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Associations of cooking self-efficacy and frequency of iCook-4H youth participants with dietary quality and BMI at baseline

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To the Graduate Council:

I am submitting herewith a thesis written by Amber Donaldson Ford entitled "Associations of cooking self-efficacy and frequency of iCook-4H youth participants with dietary quality and BMI at baseline." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

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Associations of cooking self-efficacy and frequency of iCook-4H youth participants with dietary quality and BMI at baseline

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ABSTRACT

Background: With increased obesity has come increased ready-made and fast food consumption and decreased homemade food consumption. Previous studies have shown associations between cooking self-efficacy (SE) and cooking frequency (CF) with dietary quality and weight status. Cooking interventions have shown positive associations with dietary outcomes, such as increased fruit and vegetable intake and decreased fast food consumption. There is still much unknown about SE and CF, especially among youth.

Objective: The objective of this project was to determine baseline SE and CF and the associations with dietary quality and body mass index (BMI) of youth enrolled in iCook 4-H.

Methods: Youth (n= 229) completed online surveys assessing demographics, SE, CF, and dietary quality. Anthropometrics were collected to calculate BMI-for-age percentiles and weight categories. iCook-4H lesson leaders completed surveys assessing their perceptions of their class's baseline cooking skills. Descriptive statistics were completed for SE, CF, weight categories, and demographics. Differences in SE and CF by sex, race, and participation in government assistance programs were determined through independent-sample t-tests. Pearson's correlations were used to assess the association between dietary quality and SE and CF. Associations between CF and dietary quality were assessed further through two-way ANOVAs that included CF and sex and CF and race as independent variables. Associations between weight and SE and CF were assessed through ANOVAs. Differences between mean youth SE and

lesson leader's perceptions of their class's overall skills were assessed through one-sample t-tests.

Results: Thirty-seven percent of youth were overweight or obese. Females reported significantly higher CF than males ($p=0.042$). Whites reported higher CF than non-whites, which approached significance ($p=0.096$). For each cooking skill, mean youth SE was significantly higher ($p<0.001$) than lesson leaders' perception of the group's skill. CF was positively associated with dietary quality ($p<0.001$), but BMI was not associated with dietary quality. SE was not associated with dietary quality or BMI.

Conclusion: Results indicate that CF was positively associated with dietary quality among youth. More research is needed to assess how different types of cooking relate to diet and weight. Interventions are needed to determine if increased CF leads to better diet outcomes.

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CHAPTER I
LITERATURE REVIEW

Background

In recent decades, obesity has become a threat of great national and international focus.[1] The Centers for Disease Control and Prevention (CDC) report that currently around 35% of adults in the United States (US) are obese.[2] According to the World Health Organization (WHO), worldwide obesity rates have doubled since 1980, and more individuals now live in a country with more obesity related deaths than underweight related deaths.[3]

It has been thoroughly documented that obesity can lead to negative health outcomes.[4] While there are many comorbidities associated with obesity, hypertension, type 2 diabetes mellitus (T2DM), dyslipidemia, coronary heart disease, stroke, and certain cancers are some of the most prominent.[4] These health conditions can decrease the lifespan and quality of life of the affected individuals.[4]

In addition to negative health outcomes, obesity also leads to increased financial burdens.[5,6] The aforementioned health problems and others can lead to increases in medical spending. It is estimated that in 2006 medical costs were $1,429 higher for an obese patient than for a non-obese patient.[5] Additional estimates suggest that in 2008 the US incurred $147 billion dollars in obesity related medical costs.[5] These elevated medical costs negatively impact both individual and national financial stability, and if the upward obesity trend continues, it is projected that the US will spend $344 billion on obesity related healthcare in 2018.[6] In a nation already bearing a large national deficit,

these increases in obesity-related health care costs are unsustainable and could have negative impacts on the country as a whole.

Obesity is also a serious issue in youth.[7] Currently, around 17% of children ages 2-19 in the US are obese, a rate that has almost tripled since 1980.[7] Similarly to adults, children who are obese are more likely to suffer from health problems than are non-obese children. Compared to normal weight children, obese children are at greater risk for T2DM,[8] heart problems,[9] joint pain,[10,11] breathing difficulties,[11] discrimination,[12] and lower self-esteem[13] among other outcomes. Being obese in childhood not only increases risk of adverse health problems in childhood, but the effects of childhood obesity can be long lasting.[13-15] Obese children are more likely to be obese adults and are at greater risk of experiencing extreme obesity, defined as having a body mass index (BMI) over 40 kg/m^2, in adulthood.[15,16] Undoubtedly, obesity is a serious health concern throughout the lifespan.

Many factors are associated with the development of obesity.[17] In general, obesity is caused by a lack of energy balance, meaning more calories are consumed than are used by the body.[18] Many factors contribute to energy imbalance. Facilitators include environments unsupportive of healthy behaviors,[19] genetic predisposition,[20] certain preexisting medical conditions,[21] medications, emotional state,[22,23] older age, and sleep deprivation.[24] Clearly, obesity is a multifaceted disorder that requires comprehensive approaches.[17] Childhood obesity has particularly been targeted because of its long-lasting implications and the larger window of opportunity to improve health in adulthood.[25]

Childhood obesity presents with its own unique causes and challenges. Many researchers attribute the spike in childhood obesity rates to changes in food and physical activity environments.[26] Children today are bombarded with an abundance of processed and unhealthy food choices along with constant advertising of these foods online, on television, in stores, and elsewhere.[26]

Additionally, children are more likely than adults to live in a household with an income below the poverty line.[27] Poverty is a major predictor of obesity for many reasons.[28,29] For one, poverty is associated with decreased availability of healthy food choices, as many impoverished communities are in food deserts.[28-30] These communities are also less likely to be conducive to physical activity due to limited safety and accessibility of recreational space.[30] However, there are other contributors to obesity, which will be discussed below.

Food Sources and Obesity

Another suggested contributor to the obesity epidemic is the transition from a diet of predominantly whole, scratch-made foods to a diet largely of energy-dense processed and fast foods.[31,32] The reasons for this transition are many, but a possible contributor is the decline in cooking abilities, confidence, and frequency.[33-38] The remainder of this review will outline these dietary shifts; the relationship to cooking, diet, and health; and where additional research is needed to better understand how cooking can be used as a mechanism to improve diet and weight. While children are the population of interest for this project, a large portion of research around cooking and health has been conducted with adults. In order to provide a comprehensive overview of

the relationship of cooking with dietary quality and BMI, some research with adult populations will be included.

Changes in Diet

The past decades have been marked by significant changes in the primary food sources for Americans.[31,32,39] A key change has been the transition from homemade foods to a diet largely dependent on convenience, processed, and fast foods.[31,32,39] These diet changes have coexisted with increases in caloric consumption, leading many researchers to believe that this dietary transition is largely to blame for caloric and related weight increases.[31,32]

A report from the United States Department of Agriculture (USDA), Economic Research Service provides key insights into these diet changes from 1977 to 1995.[31] In this time span, the percentage of total caloric intake from fast food and restaurants increased from 3% to 12% and from 3% to 8% respectively. Beyond the changes in the source of food, changes in where foods were consumed also occurred. In that timespan, the percentage of calories consumed at home per day declined from 82% to 66%, while the percentage of calories consumed away from home increased from 18% to 34%. During this increase in the proportion of energy from away from home food sources, researchers found that average calories consumed per day were also increasing.[31]

Adding to the evidence that consumption of away from home foods may have contributed to daily energy increases, Poti and Popkin examined changes in food source and caloric intake from 1977-2003.[32] Researchers used data gathered through

nationally administered surveys from 29,217 US children.[32] Overall they saw a 179 kcal/day increase, but despite the increase in overall caloric intake, calories consumed at home actually decreased by 76 kcal/day. Therefore, the rise in overall calories came from the rise in calories consumed away from home, which rose by 255kcal/day. This suggested that foods consumed away from home have been the largest contributor to increases in daily average energy intake.

While researchers saw fewer changes in daily caloric consumption after 1994, the biggest change after that time was the source of foods eaten at home. Foods eaten at home and purchased at the store decreased from 62.1% of calories per day in 1994 to 57.6% in 2006.[32] Conversely, foods eaten at home/prepared outside of the home increased, mainly due to significant increases in fast food consumption at home. Increases in overall fast food intake during this time were actually found to result mostly from increases in fast food consumed at home.[32] Overall, it that getting people to eat more meals at home should not be the only strategy, as foods eaten at home have become less nutritious and more reliant and ready-made and fast foods.[32] Therefore, the source and nutritional quality of foods eaten at home should also be addressed.

