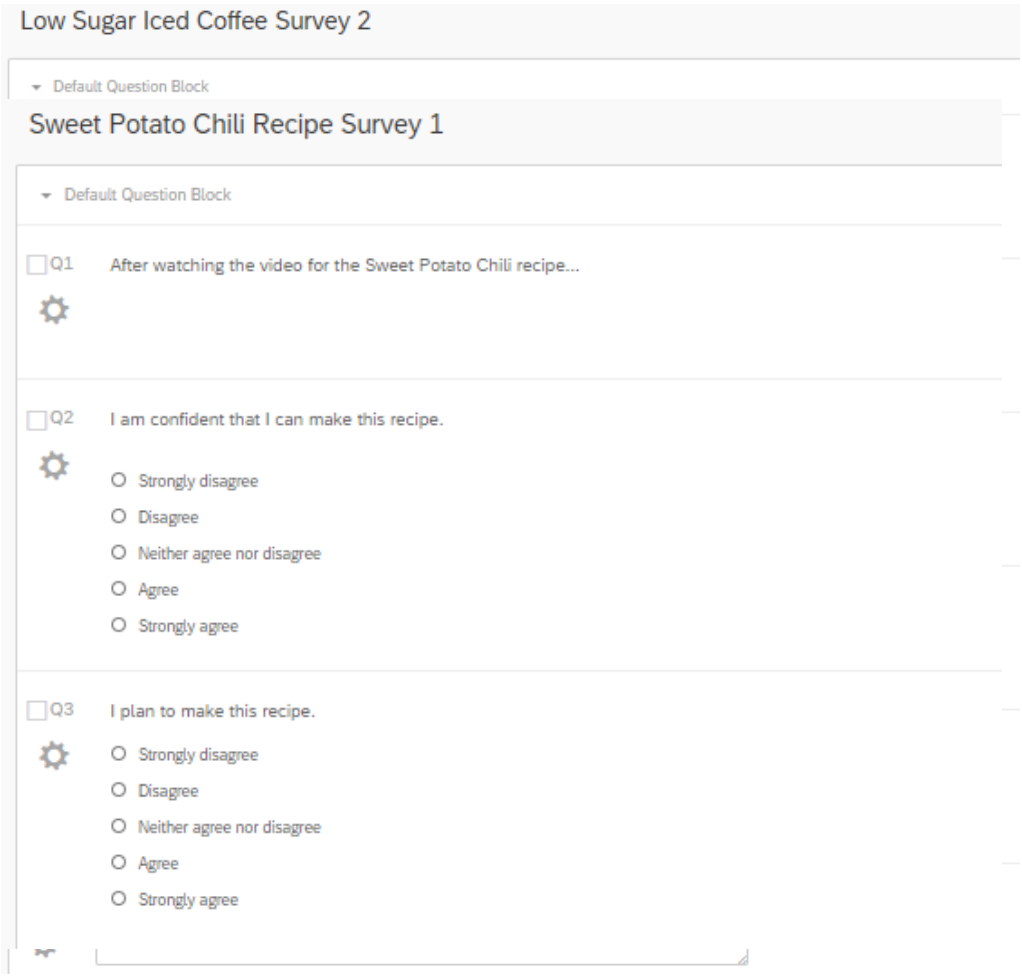
Q90 Thank you for your time. If you completed both surveys you will be entered into a drawing for a $50 Walmart gift card. If you have any questions, please contact Dr. Jamie Griffin, researcher, at 828-262-8534 or griffinjb@appstate.edu.