The findings that foods eaten at home may be low in nutritional quality were supported by a cross-sectional study by Briefel and colleagues.[40] Researchers examined the location of where 2,314 children in grades K-12 consume most of their empty calories.[40] Most children consumed breakfast, dinner, and at least one snack at home. About 35% of participants' total daily energy was consumed school, and throughout the day, youth took in about 527 low nutrient, energy-dense calories. Results indicated, however, that most of the low nutrient, energy-dense calories were actually

consumed at home, indicating that youth are more at risk of consuming products low in nutritional value at home.[40]

While this study indicates that children and adolescents are at risk of consuming unhealthy foods at home,[40] other researchers have found that young adults may be at greater risk of consuming fast foods and processed foods.[39] Nielson and colleagues analyzed dietary intake data from 1977-1978, 1989–1991, and 1994–1996 in a cross-sectional study with 12-29 year olds.[39] Both adolescents and young adults showed an overall increase in daily energy consumption, most of which was seen from 1989-1996, supporting results of other studies.[41] While both groups followed similar trends, it appears that young adults have had the largest decrease in the amount of their daily energy coming from home food sources and the largest increase in the amount of their daily energy coming from restaurant and fast food sources. While this suggests that both youth and young adults are at risk for poor diet choices, it seems that the transition to young adulthood may be an especially vulnerable time.[41] Perhaps youth need to be taught home cooking skills in order to ward off ready prepared and fast food usage when they enter adulthood and are responsible for obtaining their own food.

Overall, national observational studies suggest that fewer foods are being consumed at home and even when foods are eaten at home it is less likely that they will have been prepared in the home.[31,32,39] This has co-occurred with increases in caloric intake, suggesting that these foods may be primary contributors to national weight increases.[31,32,39] Therefore, it seems that recommendations may need a dual focus: to eat outside of the home less and to use more food prepared from whole food sources rather than ready made and fast foods when eating at home. Many strategies have

sought to decrease eating out and increase home cooking through cooking interventions.[42-45] To better understand this possible mechanism it is important to understand the state of cooking practices and abilities for adult and youth populations, the role cooking plays in diet and weight, and the outcomes cooking interventions have produced on diet and weight. The following sections will look at demographic factors associated with higher or lower cooking skills and frequency, the observed associations between cooking and diet and weight, and the diet and weight outcomes that have been observed from cooking-based interventions.

Factors Associated With Cooking

Many researchers have sought to determine the factors that predict the likelihood of cooking.[33-36,41,46] Observational studies have compared differences in cooking by sex, gender, race, socio-economic status, and weight among other factors.[33-36,41,46] Some of the most prominent studies in this area have been cross-sectional studies with primary meal preparers from the German speaking part of Switzerland.[33,37,38] Researchers like van der Horst and Brunner have used data from surveys mailed to this population to determine factors associated with various cooking behaviors.[33,37,38] Findings from these and other studies will be outlined below.

Age

Age seems to play a large part in cooking skills and frequency. A study by van der Horst and colleagues revealed that ready-made meal consumption was significantly higher for the youngest participants in their sample (17-39 years).[33] Of the independent variables assessed, age, followed by self-reported cooking skills was the strongest predictor of ready-made meal consumption (p<0.001).[33] This indicates that those who

were younger and had the least cooking skills were the most likely to consume ready-made meals rather than practice scratch-cooking food preparation.

A cross-sectional study by Winkler and Turrell also assessed the association of socio-demographic characteristics with cooking, namely confidence to use a variety of cooking techniques.[34] Primary meal preparers in 426 randomly selected Australian households were mailed a validated questionnaire.[34] Participants of an older age were more likely to report confidence in preparing vegetables ($p<0.001$). This was an important finding because confidence to prepare vegetables was the only cooking technique significantly associated with vegetable purchasing practices, indicating that individuals who are less confident in vegetable preparation may also be less likely to purchase vegetables.

A key study that has provided much of the foundation for cooking-related research is *The State of Cooking in England: the relationship of cooking skills to food choice* by Caraher and colleagues.[35] This study, published in 1993, also found differences in cooking confidence by age. Researchers found that microwaving was the only cooking technique young people were more confident in than older participants.[35] Again, it would seem that cooking for younger individuals is less likely to consist of scratch made food preparation, as microwaving is a key preparation method of ready-made meals.

In terms of young people's general frequency of food preparation, relatively little is known. However, a cross-sectional study by Larson and colleagues examined the frequency adolescents were involved in dinner preparation and shopping for food.[36] Among a diverse sample of 4,746 students from public middle and high schools in

Minnesota, 68.6% reported helping prepare dinner at least once during the past week, and 49.8% reported helping shop for food during the past week. Of participants who reported helping with food preparation, 71% reported helping less than three times per week. While it is difficult to definitively say how often adolescents are involved in food preparation, results of this study indicate that most adolescents are at least involved in dinner preparation on a weekly basis.[36] However, as other studies have shown, young people are more likely to be involved in food preparation that does not involve whole foods.[33-35]

Gender

Generally, most research has indicated that there is a gender gap in cooking frequency and skill.[34,36,47] However, recent research suggests that this gap may be narrowing.[35,41,46] While females are still usually more likely to cook and be responsible for meal preparation, increases in cooking frequency among the male population have been noted.[41] Larson's study with over 4,000 Minnesota middle and high school students found that female students were more likely than male students to be involved in helping prepare and shop for food.[36] Over one third of the female participants reported helping prepare dinner three or more times in the past week, which was statistically different from males, with only 25% reporting helping cook dinner three or more times in the past week.[36] Yet, not all studies have revealed that female youth have higher cooking frequency than males.[46] The cross-sectional study by Woodruff and Kirby with 145 Canadian youth, grades 4-8, found no difference in cooking frequency between male and female participants.[46] There were also no gender differences in cooking self-efficacy.[46]

However, beyond frequency it also seems that there may be gender differences in healthy cooking abilities and practices.[34,46,47] While Woodruff and Kirby found no gender differences in cooking frequency and self-efficacy, they did observe differences in the repertoire of food preparation techniques.[46] Female participants reported usage of a larger number of cooking techniques, which included activities like making a meal with vegetables, cutting up food, measuring ingredients, etc.[46] These cooking techniques would generally be used for the preparation of healthy, homemade meals. In the study by Winkler and Turrell, being female was positively also associated with confidence to prepare vegetables, which is positively associated with higher vegetable purchasing.[34] Findings, by Larson and colleagues further support that females may be more likely to practice healthy food preparation behaviors than males.[47] They examined data from Minnesota young adults and found that female participants were more likely than males to practice healthy food preparation behaviors. This group was more likely buy fresh vegetables, prepare a green salad weekly, write a grocery list, and prepare a dinner with chicken, fish, or vegetables at least once per week than were males. These practices were combined to yield an overall food preparation score, yielding a higher score for females ($p<0.001$).[47]

While there may be gender differences in cooking frequency and abilities, it does seem as if the gap may be narrowing.[35,41,46] When *The State of Cooking in England: the relationship of cooking skills* was carried out in 1993, 68% of women reported cooking everyday in contrast to 18% of men.[35] Women also had a higher self-efficacy mean with 94% of women having confidence that they could cook compared to 80% of men. However, more recent studies, such as that conducted by Smith and colleagues have

shown changes.[41] Researchers surveyed 38,565 US adults 19-60 years old and found that while women reported a decrease in cooking frequency from 1965 to 2008 men actually reported an increase in cooking frequency.[41] Additionally, as stated, the Woodruff and Kirby study, which was published 20 years after *The State of Cooking in England*, found no differences by gender in frequency and in self-efficacy.[46] Overall, it seems that females may cook more than males, and especially cook healthier offerings, but this seems to be becoming a less frequent phenomenon.[34-36,41,46,47]

Race

Little is known about differences in cooking by race. However, there is limited evidence that cooking may vary by race.[46] Woodruff and Kirby's study that analyzed the associations between cooking self-efficacy and various factors among 145 Canadian youth grades 4-8 found no differences in cooking self-efficacy by sex or grade level.[46] Race differences were observed, though, with white children having statistically higher cooking self-efficacy (p=0.02) and frequency (p<0.001) than non-white. White participants were also more likely to report using a wider variety of cooking techniques and to report higher cooking frequency, suggesting overall differences in attitudes towards cooking and actual practices by race.[46] With limited evidence it is difficult to conclude which if any races may be at greater risk of not cooking and of being less self-efficacious than other races.