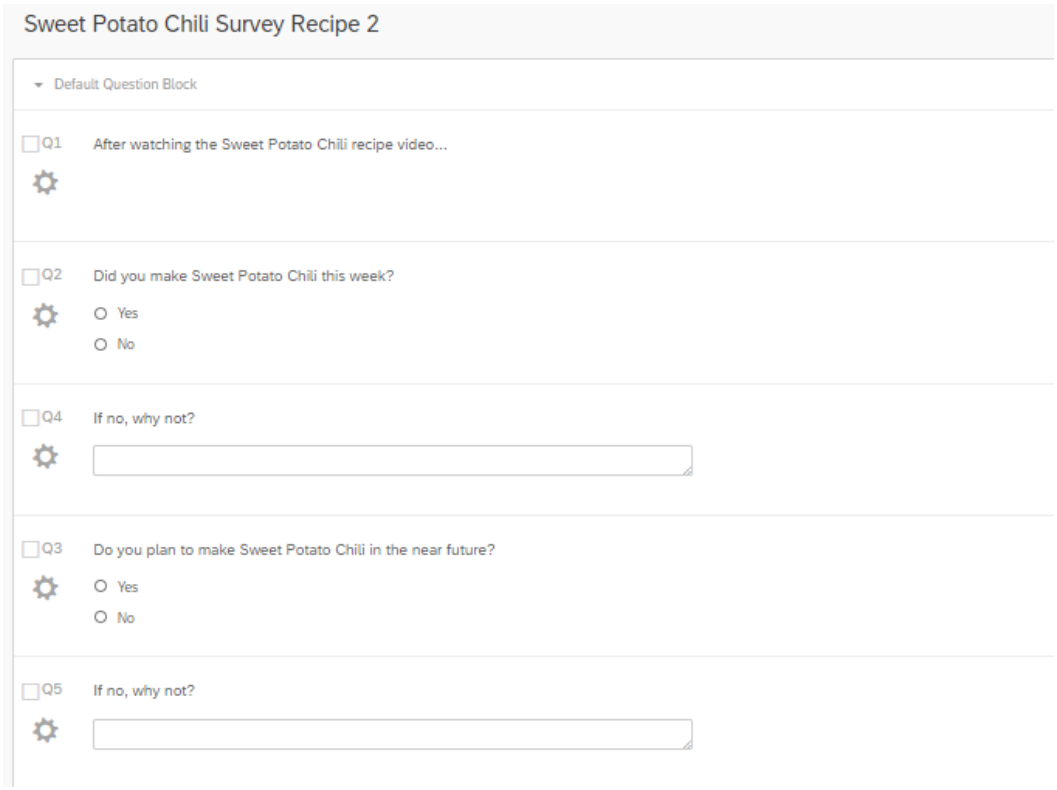
## Appendix D: Video Survey Tool

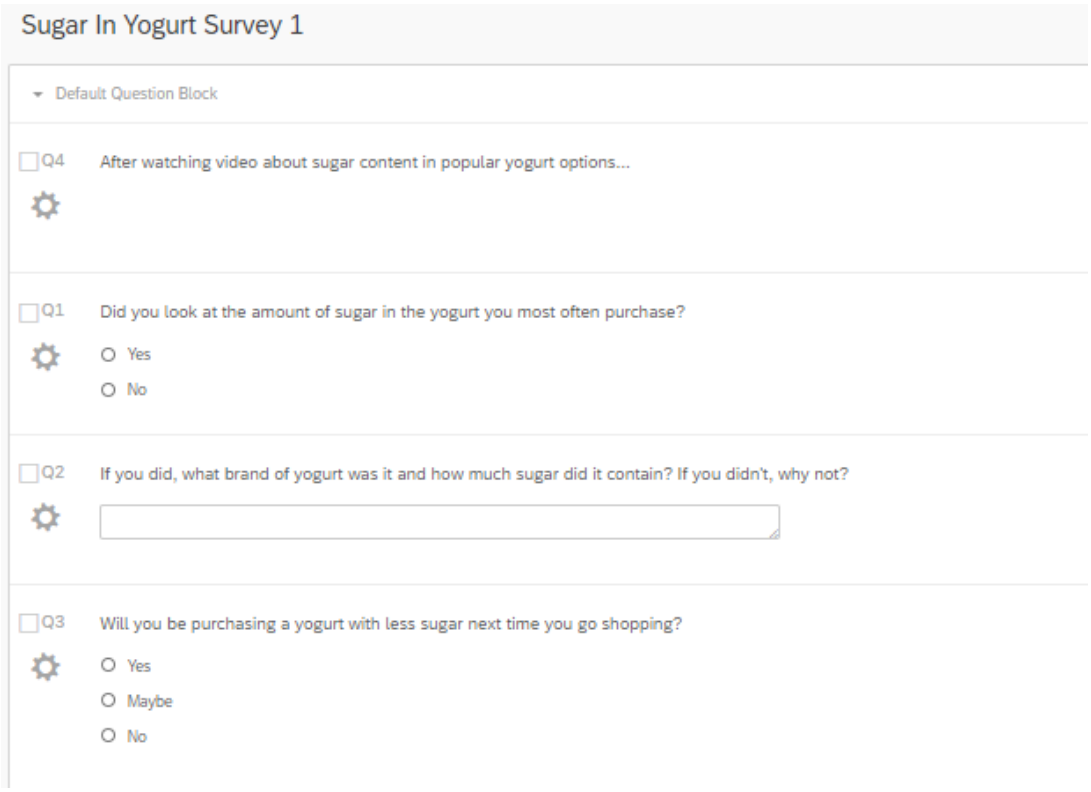


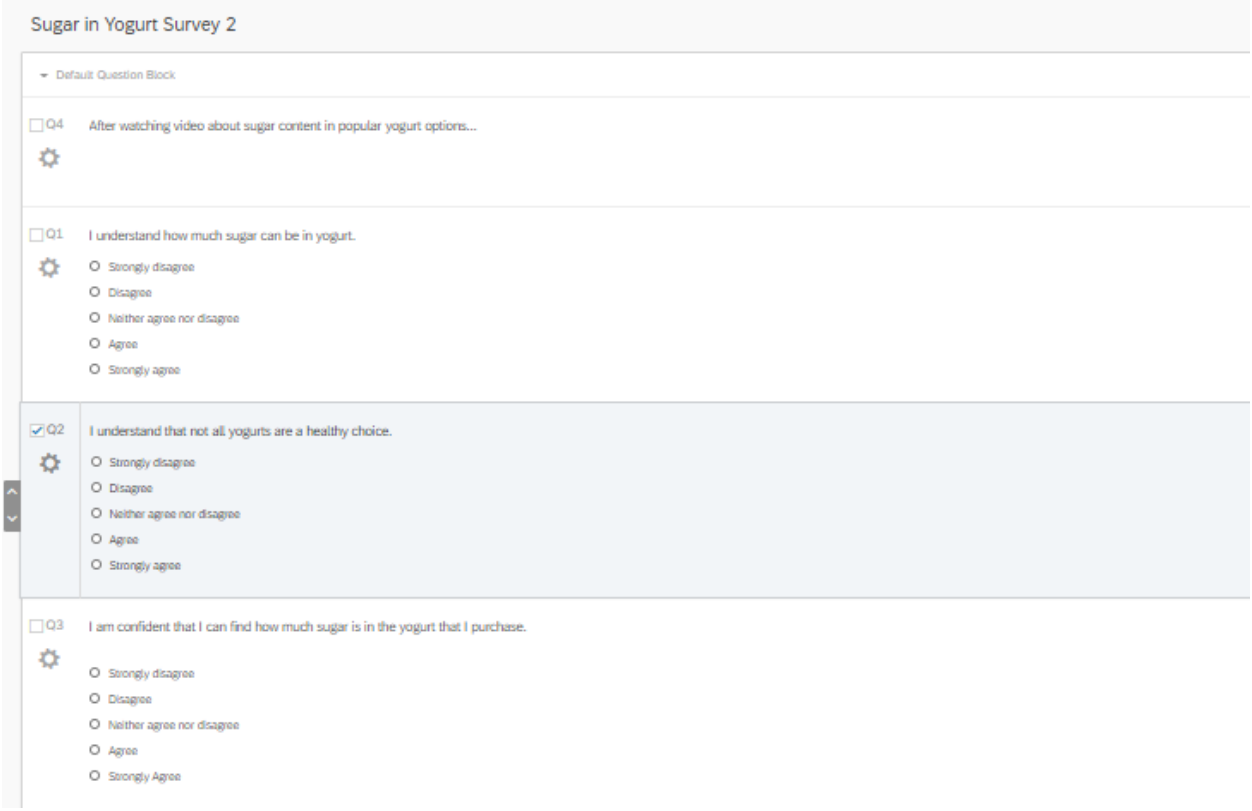

How to Cook Dried Beans Survey 2
Default Question Block
Q1
After watching the video on How to Cook Dried Beans...
Q2
Did you make beans this week?
Yes
No
Q4
If no, why not?
Q3
Do you plan to make beans in the near future?
Yes
No
Q5
If no, why not?