Socio-Economic Status

A small amount of evidence points to cooking variations by socio-economic status (SES).[34,36] However, the direction of the observed associations is mixed.[34,36] When looking at adults, Winkler and Turrell found that of their 426 randomly selected

Australian households, those with a higher household income and education were more likely to have a primary meal preparer confident in preparing vegetables, thus increasing likelihood of purchasing and preparation.[34] Conversely, Larson and colleagues found that of their Minnesota middle and high school adolescents, those of low SES were more likely to have higher food preparation frequency.[36] At this point, mixed evidence makes it impossible to accurately say how SES relates to cooking, and it is difficult to compare these studies that were performed with populations from different age groups and with different outcome variables.

Weight Status

Finally, differences in cooking by weight status have also been assessed. Van der Horst and colleagues found that among their adult sample, overweight participants had a higher opinion of ready-made meals than did normal weight participants.[37] In addition to viewing ready-made foods more positively, overweight participants also used these foods more frequently as opposed to homemade foods than did normal weight participants.[37] However, Larson found that among Minnesota adolescents, overweight youth were more likely to report helping prepare foods, but comparisons of these studies is limited, as the type of food preparation was not assessed in Larson's study.[36]

Thus, it appears, that more research is needed to determine cooking differences by weight status. Van der Horst's study indicates that overweight individuals may have lower cooking frequency and rely on ready-made foods in contrast to Larson's study that shows a positive correlation between weight and cooking frequency. [36,37] It cannot be said if these findings are opposing, however. Cooking definitions vary widely, and some individuals may still consider using ready-made ingredients as cooking.

Therefore, while overweight individuals reported higher cooking frequency in the Larson's study, it would be important to assess the type of cooking done, as van der Horst found that overweight individuals are more likely to use ready-made foods.[37]

Associations of Cooking with Health

Now that the general state of cooking has been defined and cooking variations among populations have been outlined, it is important to understand what associations cooking may have with health. Associations that have been observed in relation to diet and weight will be outlined below, drawing from many of the aforementioned studies.[33,37,38,47]

The studies with primary meal preparers in the German speaking part of Switzerland have yielded great insight into cooking's association with various dietary patterns.[33,37] Van der Horst and colleagues have shown that those who report the fewest cooking skills and spend less time cooking are most likely to consume fast food, which is often energy-dense and nutrient poor.[33,37] Additionally, Hartmann and colleagues also sought to investigate if cooking skills facilitate healthy eating among this population (n=4,436).[38] Researchers found that health consciousness was not significantly associated with cooking skills for females, who were also more likely than males to be primary meal preparers.[38] However, reported ability of various cooking skills had a significant positive association with vegetable intake and a negative association with unhealthy food intake, such as convenience foods, soft drink, and "sweet and savouries."[38] Results by both researchers with this population indicate that cooking skills are inversely associated with intake of unhealthy foods and may be a contributor to dietary quality.[33,37,38]

Yet, some evidence indicates that cooking frequency rather than cooking skills may be a better predictor of dietary quality, especially for younger age groups.[36,47] Larson's study with Minnesota young adults revealed that most young adults reported adequate cooking skills, but in contrast to frequency, self-reported cooking skills were not associated with dietary quality.[47] Participants who prepared food more often were less likely to consume fast food and more likely to have better dietary quality.[47] Of those who reported high preparation, 31% consumed five servings of fruits or vegetables daily compared with the 3% who reported low preparation. This suggests that food preparation frequency rather than self-reported cooking aptitude was most associated with dietary quality. In a related study with Minnesota middle and high school students, Larson found that cooking frequency was positively associated with fruit consumption in males and fruit and vegetable consumption for females.[36] Additionally, negative associations for fried food consumption for males and soft drink consumption for females were observed for those who were involved in food preparation.[36]

While it seems that higher cooking frequency and skill may be associated with decreased likelihood of convenience food usage, other research indicates that even among those who cook convenience products are still used. Brunner and colleagues examined fifteen primary factors associated with the use of convenience foods.[48] They did find inverse associations between cooking skills and utilization of highly and moderately processed foods. However, they did not find that time spent cooking was associated convenience food use, as both short and long times spent cooking had individuals that reported use of convenience foods.[48] This suggests that even those who cook a great deal utilize convenience products. Therefore, increasing cooking skills and

frequency should not be the only focuses. It is also important that the types of cooking being done should be assessed and that individuals should be encouraged to choose healthy foods even when selecting convenience foods.

Outcomes of Cooking Interventions

While much of the aforementioned research has examined associations between cooking and health indicators, causal relationships between these variables have also been investigated. For example, Garcia and colleagues sought to determine the effects of hands-on cooking and nutrition classes offered to 44 Scottish parents of young children, using a shortened validated questionnaire.[42] This study is one of few that have assessed the long-term effects of a cooking program.[42] From pre- to post-intervention, nutrition knowledge and all tested aspects of cooking confidence, which included cooking using basic ingredients, following a simple recipe, tasting new foods, and preparing new foods, increased significantly. At one-year follow-up, the significant increases from baseline were retained for nutrition knowledge and for confidence in following a simple recipe and confidence in preparing new foods. Post-intervention and at one-year follow up, 97% and 84% of respondents reported that they felt their diet was more balanced as a result of the classes. Cooking confidence increases were seen post-intervention and at one-year-follow-up. After the classes, decreases in ready-made meals and increases in fruit and vegetables were observed and were retained at one-year follow-up. The retained increases in cooking confidence and dietary quality, suggest that increasing cooking confidence may lead to long-term positive health benefits.[42]

Also assessing cooking interventions impact on diet, Brown and Herman assessed the impact of cooking classes on dietary practices and food preparation behaviors.[43] Fruit and vegetable cooking classes were implemented in 28 Oklahoma counties over two months and were available to both youth and adults. Of the 229 youth and 373 adults surveyed, significant increases in both fruit and vegetable consumption were observed. Following the intervention, youth increased fruit consumption from 1.1 to 2.3 servings/day and vegetable consumption from 1.4 to 2.4 servings/day. Increases in willingness to taste and to prepare new foods were also noted with 69% reporting consuming a new fruit or vegetable and 67% reporting attempting novel preparation methods for fruits and vegetables.[43] While the assessment tools used were invalidated and only short-term effects were measured, the results suggest that the cooking intervention led to better eating habits and willingness to try new foods.

The Cookshop Program also assessed outcomes of a youth cooking intervention on diet. The program was carried out in low-income elementary schools of New York City, New York and focused on sustainability and a plant-based diet.[44] Three primary components defined the program. The school lunch component made sure that a variety of vegetables and whole-grains were offered to reinforce the foods they were cooking and learning about in the classroom. The classroom component was divided into two main parts (hands-on cooking activities with plant/food education and no cooking with plant/food education). Third was the parent and community component for which parents and community members assisted instructors for the small group lessons.[44]

Outcome data from the 590 students involved were collected and stratified based on the type of intervention received. Youth that received the cooking component had increased food preferences, food knowledge, and cooking self-efficacy along with decreased plate waste of fruits and vegetables.[44] The food/environment lessons alone were not associated with changes in preferences, attitudes, and self-efficacy in cooking. Cooking and food/environment lessons together, though, were associated with the least amount of fruit and vegetable plate waste, showing an increase in fruit and vegetable consumption after the implementation of the full program.[44] Again, it appears that cooking interventions, especially when focused on healthy food preparation and combined with nutrition education, may yield favorable dietary changes.[44]

In terms of weight, evaluation of the LA Sprouts program saw reductions in BMI and less weight gain among their intervention group.[45] This program was intended for Californian, low SES Latino fourth and fifth grade elementary school students and involved cooking, nutrition, and gardening.[45] Because this is a multicomponent intervention, it is not possible to attribute these results to cooking alone. However, the findings suggest that cooking interventions may not only improve the healthfulness of foods consumed but may also lead to decreased weight in overweight and obese individuals,[45] but additional research is warranted, to test this further.