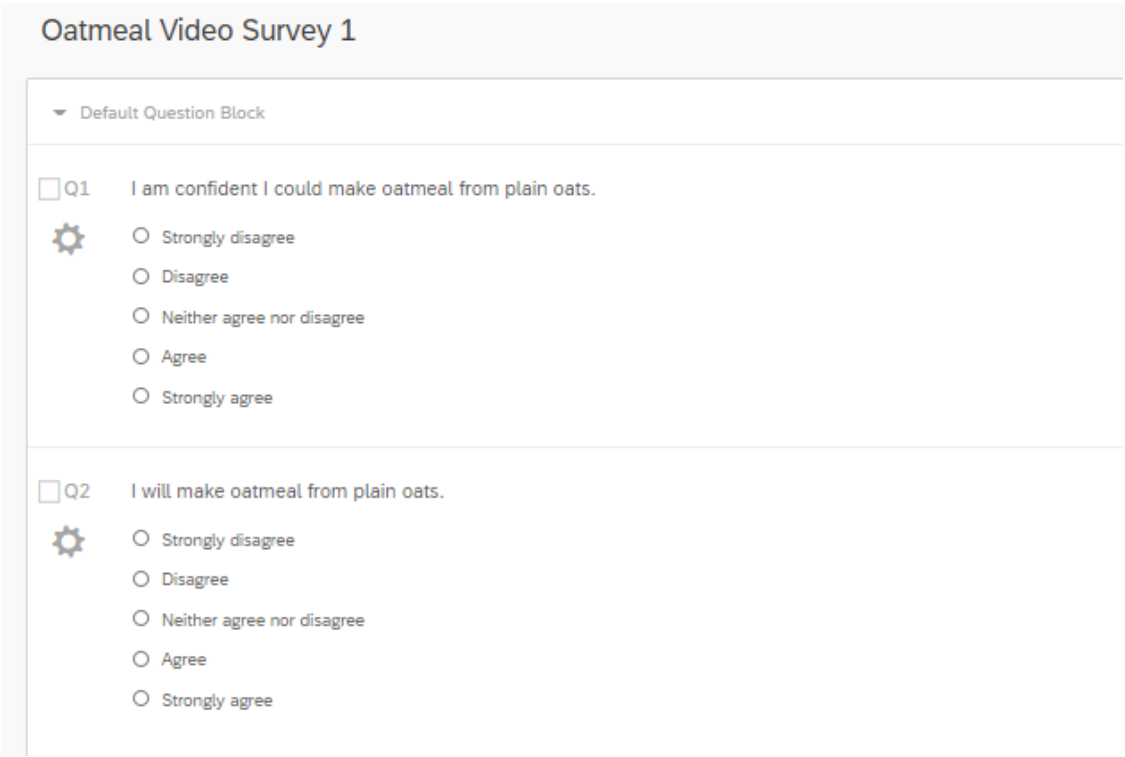

Low Sugar Iced Coffee Survey 1
Default Question Block
Q1
After watching the video on Low-Sugar Iced Coffee options...
Q2
I am confident I could make these recipes.
Strongly disagree
Disagree
Neither Disagree or Agree
Agree
Strongly Agree
Q3
I plan to make one of these recipes.
Strongly disagree
Disagree
Neither Disagree or Agree
Agree
Strongly Agree


Low Sugar Iced Coffee Survey 2
Default Question Block
Sweet Potato Chili Recipe Survey 1
Default Question Block
Q1
After watching the video for the Sweet Potato Chili recipe...
Q2
I am confident that I can make this recipe.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
Q3
I plan to make this recipe.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree


Sweet Potato Chili Survey Recipe 2
Default Question Block
Q1
After watching the Sweet Potato Chili recipe video...
Q2
Did you make Sweet Potato Chili this week?
Yes
No
Q4
If no, why not?
Q3
Do you plan to make Sweet Potato Chili in the near future?
Yes
No
Q5
If no, why not?


Sugar In Yogurt Survey 1
Default Question Block
Q4
After watching video about sugar content in popular yogurt options...
Q1
Did you look at the amount of sugar in the yogurt you most often purchase?
Yes
No
Q2
If you did, what brand of yogurt was it and how much sugar did it contain? If you didn't, why not?
Q3
Will you be purchasing a yogurt with less sugar next time you go shopping?
Yes
Maybe
No


Sugar in Yogurt Survey 2
Default Question Block
Q4
After watching video about sugar content in popular yogurt options...
Q1
I understand how much sugar can be in yogurt.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
Q2
I understand that not all yogurts are a healthy choice.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
Q3
I am confident that I can find how much sugar is in the yogurt that I purchase.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly Agree


Oatmeal Video Survey 1
Default Question Block
Q1
I am confident I could make oatmeal from plain oats.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
Q2
I will make oatmeal from plain oats.
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree

## Oatmeal Video Survey 2

Default Question Block

Q1 After watching the video about homemade oatmeal...

Q2 Did you make oatmeal this week?

- Yes
- No

Q4 If no, why not?

Q3 Do you plan to make oatmeal in the near future?

- Yes
- No

Q5 If no, why not?

## Seasonal Produce Video 1

Default Question Block

Q1 I am confident I could choose in-season produce when I shop for groceries.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q2 I am confident I could use in-season produce to make a meal for myself.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Seasonal Produce Video 2

Default Question Block

Q1 After watching the video about seasonal produce recipes...

Q2 Did you use seasonal produce in a meal this week?

- Yes
- No

Q4 If no, why not?

Q3 Do you plan to use seasonal produce to prepare meals in the future?

- Yes
- No

Q5 If no, why not?

## Breakfast Eggs 1

Default Question Block

Q1 I am confident I could prepare eggs using different cooking methods (boil, microwave, scramble, etc.)

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q2 I am confident I could use eggs in different ways to have a variety of breakfast options.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Breakfast Egg Survey 2

Default Question Block

Q1 After watching the video about egg recipes...

Q2 Did you have eggs for breakfast this week?

- Yes
- No

Q6 If yes, how did you prepare them?

Q7 If no, why not?

Q8 I will prepare eggs for breakfast in the future.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Roasted Vegetables 1

Default Question Block

Q3 After watching the recipe video for roasting frozen vegetables...

Q1 I am confident that I can make this recipe.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

Q2 I plan to make this recipe.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

## Roasted Vegetables 2

Default Question Block

Q1 After watching the recipe video for roasting frozen vegetables...

Q2 Did you roast vegetables this week?

- Yes
- No

Q4 If no, why not?

Q3 Do you plan to roast vegetables in the near future?

- Yes
- No

Q5 If no, why not?

## Low Sugar Desserts Survey 1

Default Question Block

Q3 After watching the recipe video for quick low sugar desserts....

Q1 I am confident that I can make these recipes.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

Q2 I plan to make one or both of these recipes.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

## Hummus Survey 1

Default Question Block

Q3 After watching the recipe video for easy pantry hummus....

Q1 I am confident that I can make this recipe.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

Q2 I plan to make this recipe.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly Agree

- Disagree
- Neither agree nor disagree

## Hummus Survey 2

Default Question Block

Q1 After watching the video for easy pantry hummus...

Q2 Did you try making the recipe this week?

- Yes
- No

Q7 If no, why not?

Q8 I plan on trying the hummus recipe in the future.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## How to Wash Produce 1

Default Question Block

Q2 After watching the video on how to wash produce...

Q1 I am confident I can thoroughly wash all produce.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q3 I will wash all produce following these guidelines.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## How to Wash Produce 2

Default Question Block

Q1 After watching the video on how to wash produce...

Q2 Did you prepare any produce this week?

- Yes
- No

Q7 If yes, what did you prepare?

Q9 If no, why not?

Q8 I plan on washing produce following these guidelines.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Picnic Safety Video 1

Default Question Block

Q2 After watching the video on picnic safety...