The recognition of the potential role cooking in health and the observed declines in cooking literacy has led some experts to believe that interventions are needed to improve cooking self-efficacy and frequency among youth.[49] In 2010 Lichtenstein and Ludwig issued a call in the *Journal of the American Medical Association* for cooking education to be brought back to schools.[49] They believe that the link between cooking

decline and dietary quality decline is clear and warrants immediate, widespread change. They argue that since many parents and adults today rely on convenience foods rather than scratch cooking, a large number of children may be unaware of what a homemade meal is like. According to the authors, cooking classes would reinstate healthy eating behaviors.[49] Given expert demand and a wide use of cooking in nutrition interventions, it seems as if increasing cooking skills and frequency has become a prominent goal of obesity prevention strategies.[33,37,38,47] However, inconsistent results among studies and research gaps have been documented, and understanding these gaps is important to intervene effectively.[33-36,41,46]

Conclusion and Research Gaps

Overall, it seems that changes in food purchasing sources, food consumption locations, cooking frequency, and cooking skills and confidence may have an association with diet and weight and may be associated with the obesity rise.[31-36,39,41,46] While a variety of research has been conducted in regard to these factors and their role in dietary practices and weight, gaps remain. Although previous studies have assessed dietary practices in regard to cooking behaviors and skills, cooking behaviors and skills are not always clearly and consistently defined, making interpretation of these studies difficult.[33-36,41,46] Additionally, less is known about the relationship between children's cooking frequency and self-efficacy at home with their weight and dietary practices than is known in regards to adults.

Furthermore, few youth-based studies have examined weight status and instead have looked at singular dietary outcomes like fruit and vegetable consumption or fast

food intake as a main outcome.[43,44] Since, childhood obesity is a growing problem, weight status and overall dietary quality are important outcome measures.[7] Additionally, a large portion of the studies that have provided key insights into the state of cooking and factors influencing cooking skills and behaviors have been done outside of the United States.[33-35,37,38] Because obesity and childhood obesity are such serious issues for the United States, it is important that these topics be researched from an American perspective in order to identify the key components influencing cooking and its relationship to diet within this country and to develop appropriate strategies and interventions.

Overall, research suggests that the diet of Americans has changed to a diet largely made up of ready-made and fast foods, while cooking practices and self-efficacy have declined.[31-36,39,41,46] Preliminary cooking interventions have shown positive changes in some aspects of dietary quality and in some cases weight status.[42-44] However, more research is needed with American youth to determine their current cooking frequency and self-efficacy and how those relate to their health.

CHAPTER II
MANUSCRIPT

Abstract

Background: With increased obesity has come increased ready-made and fast food consumption and decreased homemade food consumption. Previous studies have shown associations between cooking self-efficacy (SE) and cooking frequency (CF) with dietary quality and weight status. Cooking interventions have shown positive associations with dietary outcomes, such as increased fruit and vegetable intake and decreased fast food consumption. There is still much unknown about SE and CF, especially among youth.

Objective: The objective of this project was to determine baseline SE and CF and the associations with dietary quality and body mass index (BMI) of youth enrolled in iCook 4-H.

Methods: Youth (n= 229) completed online surveys assessing demographics, SE, CF, and dietary quality. Anthropometrics were collected to calculate BMI-for-age percentiles and weight categories. iCook-4H lesson leaders completed surveys assessing their perceptions of their class's baseline cooking skills. Descriptive statistics were completed for SE, CF, weight categories, and demographics. Differences in SE and CF by sex, race, and participation in government assistance programs were determined through independent-sample t-tests. Pearson's correlations were used to assess the association between dietary quality and SE and CF. Associations between CF and dietary quality were assessed further through two-way ANOVAs that included CF and sex and CF and race as independent variables. Associations between weight and SE and CF were

assessed through ANOVAs. Differences between mean youth SE and lesson leader's perceptions of their class's overall skills were assessed through one-sample t-tests. **Results:** Thirty-seven percent of youth were overweight or obese. Females reported significantly higher CF than males ($p=0.042$). Whites reported higher CF than non-whites, which approached significance ($p=0.096$). For each cooking skill, mean youth SE was significantly higher ($p<0.001$) than lesson leaders' perception of the group's skill. CF was positively associated with dietary quality ($p<0.001$), but BMI was not associated with dietary quality. SE was not associated with dietary quality or BMI. **Conclusion:** Results indicate that CF was positively associated with dietary quality among youth. More research is needed to assess how different types of cooking relate to diet and weight. Interventions are needed to determine if increased CF leads to better diet outcomes.

Introduction

Both adult and childhood obesity have become widely distributed across the United States population in recent decades.[1,2] Obesity is a serious health threat that is associated with numerous co-morbidities, such as type 2 diabetes mellitus and heart disease, as well as increased financial burdens.[4-6] Children are an especially vulnerable population because children who are obese are more likely to experience extreme obesity in adulthood.[15,16] Due to the negative outcomes associated with obesity, much effort has been employed to identify and understand the underlying causes of this trend.[4] A major change that has taken place as obesity rates have risen is an increase in ready-made and fast food consumption and a decrease in homemade food consumption.[2,3,7,31-39] These diet changes have coexisted with increases in caloric consumption, leading many researchers to believe that this dietary transition is a substantial contributor to national caloric and related weight increases.[31,32]

A report from the United States Department of Agriculture (USDA), Economic Research Service provides key insights into these diet changes among youth and adult Americans.[31] From 1977 to 1995, the percentage of calories consumed at home declined from 82% to 66%, while the percentage of calories consumed away from home increased from 18% to 34%. The increase from 18 to 34% (a 16% increase) was mostly made up of increases in fast food and restaurant consumption (14%).[31]

Trends towards energy from away from home food sources have also been noted specifically among children, who are the target population of this present study.[32] From 1977-2003, calories consumed from home food sources decreased by 76 kcals/day, while calories from away from home food sources increased by 255

kcals/day.[32] These observations suggest that foods consumed away from home are substantial contributors to daily average energy consumption among youth.

Since 1994, one of the biggest changes in diet has been the source of foods eaten at home.[32] For children, foods eaten and prepared at home decreased from 62.1% of calories per day in 1994 to 57.6% in 2006, while foods eaten at home but prepared outside of the home increased by almost 4% of average daily intake.[32] It seems that even when eating at home, youth are now more likely to eat fast foods and ready-made foods, which have been documented as being less nutritious than whole food, instead of homemade foods than they were in the past.[32,39,40] These trends in dietary intake patterns highlight that there may be a link between cooking with diet and weight.

Studies have supported the possibility of this relationship and have demonstrated that ready-made and fast food usage is negatively associated with cooking skills and cooking frequency.[33,37,38,47] Larson and colleagues found that among Minnesota young adults who reported high food preparation frequency the prevalence of consuming five servings of fruits or vegetables a day was 31% compared with 3% for young adults who reported low food preparation frequency.[47] Additionally, van der Horst and colleagues found that participants in their sample of Swiss primary meal preparers who reported the fewest cooking skills and spent less time cooking were the most likely to consume fast food.[33,37]

Furthermore, cooking interventions have shown positive outcomes on diet behaviors for youth and adults, such as increased fruit and vegetable consumption and decreased fast food consumption.[42-44] Garcia and colleagues found that hands-on

cooking experience and nutrition classes with Scottish parents yielded increases in cooking confidence and in fruit and vegetable consumption along with decreases in use of ready-made meals.[42] These increases in fruit and vegetable consumption are consistent with the findings of Brown and Herman, who examined outcomes of a youth and adult cooking intervention in Oklahoma. Brown and Herman found that the program increased daily fruit and vegetable consumption from 1.1 to 2.3 and 1.4 to 2.4 respectively.[43] School-based cooking programs like the quasi-experimental Cookshop Program study have also demonstrated fruit and vegetable consumption increases.[44]

Numerous characteristics have been examined to assess demographic associations with cooking skills and frequency.[33-36,41,46] While results have been limited for race and socio-economic status, it does appear that age and gender are associated with cooking abilities and frequency.[33-36,47] Adult studies have shown that those participants in the youngest age groups are more likely to report lower cooking skills and frequency and to report utilization of ready-made and fast foods.[33,35] Additionally, some research has shown that females are more likely to report higher cooking skills and frequency, although, this gap seems to be narrowing.[35,41,46] However, much of this research has been done with adults, and research is limited on the cooking abilities and behaviors among youth and the association with diet and weight.

Because youth are vulnerable to the long-term effects of childhood obesity, this relationship warrants further exploration.[7] This present study sought to provide knowledge on current cooking practices of American youth. The objective of this project was to determine the baseline cooking self-efficacy and frequency of 9-10 year old youth enrolled in a cooking-based obesity prevention study (iCook 4-H) and the

associations of those factors with dietary quality and body mass index (BMI). Procedures were approved by the University of Tennessee Institutional Review Board for Protection of Human Subjects.