Q1 I am confident I can safely prepare food for an outdoor gathering.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Q3 I will follow FDA guidelines for outdoor food safety.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Picnic Safety Video 2

Default Question Block

Q2 After watching the video on picnic safety...

Q1 Did you prepare food to eat outside using the video guidelines?

- Yes
- No

Q5 If yes, what did you make and how did you prepare it?

Q3 I will use the video guidelines to prepare food for a cookout or picnic in the future.

- Strongly Disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

## Appendix E: Video Topics & Objectives

| Video # | Topic | Objectives |
|---|---|---|
| 1 | How to Cook Dried Beans | 1. Participants will be exposed to the simplicity of preparing dried beans.<br>2. Participants will learn basic cooking techniques that can be applied to other dried legumes.<br>3. Participants will use this preparation method to save money on groceries. |
| 2 | Low Sugar Iced Coffee | 1. Participants will learn two recipes that can be used as substitutions for coffee beverages high in sugar.<br>2. Participants will try preparing one of the two recipes presented in place of the usual coffee beverage.<br>3. Participants will be encouraged to try alternatives to sugar sweetened beverages. |
| 3 | Sweet Potato Chili Recipe | 1. Participants will learn a simple pantry staple recipe.<br>2. Participants will prepare recipes in video and try it.<br>3. Participants will be encouraged to use simple pantry ingredients to make meals at home. |
| 4 | Sugar Content in Popular Yogurt Brands | 1. Participants will be exposed to the amount of added sugar in different yogurt brands.<br>2. Participants will choose yogurts lower in sugar in the future. |
| 5 | Oatmeal Recipes | 1. Participants will learn two simple ways to prepare oatmeal at home.<br>2. Participants will recognize different ingredients that can be added to oatmeal based on preference.<br>3. Participants will be encouraged to make oatmeal at home rather than using instant oatmeal packets. |
| 6 | Seasonal Produce Recipes | 1. To introduce participants to a variety of produce that is growing during each season.<br>2. Participants will choose in-season produce when grocery shopping. |

| | | |
|---|---|---|
| | | 3. Participants will consume more fruits and vegetables. |
| 7 | Breakfast Egg Recipes | 1. Participants will learn three simple recipes to promote a balanced breakfast.<br>2. Participants will try one of the recipes in place of their usual breakfast.<br>3. Participants will understand that a healthy breakfast can also be easy to make. |
| 8 | Roasted Frozen Vegetable Recipe | 1. Participants will learn a simple recipe to include more vegetables in their diet.<br>2. Participants will understand that any frozen vegetables they prefer can be used in this recipe.<br>3. Participants will try making this recipe as part of a meal. |
| 9 | Low Sugar Dessert Recipes | 1. Participants will learn two simple diabetic friendly dessert recipes.<br>2. Participants will understand how simple it is to substitute ingredients to make a recipe healthier.<br>3. Participants will try making one of the recipes. |
| 10 | Easy Pantry Hummus Recipe | 1. To expose participants to a simple, healthy snack option.<br>2. Participants will recognize the simplicity of making hummus at home.<br>3. Participants will try making hummus at home using basic pantry ingredients. |
| 11 | How to Wash Produce | 1. To expose participants to basic produce preparation guidelines.<br>2. To promote food safety.<br>3. To encourage participants to prepare more produce at home. |
| 12 | Picnic Safety 101 | 1. To expose participants to basic principles of proper food storage and temperatures.<br>2. To promote food safety.<br>3. To encourage participants to maintain proper food temperatures for a variety of foods. |

**Appendix F: eNewsletter Topics & Objectives**

| Week | eNewsletter Topic | Objectives |
|---|---|---|
| 1 | Food Journaling: Staying on Track | Use a food journal to log food intake. |
| 2 | Fiber | Know the importance of fiber and what the best sources of fiber are. |
| 3 | Portion Control: Avoiding Portion Distortion | Know what a standard serving of food is compared with a portion. |
| 4 | Sugar Sweetened Beverages: Hidden Sugar | Know the amount of added sugar and calories in common sugar-sweetened beverages. |
| 5 | Food Labels: Know the Facts | Know how to read the nutrition facts label on foods to choose nutritious foods. |
| 6 | SMART GOALS: Pathway to Success | Know how to develop a SMART goal. |
| 7 | Fitness Tracker: Just Get Moving! | Keep a daily exercise log via tracker and know weekly physical activity guidelines. |
| 8 | Rethink Your Drink: Drink More Water | Know the daily recommended water intake. |
| 9 | All About Protein | Know the importance of protein intake and what good sources of protein are. |
| 10 | Choosing the Right Kind of Fat | Know the difference in types of fats and what good sources of healthy fats are. |
| 11 | Simple vs. Complex Carbohydrates | Know the difference in simple vs. complex carbohydrates and what good sources of complex carbohydrates are. |
| 12 | Cutting Down on Sodium | Know the daily recommended sodium intake. |
| 13 | Pedometers: Keeping You in Step! | Walking ≥5,000 steps each day. |
| 14 | Antioxidants | Know the benefits of consuming foods rich in antioxidants and what good sources of antioxidants are. |
| 15 | Fruits and Veggies: 5 a day the color way! | Know the importance of consuming fruits and vegetables each day and best practices for choosing produce at the store. |

| | | |
|---|---|---|
| 16 | Calcium/Vitamin D | Understand the importance of calcium and vitamin D consumption and good sources of both nutrients. |
| 17 | Added Sugars: How to Avoid Them | Know the risks of consuming excess sugar and how to identify added sugars in foods. |
| 18 | Iron and Its Importance | Understand the importance of iron and what the best sources of iron are. |
| 19 | Healthy Snacking: Make the Good Choice | Choose fruits, vegetables, low-fat dairy, or low-fat, whole-grain foods as snacks. |
| 20 | All About Vitamin C | Understand the importance of Vitamin C, what happens when not enough is consumed, and what the best sources of Vitamin C are. |
| 21 | Rate of Perceived Exertion: The Talk Test | Understand RPE and how to evaluate personal RPE using the 'talk test'. |
| 22 | Potassium | Understand the importance of potassium, what happens when not enough is consumed, and what the best sources of potassium are. |
| 23 | Screen Time = Sedentary Time | Decrease time spent in front of a screen (≤2 h/d). |
| 24 | Tackling Picnics and Summer BBQs | Know best practices for sticking to personal goals when participating in social gatherings. |

# Appendix G: Participant Demographics

| | | Completed Both Pre and Post | Completed Only Pre |
|---|---|---|---|
| Age (Years) | | 51.8 ±6.39 | 50.25±19.97 |
| Gender | | | |
| | Male | 3 (30%) | 1 (25%) |
| | Female | 7 (70%) | 3 (35%) |
| Relationship Status | | | |
| | Married | 4 (40%) | 3 (75%) |
| | Widowed | 1 (10%) | 0 |
| | Divorced | 2 (20%) | 0 |
| | Separated | 1 (10%) | 0 |
| | Never Married | 2 (20%) | 1 (25%) |
| Hispanic/Latino | | | |
| | Yes | 0 | 0 |
| | No | 10 (100%) | 4 (100%) |
| Race | White/Caucasian | 10 (100%) | 4 (100%) |
| | Black/African American | 0 | 0 |
| | American Indian/Alaska Native | 0 | 0 |
| | Native Hawaiian/Other Pacific Islander | 0 | 0 |
| | Asian | 0 | 0 |
| | Other/Multi-Racial | 0 | 0 |
| Adults in Household | | 2.1±.74 | 2.25±.96 |

| | | | |
|---|---|---|---|
| **Children in Household** | | **.50±.97** | **.5±1.0** |
| **Education Level** | | | |
| | **Less than HS** | **1 (10%)** | **1 (25%)** |
| | **HS Grad/GED** | **3 (30%)** | **1 (25%)** |
| | **2-year degree/Some college** | **4 (40%)** | **2 (50%)** |
| | **4 year degree or more** | **2 (20%)** | **0** |
| **Employment Status** | | | |
| | **Full-time** | **5 (50%)** | **1 (25%)** |
| | **Part-time** | **1 (10%)** | **0** |
| | **Unemployed** | **2 (20%)** | **2 (50%)** |
| | **Retired** | **2 (20%)** | **1 (10%)** |
| **Income Level** | | | |
| | **<15,000/year** | **5 (50%)** | **4 (100%)** |
| | **$15,001-$25,000/year** | **0** | **0** |
| | **$25,001-$50,000/year** | **3 (30%)** | **0** |
| | **$50,001-$75,000/year** | **1 (10%)** | **0** |
| | **$75,001 or more/year** | **1 (10%)** | **0** |

## Appendix H: NCAND Regional Meeting Abstract & Poster

**Title:** My Quest in The High Country: Video Intervention to Improve Food Security and Promote Weight Loss in a Rural, Low-Income Population

**Authors:** Sarah Booth, Appalachian State University; Ariel Danek, MS, RDN, High Country Community Health; Alisha R. Farris, Ph. D, RDN, Appalachian State University; Danielle Nunnery, Ph.D., RDN, LDN, Appalachian State University; Jamie B. Griffin, Ph.D., RDN, LDN, Appalachian State University

**Introduction:** Low income, rural dwelling individuals are at higher risk of obesity and chronic disease, in large part due to isolation from proper health education and health care. High Country Community Health (HCCH) and Appalachian State University (ASU) developed a tailored 24-week, community-based mHealth-based prevention and health risk reduction program called *My Quest in the High Country (MQHC)* to support these individuals.

**Materials and Methods:** From December 2019 to January 2020, HCCH patients were recruited by the HCCH Registered Dietitian (RD) using a standardized Recruitment Script. Biometric data was collected through the electronic medical record (EMR) and individualized out-patient Medical Nutrition Therapy (MNT) counseling was conducted by the HCCH RD. ASU implemented the mHealth community-based intervention. Participants received a scale, FitBit, text messages (n=1-2/ day), weekly eNewsletter, targeted videos, and weekly individualized physical activity feedback. At post, participants completed a post-assessment survey. Video topics included: low cost/easy-to-follow recipes, ingredient substitution to reduce sodium and sugar intake, how to prepare dried legumes and vegetables, food safety, and how to select and use seasonal produce. Participants continue to receive text messages (n=2-3/week). Biometric data from the EMR are assessed annually for 60 months. Individual food security was assessed using the USDA Food Security Screener. Analyses included McNemar, Wilcoxon Signed Rank, and descriptives. Significance was set at $p<.05$.