Methods

Participants

Participants for this sub-project were control and treatment participants who had been recruited for the iCook-4H research project, which took place in Maine, Nebraska, South Dakota, Tennessee, and West Virginia. Methods and outcomes for the overall iCook-4H intervention will be described elsewhere. Participants, 9 and 10 year old youth and their primary meal preparers, were recruited via flyers, emails, and word-of-mouth in schools, after school programs, and other community outlets, such as recreation centers, by researchers and community stakeholders. Participants who indicated interest in the program in person, via email, or over the phone were screened for eligibility before being enrolled in the program. Selection of eligibility criteria was based on factors that would facilitate participation in the larger iCook-4H study. Eligibility criteria were being 9-10 years old at enrollment, being able to participate in the iCook-4H cooking classes with their adult primary meal preparer, being free of food allergies and activity-related medical restrictions, having home Internet access, and consuming a diet that allowed for the intake of meat and dairy products.

Once enrolled, participants were randomly assigned to either the control or treatment group in some states and non-randomly assigned in other states based on convenience. The treatment group would go on to receive six hands-on nutrition, physical activity, family meal, and cooking focused classes in addition to access to the

educational iCook-4H website that allowed participants to post videos, pictures, and comments related to healthy eating and physical activity. Both treatment and control participants completed pre- and post- assessments prior to and following the intervention. As part of these assessments, youth completed online surveys outlined below and underwent anthropometric assessments. Adults completed online surveys and blood pressure screening. For the purposes of this project, control and treatment youth participants were treated as one singular data source, as only baseline youth measurements were used. This sub-project used baseline data collected from iCook-4H participants before the treatment group began receiving the intervention.

Measurements

Baseline measurements were obtained one week prior to the start of the iCook-4H intervention. Youth's (n=229) online survey assessed their cooking frequency and self-efficacy, age, and sex. The online survey completed by adults elicited information regarding the race of the youth and whether or not the family participated in government assistance programs.

The iCook-4H program had been pilot tested one year prior to the intervention study of which this project was part. Pilot survey questions around cooking were developed by nutrition experts working on the project and were related to specific skills the program curriculum addressed. After pilot testing, questions were modified to reflect the skills covered in the modified curriculum and to better assess self-efficacy, which is an important measure to predict the likelihood of a behavior.[52] The modified questions were based on expert input and on a validated survey developed for adults.[50] In accordance with validated self-efficacy questionnaires for youth developed by

Baranowski and colleagues, question wording was formatted to be more appropriate for the cognitive level iCook-4H youth participants.[51] To test face validity of the modified questions, the primary researcher conducted cognitive interviews with eight youth (four male and four female) in Knoxville, Tennessee. Results from cognitive interviewing informed the selection of questions used for the cooking self-efficacy score described below. The final questions assessed self-efficacy to cook, follow a recipe, use a knife, use an oven, and use a stovetop. Questions were administered in the format "I am sure I can [insert cooking skill]." Participants rated each question on a 5-point Likert as strongly disagree (5), disagree (4), neither agree nor disagree (3), agree (2), or strongly agree (1). Responses were reverse coded for each question (strongly disagree=5, strongly agree=1) and were averaged for an overall self-efficacy score for each participant. Cooking frequency was assessed through a single question ("How often do you help cook family meals?") that was rated on a 5.0 Likert scale as never (1), rarely (2), sometimes (3), most of the time (4), or always (5). All questions were asked through the online survey that was administered via Qualtrics survey software.

Dietary data of youth were collected through online administration of the Block Food Frequency Questionnaire. Dietary quality was scored based on compliance with the Dietary Guidelines for Americans' recommended daily intake levels of protein, dairy, whole grains, fruits, vegetables, and empty calories for age and gender, using methods adapted from the 2005 and 2010 Healthy Eating Indexes (HEI).[55] Anthropometric measurements of youth, including height and weight, were collected by trained research assistants. These measurements along with age were used to calculate youth's BMI-for-age percentile ranking in accordance with Centers for Disease Control and Prevention

(CDC) growth charts. Percentile ranking allowed for determination of each youth's weight category as underweight (less than the 5th percentile), healthy weight (5th percentile to less than the 85th percentile), overweight (85th to less than the 95th percentile), or obese (equal to or greater than the 95th percentile).

Researchers who observed youth at baseline found preliminary analysis of youth's reported cooking self-efficacy as being higher than their own perceptions of youth's skill-level. To further test if self-efficacy reports from youth were higher than perceived skill by experts, an online survey was administered via email to iCook-4H lesson leaders and helpers who had direct observation of intervention participants at baseline. iCook-4H lesson leaders and helpers were nutrition graduate student researchers and Cooperative Extension agents with backgrounds in teaching cooking.

The questions that examined lesson leaders' and helpers' perceptions of youth's cooking skills assessed the same skills included in the self-efficacy questions administered to youth (cook, follow a recipe, use a knife, use and oven, use a stovetop). Rather than being in the format administered to youth of "I am sure I can [insert cooking skill]," lesson leaders were asked, "I am sure my students could [insert cooking skill]." Again, participants rated each question on a 5-point Likert scale ranging from strongly disagree (5) to strongly agree (1), and responses were reverse coded for each question (strongly disagree=5, strongly agree=1). Due to the retrospective nature of the lesson leader assessment, lesson leaders and helpers were asked about their perceptions of their classes as a whole rather than of individual students, as they did not observe and formally assess each student individually at baseline. Scores for each skill were averaged among the lesson leaders.

Statistical Analyses

All analyses were performed using SPSS version 22.0. Cronbach's alpha was calculated to determine the internal reliability of the questions used to develop the self-efficacy score, and descriptive statistics were then completed. Mean cooking self-efficacy scores and frequencies for cooking frequency responses were calculated in addition to frequencies for weight categories (underweight, healthy weight, overweight, obese), sex (male, female), race (white, non-white), and participation in government assistance programs (yes, no). Due to the small sample of underweight participants (n=4), underweight participants were excluded from further analyses. To determine if there were significant differences in cooking self-efficacy and frequency by certain participant characteristics, independent sample t-test were performed. Independent sample t-tests were performed for independent variables race (white or non-white), sex (male or female), and participation in government assistance programs (yes or no) with the dependent variables cooking self-efficacy and frequency. Analyses were then conducted to determine how cooking self-efficacy and frequency related to weight and diet. To determine the association between cooking self-efficacy and weight category and between cooking frequency and weight category, analysis of variance (ANOVA) was used with weight category serving as the independent variable. Because no associations were noted between mean cooking self-efficacy and dietary quality or weight category, no further analyses were completed for self-efficacy. Associations between cooking frequency and dietary quality and between cooking self-efficacy and dietary quality were examined through calculation of Pearson’s correlations. Because statistical significance was seen for the association between cooking frequency and

dietary quality, two-way ANOVA was used to test this relationship by sex and by race, as in the independent sample t-tests. Because the self-efficacy measure for youth was done on an individual basis and because lesson leaders and helpers reported their perceptions for their whole class as a group rather than for each individual student, one-sample t-tests were used to compare the means between youth and lesson leaders. Self-efficacy ratings from youth were averaged for each cooking skill, and ratings from lesson leaders and helpers were averaged for each cooking skill. Differences for each skill between the youth mean and the lesson leader and helper mean were assessed through one-sample t-tests.

Results

Sample Characteristics

Sample characteristics of the iCook-4H youth are summarized in Table 1. Youth (n=229) were diverse in sex, race, and weight status and were an average age of 9.5 years old.

Cooking Frequency

Participants indicated moderate participation in helping cook family meals with reports of 11% never, 23% rarely, 44% sometimes, 17% most of the time, and 6% always helping cook family meals (Table 1). Independent sample t-tests found significant differences between male and female youth in cooking frequency (t=-2.045, df=215, p=0.042) with females reporting higher mean cooking frequency than males (Table 2). Females reported an average of 2.92 (±1.03) out of the possible 5.0 Likert scale, and males reported an average of 2.63 (±1.01). While no significant differences

Table 1. Demographics of iCook-4H youth participants at baseline	
n=229[a]	**n (%)**
Sex[b]	
Male	97 (44%)
Female	124 (56%)
Race[c]	
White	142 (67%)
Non-white	69 (33%)
Weight Category[d]	
Healthy weight	120 (63%)
Overweight	31 (16%)
Obese	40 (21%)
Participate in government assistance programs[e]	
No	121 (59%)
Yes	83 (41%)
How often youth help cook family meals[f]	
Never	21 (11%)
Rarely	42 (23%)
Sometimes	81 (44%)
Most of the time	31 (17%)
Always	11 (16%)

[a]Sample size varies due to missing responses and rounding of weighted frequencies.
[b]Youth were asked via survey **"**Are you a boy or a girl?"
[c]Adults were asked via survey to "Select one group that best represents your child's race." Response options were white, black, Asian, Hispanic, Native American, and other. All but "white" were classified as "non-white."
[d]Youth height and weight were collected by trained researchers and used to calculate youth's BMI-for-age percentile ranking in accordance with CDC growth charts. Percentile ranking was used to classify youth as healthy weight (>5th and <85th percentiles), overweight (≥85th and <95th percentiles), or obese (≥95th percentile).
[e]Aid to Families with Dependent Children (AFDC)/Temporary Assistance for Needy Families (TANF), Expanded Food and Nutrition Education Program (EFNEP), free/reduced price school meals, Medicaid, Welfare to Work (WTW), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Supplemental Nutrition Assistance Program (SNAP), Supplemental Security Income (SSI)?"
[f]Questions were administered to each youth participant in the format "How often do you help cook family meals?"

were observed by race, the differences in cooking frequency between whites and non-whites approached significance (t=1.672, df=195, p=0.096) as shown in Table 2. Whites reported an average cooking frequency score of 2.88 (±0.99) out of the 5.0 Likert scale in comparisons to non-whites who reported an average of 2.61 (±1.11). Significance was not observed between cooking frequency and participants' participation or non-participation in government assistance programs (Table 2).