**Results and discussion:** Participants (n=14) were female (71.4%), had an individual income less than $15,000 per year (64.2%), with a mean age of 51.36. Participant food security status did not improve significantly during the study, however, positive and significant changes in body weight and blood pressure were observed, suggesting that mHealth interventions are impactful in a rural, low-income population.

**Discussion and conclusions:** The targeted video education did not significantly change food security status or food literacy behavior; participant feedback showed that similar interventions may have a positive impact on behavior change.

# Improving Food Literacy through mHealth (text messaging) to a Predominantly Low-Income, Rural Population in the Appalachian High Country

Sarah Booth[1]; Ariel Danek, MS, RDN[2]; Alisha R. Farris, Ph.D., RDN[1]; Danielle Nunnery, Ph.D., RDN, LDN[1] Jamie B. Griffin, Ph.D., RDN, LDN[1]

Department of Nutrition and Health Care Management; Beaver College of Health Sciences, Appalachian State University[1]
High Country Community Health, Boone, North Carolina[2]

## INTRODUCTION

Rural, low-income communities have increased rates of obesity and chronic illness due to socioeconomic and distance barriers that limit their access to nutritious foods and healthcare.[1,2] Limited access to nutritious food because of economic or geographic conditions creates food-stressed populations that are food insecure and many rural, low-income communities face these conditions.[3]

Food insecure individuals often do not have the confidence or skills to utilize the available food resources because there is a lack of emphasis on them developing these skills at home and in school.[4] This leads to many individuals in the United States not developing adequate food literacy skills. These skills, which can be described as food literacy attributes, include shopping and choosing groceries, meal planning, basic cooking skills (including preparing fruits and vegetables), and recipe modification.[4,5]

*My Quest*, a study conducted in 55 rural Alabama counties, showed that mHealth initiatives could promote weight loss and improve health behaviors.[4,6] Participants received 2-3 daily text messages and a weekly eNewsletter that included health tips, reminders, goal-setting prompts, and recipes.[4,6] Results showed significant improvement in health behaviors, food environment, and a reduction in body weight.[4,6]

In a study on the effects of a video-based intervention on grocery shopping habits, Latino participants were separated into two cohorts: a 1-video or a 2-video intervention. Results showed that both interventions improved knowledge, with the 2-video intervention showing significantly improved self-efficacy scores.[7] Health-promotion content produced and distributed through video-based intervention may increase the breadth of health education as the use of mobile technology continues to increase globally.[7] Creating nutrition videos that are tailored to the culture of the targeted audience can improve the quality of household food.[8]

Research on how food literacy programs impact food insecure populations is limited. Implementing a food literacy component within an existing 24-week weight loss and health behavior intervention, *My Quest in the High Country (MQHC)*, will give participants access to educational materials to improve food literacy-based self-efficacy skills.

## PURPOSE

To improve food security status by improving self-efficacy and food literacy skills within the population participating in the pre-existing mobile health (mHealth) initiative, *My Quest in the High Country*.

## METHODS

The High Country Community Health (HCCH) registered dietitian recruited active HCCH patients age 18-66 years in December 2019 and February 2020 using an Eligibility Checklist. Patients (n=14) interested in MQHC provided informed Consent and took the online pre-assessment survey.

Participants were recruited in two phases. Participants (n=9) recruited before January 31st, 2020 began MQHC on February 1, 2020 as group A. Participants (n=5) recruited during February 2020 began MQHC on March 1, 2020 as group B. Participants received a Fitbit to self-monitor physical activity and step counts, and a health scale to self-monitor and report body weight. Participants received 1-2 SMS texts per day and a weekly eNewsletter. Delivery time for each message was randomized to avoid participant compliancy.[6] Participants received a weekly body weight prompt and several self-monitoring prompts per week.[4,6]

Twelve food-literacy focused nutrition and health education videos were developed. Video topics included: easy-to-follow/low-cost recipes, how to substitute ingredients to reduce sugar/sodium intake, how to prepare legumes and vegetables, food safety, and how to select and use seasonal produce.[4] A video link was texted to participants every other week. Follow-up survey links (n=2) were used to evaluate the effectiveness of the targeted food literacy video for that week.

At post, participants received a post-assessment survey identical to the pre-assessment. The surveys included 61 items from previously validated survey tools to determine changes in participant engagement and self-efficacy between the pre- and post- assessment.[4,6]

Social Cognitive Theory guided program design and development. Analyses were conducted using McNemar (dichotomous) and Wilcoxon Signed Rank (ordinal data). Statistical significance was set at $p<.05$.

## RESULTS

Before MQHC began, one participant opted-out of the program. During the 24-week study, three participants opted out of the program, leaving 10 participants who completed the study and the post-assessment.

There was a slight decrease in the mean response in 4 out of 6 food security questions but the results did not show a significant change from the pre- and post- assessment. Similarly, responses in food literacy questions showed evidence of improved behavior but not significantly.

Figure 1. Which of the following videos, did you find helpful? Select all that apply.