Cooking Self-Efficacy

Cronbach's alpha for the cooking self-efficacy questions was 0.82, indicating sufficient internal consistency for the five cooking self-efficacy questions that were averaged for the cooking self-efficacy score. Overall, youth's baseline average combined cooking self-efficacy score was 3.78 (±0.81) of a possible 5.00, which would indicate that on average participants were between neutral and agreement that they were able to perform the surveyed cooking tasks. Conversely, lesson leaders and helpers reported observing low cooking ability of youth at baseline with an average score of 2.31 (±0.48) of a possible 5.00. Youth's self-efficacy and leaders' perceptions were significantly different as assessed by one-sample t tests for each cooking skill (Table 3). Self-efficacy in cooking did not differ by sex, race, weight status, or participation in government assistance programs (Table 2).

Cooking Frequency and Self-efficacy with BMI Category Overall, neither cooking self-efficacy nor cooking frequency was associated with BMI category. ANOVA testing revealed no significant association between BMI category (healthy weight, overweight, obese) with frequency of helping cook family meals (p=0.242) or with self-efficacy in

Table 2. Differences in mean cooking frequency and mean cooking self-efficacy ratings by sex, race, and participation in government assistance programs

	Mean Cooking Frequency[b]	*p*-value[c]	Mean Cooking Self-efficacy[d]	*p*-value[c]
Sex		**0.042**		0.485
Male	2.63		3.73	
Female	2.92		3.81	
Race		0.096		0.103
White	2.88		3.82	
Non-white	2.61		3.61	
Participant in government assistance programs[a]		0.710		0.733
No	2.83		3.76	
Yes	2.77		3.79	

[a]Aid to Families with Dependent Children (AFDC)/Temporary Assistance for Needy Families (TANF), Expanded Food and Nutrition Education Program (EFNEP), free/reduced price school meals, Medicaid, Welfare to Work (WTW), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Supplemental Nutrition Assistance Program (SNAP), Supplemental Security Income (SSI)
[b]Youth were asked via survey "How often do you help cook family meals?" Responses were never (1), rarely (2), sometimes (3), most of the time (4), or always (5). Mean responses are above.
[c]P value determined through independent sample t-tests with sex, race, and participation in government assistance programs as independent variables and mean cooking frequency and self-efficacy as dependent variables.
[d]Youth were asked five questions via survey. Questions were administered in the format "I am sure I can [insert cooking skill]." Responses were strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), or strongly agree (5). The average means are reflected in this table.

Table 3. Variation between youths' cooking self-efficacy at baseline and lesson leaders' perceptions of youths' skill

Skill	Mean Youth Self-efficacy[a]	Mean Lesson Leaders Perceptions of Youths' Cooking Skills[b]	*p*-value[c]	t, df
Cook	3.90	2.58	p<0.001	19.74, 219
Follow a recipe	4.02	2.69	p<0.001	19.76, 215
Use a knife	4.09	1.73	p<0.001	35.48, 214
Use an oven	3.37	2.31	p<0.001	13.45, 217
Use a stovetop	3.56	2.23	p<0.001	16.95, 219

[a]Questions were administered to each youth participant in the format "I am sure I can [insert cooking skill]." Responses were strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), or strongly agree (5). The averages of these scores are reflected in this table.
[b]Questions were administered to lesson leaders and helpers in the format "I am sure my students could [insert cooking skill] at baseline." Responses were strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), or strongly agree (5). Lesson leaders rated their students overall as a group rather than as individuals. The averages of these scores are reflected in this table.
[c]*P*-values determined through one sample t-tests

cooking (p=0.822). Associations of cooking frequency and cooking self-efficacy with BMI category are outlined in Table 4.

Table 4. Associations of cooking frequency and cooking self-efficacy with dietary quality and BMI category

Variable	Cooking Frequency	Cooking Self-efficacy
BMI Category[a]	n=191	n=183
F	1.429	0.20
df	2	2
p-value	0.242	0.822
Dietary Quality[b]	n=211	n=204
r	0.314	0.031
p-value	**<0.001**	0.662

[a]Associations determined via one-way ANOVA
[b]Associations determined via Pearson's correlations

Cooking Frequency and Self-efficacy with Dietary Quality

Pearson's correlation's revealed a significant positive association between cooking frequency and dietary quality (r=0.314, p=<0.001). Youth who reported higher involvement in family meal preparation were more likely to have better dietary quality than youth who reported lower involvement. Two-way ANOVA testing showed that this association did not differ by race and sex. Pearson's correlations yielded no significant association between cooking self-efficacy and dietary quality (r=0.031, p=0.662). Results from the Pearson's correlation and two-way ANOVA testing are outlined in Table 4.

Discussion and Conclusions

Overall, results indicate that youth were only somewhat involved in home food preparation prior to commencement of the iCook-4H program. Most youth reported

sometimes helping cook family meals followed by *rarely helping cook family meals*, which is consistent with previous research with the young adult population.[47] While no association was found between cooking frequency and BMI, cooking frequency was positively associated with dietary quality. Theses findings support previous research that has also shown positive association between cooking frequency and dietary quality.[47]

As shown in previous studies, significant differences in cooking frequency were found between sexes with females reporting significantly greater cooking frequency than males.[34] While males and females were statistically different in their reported cooking frequency, the association of cooking frequency with dietary quality did not differ by gender in the two-way ANOVA testing despite previous research that has shown that females are more likely to report preparing and consuming healthy foods than are males, who are more likely to consume and utilize processed foods.[34,47]

This study is not without limitations. For one, cooking frequency was assessed somewhat subjectively. Research has shown that utilization of processed food products in cooking is associated with poorer diet and increased weight and that definitions of what constitutes cooking vary broadly.[32-34,36,37,47] Therefore, it would be important to also assess the type of "cooking." However, the question "How often do you help cook family meals" did not define the type of cooking, and interpretation was left to the participants. Since more specific measures of cooking frequency were not included in this study, this may partially explain why cooking frequency was not associated with BMI. It is possible that there might be differences in BMI category between youth who

practice more scratch-based cooking compared to youth cooking with highly processed, pre-prepared ingredients.

Additionally, youth were asked to rate often they help cook family meals on a Likert scale that did not indicate the number of times they were involved in food preparation per week. Instead, they rated themselves on a scale that ranged from never to always helping cook family meals, which could be a more subjective measure than a numerical scale. The rating used for this study would be largely based on the number of family meals offered per week. For instance, if only two family meals a week were prepared at home and a child helped with both of those meals, they would report always helping cook family meals. However, if family meals were prepared at home every day of the week and a child only helped twice, he or she would report minimal involvement in helping cook family meals. While youth would have the same numerical cooking frequency, it would appear that they have a different cooking frequency based on this scale. Lacking the ability to fully discern cooking frequency may have resulted in the failure to detect relationships between cooking frequency and BMI category. Future projects should consider the type of cooking being done and include more objective assessments of frequency to determine if varying degrees of cooking and involvement have stronger or weaker associations with diet quality and BMI.