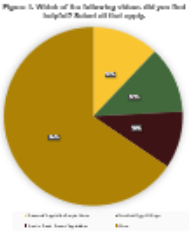


**Table 1. Participant Demographics (n=14)**

| | |
|---|---|
| Age (mean±SD) | 51.36 ±11 |
| Female (%) | 71.4 (28.6) |
| Caucasian/White (%) | 100 |
| Married (%) | 50 (50) |
| Full-time Employment (%) | 42.9 (57.1) |
| Income Level <15,000/year (%) | 64.2 (35.8) |
| 2-Year Degree/Some College Education (%) | 42.9 (57.1) |

**Table 2. Pre- and post- survey results (n= 9) for Food Insecurity Questions.**

| Question | Pre [Mean(SD)] | Post [Mean(SD)] | P-value |
|---|---|---|---|
| Do you ever worry that you do not have enough money to buy food? a,b | 0.67(0.50) | 0.56(0.53) | 1.00 |
| In the past month, did you ever cut the size of your meals or skip meals because there wasn't enough money for food? a,c | 0.44(0.53) | 0.44(0.53) | 1.00 |
| In the past month, did you ever eat less than you felt you should because there wasn't enough money for food? a,c | 0.33(0.50) | 0.44(0.53) | 1.00 |
| I do not have enough money to buy food. a,c | 0.56(0.53) | 0.44(0.53) | 1.00 |
| I do not know how to purchase food. a,c | 0.11(0.33) | 0.22(0.44) | 1.00 |
| I do not know how to prepare or cook food. a,c | 0.11(0.33) | 0.33(0.50) | 0.63 |

**Table 3. Pre- and post- survey results (n=10) for Food Literacy Questions**

| Question | Pre [Mean(SD)] | Post [Mean(SD)] | P-value |
|---|---|---|---|
| How often do you plan your meals ahead? a,d | 4.20(1.87) | 5.20(1.99) | 0.07* |
| How often do you have fruits and vegetables ready to eat as a snack? a,d | 5.60(2.20) | 4.80(2.44) | 0.48 |
| How often do you eat fruits and vegetables as a snack? a,d | 4.80(1.97) | 5.40(1.84) | 0.15 |
| How often do you eat canned vegetables with salt? a,d | 3.90(1.79) | 3.30(1.57) | 0.30 |
| How often do you eat canned vegetables with low sodium/NSALT a,d | 2.80(1.99) | 2.80(1.55) | 0.89 |
| How often do you eat frozen vegetables with salt or sauce added? a,d | 3.70(1.95) | 3.40(1.78) | 0.52 |
| How often do you eat frozen vegetables with no salt or sauce added? a,d | 3.30(2.21) | 3.40(2.27) | 0.95 |
| How often do you eat fresh vegetables? a,d | 5.20(1.55) | 5.70(1.16) | 0.24 |

*p<.05; a McNemar; b Wilcoxon Signed Rank; c Response Scale: 0= Not, 1= Rarely, 2= Less than once a month, 3= Once a month, 4= 2-3 times a month, 5= Once a week, 6= 2-3 times a week, 7= Daily

## DISCUSSION

All 10 participants reported that they found the education videos **a little helpful** (30%) or **very helpful** (70%). The 'Breakfast Eggs – 3 Ways' and 'Seasonal Vegetable Recipe Ideas' were the two most popular videos (Figure 1). A significant ($p<.05$) increase in meal planning was also observed in participants who completed both the pre- and post-assessment.

This study was not without limitations. First, is the very small sample size which can limit generalizability to other populations. Next, the majority of the intervention occurred during the COVID-19 pandemic. Participants reported that this impacted their food and health behaviors during the study. When asked at post-assessment how the pandemic affected their progress, participants reported that 1) they were eating more comfort/snack foods, 2) their food budget was impacted, 3) they weren't able to afford foods that they wanted, and 4) they purchased less healthy foods because healthier options were out of stock.

The study was also impacted by suboptimal participant engagement. Participant response rate to the video surveys averaged 33.9%, making it difficult to assess behavioral change related to the video intervention.

## CONCLUSION

While the results did not show a significant change in food security or food literacy behaviors, participant feedback showed that the targeted video education may have a positive impact on behavior change dependent on the population.

The onset of the COVID-19 pandemic may have negatively impacted the study outcomes due to a change in routine behaviors as reported by participants, which were initiated in the North Carolina 'Stay-At-Home' order.

Further studies should more closely research the impact that a video intervention has on food security when delivered via text message.

Although not reported here, MQHC participants had positive and significant changes in body weight and blood pressure. This suggests that mHealth interventions are impactful in a rural, low-income population.

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## Vita

Sarah Booth is a native of Oak Island, North Carolina. She is the daughter of Grant and Sandra Booth. She graduated from South Brunswick High School in 2010. Sarah continued her education at the University of North Carolina Wilmington, where she earned a Bachelor of Arts in Anthropology, and Appalachian State University, where she earned a Bachelor of Science in Nutrition and Dietetics. She received her Master of Science in Nutrition and Dietetics from Appalachian State University in May 2021. Sarah will pursue a career as a Registered Dietitian Nutritionist.