Generally, youth had positive self-efficacy in each of the assessed cooking skills. Contrastingly, lesson leaders' perceptions of the combined ability of the students were negative. Failure to see associations between youth's self-efficacy in cooking with weight and dietary quality may be the outcome of limited self-efficacy variation. Only 24 of 181 youth, who provided data for every self-efficacy question part of the self-efficacy

score, averaged below 3 (neither agree nor disagree), falling more closely to strongly disagree and agree. Conversely 145 of 181 youth, who provided data for every self-efficacy question part of the self-efficacy score, averaged a self-efficacy score above 3 (neither agree nor disagree), falling more closely to agree and strongly agree. The limited variability among participants and the differences between youth self-efficacy and lesson leaders' perceptions indicate that objective assessment may be a better strategy to determine cooking abilities of youth than self-reported self-efficacy. Lesson leaders and youth may also have different interpretations of the questions and different criteria for assessing cooking ability based on their levels of experience. Future studies that seek to assess the relationship between cooking skills and health outcomes should consider incorporation of direct observation of youth's skills by trained research personnel rather than relying solely on self-efficacy reports. Direct observation should be done at baseline to allow individual assessment of youth in order to compare each participant's observed skill with his or her diet and weight. Due to the retrospective nature of this study, perceptions of the classes as a whole rather than of individual participants were assessed. This restricted the ability to compare observed skill with dietary quality and BMI category.

Generalizability of these results may be limited, as youth interested in participating in a cooking program may differ in cooking frequency and self-efficacy from youth who lack interest to participate. To determine cooking behaviors of the youth population at large, further research is needed outside of cooking programs. Overall, the finding that cooking frequency is positively associated with dietary quality warrants

further research to determine if encouraging home food preparation is an effective strategy to improve diet.

CHAPTER III
EXTENDED METHODS

Program Overview

iCook-4H is a multi-state research project developed by the USDA research group, the Healthy Campus Research Consortium (HCRC). The goal of the program is to improve the health of youth and their families while improving the quality and frequency of their family meals. This present study is a sub-project within the iCook-4H program. A general overview of the iCook-4H program will be described in this section to provide perspective on the context of this present study.

iCook-4H is a five-year project that has been developed and tested in Maine, Nebraska, South Dakota, Tennessee, and West Virginia with the aim of nationwide distribution. Within the first year, various committees working on iCook-4H developed the program curriculum and procedures. The first year concluded with pilot testing of the program in all five states and is described in greater detail below. The program was modified based on the results of the pilot-testing prior to the primary intervention that took place in the second year of the iCook-4H project. For the intervention-testing phase of the project, participants, who were 9-10 year old youth and their primary meal preparers, were divided into treatment and control groups. Each group underwent identical assessments pre and post intervention and one and two years post intervention. Participants enrolled in the treatment arm of the study attended six hands-on classes and access to the educational iCook-4H website that allowed participants to post videos, pictures, and comments related to healthy eating and physical activity.

Classes for treatment group participants focused on nutrition, cooking, physical activity, goal setting, and family meals and were delivered in various community venues by graduate students studying nutrition and by Cooperative Extension agents. This sub-project of iCook-4H used data collected during pre-assessments from treatment and control participants enrolled in the intervention study.

The primary researcher for this sub-project has been actively involved in the project as a whole. She worked on the curriculum committee, helping develop the curriculum for the pilot study and to modify the curriculum and assessment tools for the intervention study. The primary researcher also served as lesson leader, teaching classes for the pilot and the intervention studies. Additionally, she was involved in recruitment and assessments of participants and helped supervise the intervention in Tennessee. The following sections will outline the pilot testing process, the study design of this sub-project, recruitment procedures, data collection, and statistical analyses.

Pilot Testing

Committees within the iCook-4H program worked to develop the pilot curriculum, assessment tools, and implementation procedures from Spring 2012 through Summer 2012. Committees included Measurement and Publications, Curriculum, Website/Technology, Recruitment, Process/Program Evaluation, and Dissemination. Researchers communicated weekly through emails and conference calls and annually through in person meetings. The intervention and assessment methods were pilot tested in Fall 2012 with a total of 60 youth and adult dyads in the aforementioned states.

The intervention and assessment methods were refined prior to the full intervention administered in Fall 2013 and are described in greater detail bellow.

Study Design

The aim of this thesis project was to identify the associations between cooking self-efficacy and cooking frequency with dietary quality and BMI of 9-10 year old youth. As stated, this cross-sectional study used baseline assessment data collected prior to the start of the intervention from treatment and control participants enrolled in the Fall 2013 iCook-4H food and fitness study in Maine, Nebraska, South Dakota, Tennessee, and West Virginia. Because this project analyzed only pre-intervention data, control and treatment group data were treated as one singular data source.

Recruitment

In order to have far reach into the targeted communities, recruitment for the iCook-4H program was done with a variety of strategies by numerous individuals. Recruitment was carried out by Cooperative Extension agents who worked in the communities and would be teaching the classes, by primary investigators, by undergraduate and graduate research assistants, and by community stakeholders, such as church leaders, after school program coordinators, and local school officials. Participants were recruited from elementary schools; local community outlets like pools, libraries, churches, festivals and community events, and grocery stores; and child care programs like the Boys and Girls Clubs of America, the YWCA and YMCA, after school programs, and summer camps.

Recruitment methods involved multiple strategies. Flyers (Appendix A) and magnets were hung in prominent community locations and distributed to families through the outlets described above. Emails were distributed through various electronic mailing lists (EML), such as those of homeschool programs, 4-H programs, and churches. Short cooking demonstrations were also conducted with children at the aforementioned outlets, and representatives from the iCook-4H program attended meetings with various community leaders and members to discuss and promote the program. Information about the study was also distributed through community news outlets, including newspapers, online media, and television. Recruitment strategies and messaging were guided through scripts and sample print materials found in the iCook Study Manual (Appendix B). Contact information was collected from those who indicated interest in the program in person, via email, or over the phone. These individuals were later contacted via phone or in person to confirm that they met the eligibility criteria.

Eligibility Criteria

In order to be eligible for the program, participants had to meet each of the eligibility criteria. Selection of eligibility criteria was based on factors that would facilitate participation in the larger iCook-4H study. Youth had to turn 9 years old before July 28, 2013 and could not turn 11 years old before January 1, 2014. If in the treatment arm of the study, the adult primary meal preparer had to be able to attend each of the six classes with the youth participant. Both adults and youth participants had to be free of food allergies and activity-related medical restrictions that would limit their participation

in a face-to-face nutrition and fitness program, and dyads had to have Internet access at home. Finally, participants in both arms had to consume a diet that allows for the intake of meat and dairy products, as vegetarian options were not offered in every class. If they met the criteria, informed consent and assent were collected at the pre-assessment prior to data collection (Appendix C).

Measures and Data Collection

Cooking Skills and Frequency Measures

Questions to assess cooking skills for the pilot testing were developed by nutrition experts working on the project. Skills included measuring ingredients, using a grater, using a vegetable peeler, using a colander, baking chicken, and wash and cut up fruits. These cooking skills were chosen because they related to specific skills the program curriculum aimed to address. Two questions were asked to assess both independent ability and ability with help for each skill: “Can you specified skill by yourself” and “Can you specified skill with help from someone else?” Participants rated themselves on a five-point scale ranging from never (1) to always (5).

As the curriculum was modified following the pilot study, the skills measured by the assessment tool were adapted to fit with the modified cooking skill competencies covered in the curriculum. After pilot testing, it was recognized that questions were not delivered in a way as to assess self-efficacy, but self-efficacy is an important measure to predict the likelihood of a behavior.[52] As a result, members of the research team modified the questions to better assess cooking self-efficacy. These new questions were based on expert input and on a validated survey developed for adults.[50] In

accordance with validated self-efficacy questionnaires for youth developed by Baranowski and colleagues, question wording was formatted to be more appropriate for the cognitive level iCook-4H youth participants.[51]

The primary researcher conducted cognitive interviews with eight youth (four male and four female) in Knoxville, Tennessee to test the understanding of the meanings of the modified questions. The researcher had undergone previous cognitive interviewing training for two other projects also conducted by the HCRC. One of these projects was with college age students, and the other was with children also 9-10 years of age. The researcher conducted interviews with one child at a time and had the child read the question to him or herself. The child was then asked to say in his or her own words what the question was asking. Youth were also asked if they thought there should be any changes made to the wording of each question after the researcher explained what the question was intending to measure.

The researcher recorded the answer given by each child for each question on a premade, printed document (Appendix D). Responses were entered in a Microsoft Excel document. The research team then coded responses as adequately restating the intended meaning or inadequately restating intended meaning. These results informed the selection of questions used for the cooking self-efficacy score described below.

Five questions were included for the self-efficacy score delivered in the format of "I am sure I can [insert cooking skill]." Skills were: cooking, following a recipe, using a knife, using an oven, and using a stovetop. Participants ranked each question on a 5-point Likert as strongly disagree (5), disagree (4), neither agree nor disagree (3), agree (2), or strongly agree (1). Responses were reverse coded for each question (strongly

disagree=5, strongly agree=1) and were averaged for an overall self-efficacy score for each participant. Cooking frequency was assessed through a single question ("How often do you help cook family meals?") that was rated on a 5.0 Likert scale as never (1), rarely (2), sometimes (3), most of the time (4), or always (5). All questions associated with these measures were asked through the program evaluation that was administered via Qualtrics survey software. Data collection and descriptive statistic procedures for cooking self-efficacy and skills are outlined in Figure 1.

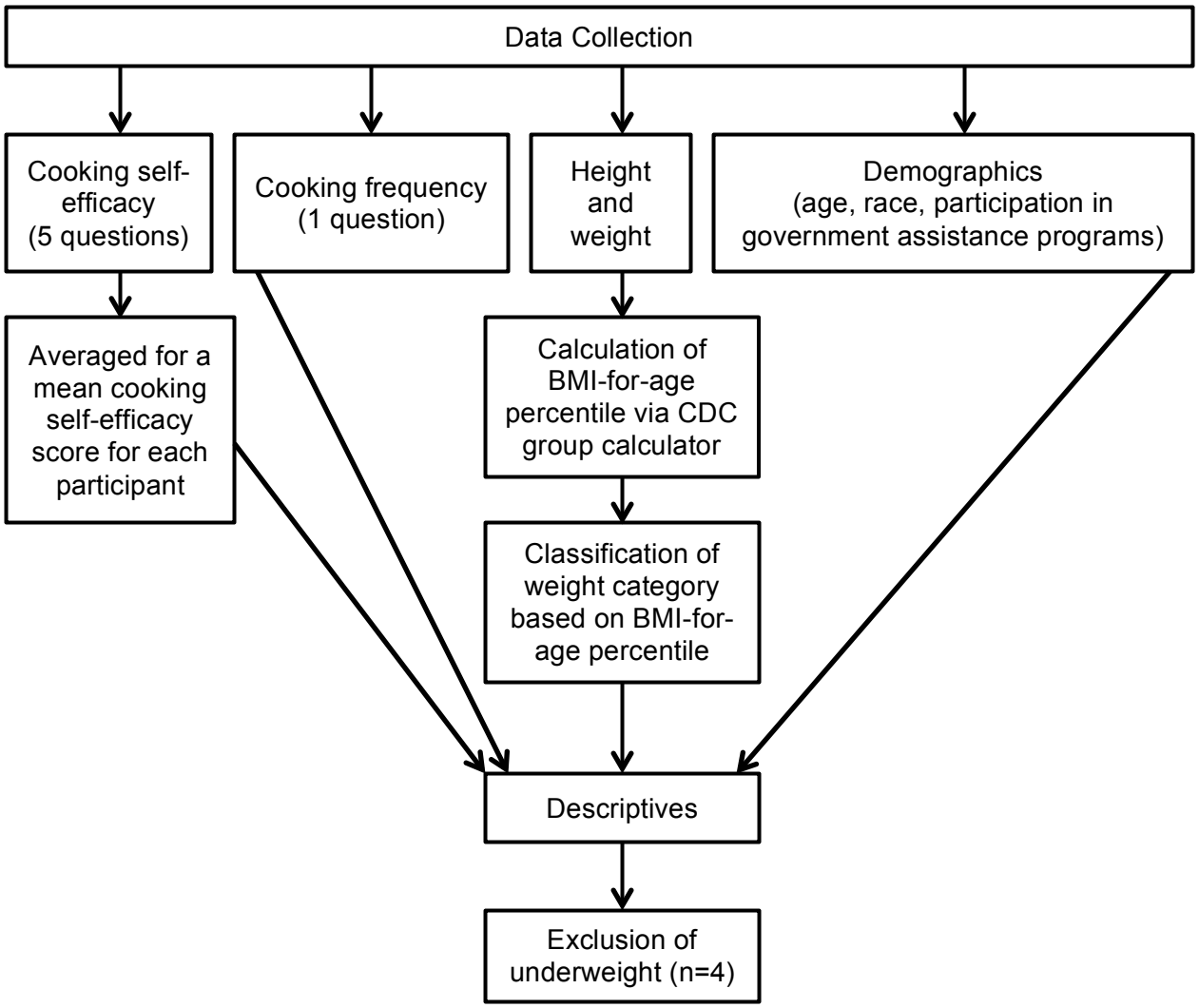

Figure 1. Data collection and descriptive statistics procedures.

Lesson Leader Perceptions

Researchers who observed youth at baseline found preliminary analysis of youth's reported cooking self-efficacy as being higher than their own perceptions of youth's skill-level. To further test if self-efficacy reports from youth were higher than perceived skill by experts, an online survey was administered via email iCook-4H lesson leaders and helpers who had direct observation of intervention participants at baseline. iCook-4H lesson leaders and helpers were nutrition graduate student researchers and Cooperative Extension agents with backgrounds in teaching cooking.

The questions that examined lesson leaders' and helpers' perceptions of youth's cooking skills assessed the same skills included in the self-efficacy questions administered to youth (cook, follow a recipe, use a knife, use and oven, use a stovetop). Rather than being in the format administered to youth of "I am sure I can [insert cooking skill]," lesson leaders were asked, "I am sure my students could [insert cooking skill] at baseline." Lesson leaders and helpers rated each question on the same 5-point Likert scale as strongly disagree (5), disagree (4), neither agree nor disagree (3), agree (2), or strongly agree (1), and responses were reverse coded for each question (strongly disagree=5, strongly agree=1). The full survey administered to lesson leaders and helpers can be found in Appendix F. Due to the retrospective nature of the lesson leader assessment, lesson leaders and helpers were asked about their perceptions of their classes as a whole rather than of individual students, as they did not observe and formally assess each student individually at baseline. Scores for each skill were averaged among the lesson leaders.

Dietary Quality

Dietary intake was assessed using the electronic format of NutritionQuest's Block Food Frequency Questionnaire (FFQ) that was accessed at https://www.nutritionquest.com/login/. Block FFQ was first developed in 1982 through the National Cancer Institute.[53] Since that time, these questionnaires have been validated for numerous populations and have been employed by an excess of 700 public heath and research groups throughout the United States.[54] These questionnaires are continuously updated in accordance with emerging research and recommendations.[54]

Methods for scoring dietary intake records and determining dietary quality were modified from procedures used as part of the Healthy Eating Index (HEI) scoring system.[55] The HEI determines dietary quality based on compliance with the Dietary Guidelines for Americans.[55] This scoring system has been widely used and tested at a national level to assess compliance with national guidelines and changes in compliance for both youth and adults.[55]

The original HEI was based on the 2005 Dietary Guidelines for Americans.[55] As part of this scoring system, nine components deemed beneficial for a healthy diet are scored in ascending order with increased intake. The maximum score for these components is granted if intake is greater than or equal to the recommended intake level. Three diet components are scored in descending order with increased intake. The maximum score for these components is granted if intake is less than or equal to the recommended maximum intake level. Scores from each of the 12 diet components are added to reflect an overall score with a maximum score of 100.

The most recent HEI was developed to reflect recommendations from the 2010 Dietary Guidelines for Americans and was modified by an expert workgroup made up of members from the USDA Center for Nutrition Policy and Promotion (CNPP) and the National Cancer Institute.[55,56] The 2010 HEI shares many similarities with the 2005 tool, such as nine beneficial components and three restricted components which many components being the same between tools. For both tools, the maximum score is 100 points with each diet component ranging from 0, meaning non-compliance with guidelines, to the maximum score of usually 5, 10, or 20, meaning compliance with guidelines. Ratio scores for dietary intake levels that range from complete non-compliance to complete compliance are assigned to give specific intake scores. Methods of development of the HEI are described in greater detail elsewhere.[55]

For this study, similar procedures and diet components were used to create a dietary quality scoring system based on data at hand. Dietary quality was scored based compliance with the Dietary Guidelines for Americans' recommended daily levels of protein, diary, whole grains, fruits, vegetables, and empty calories for age and gender,[57] using methods adapted from the 2005 and 2010 Healthy Eating Indexes (HEI).[55] A comparison of the 2005 and 2010 HEIs and the system used for this project can be found in Appendix E. The maximum score for this project was 70 points.

Anthropometrics

Anthropometric measurements of youth, including height and weight, were collected by research assistants, who had undergone inter-rater reliability (IRR) training. For height, participants removed their shoes and hair ornaments, buns, or barrettes that would prevent the participant from placing his/her head against the back of the

stadiometer. Youth were asked to step completely under the slide of the stadiometer and to stand as straight as possible with feet together and heels, buttock, shoulder blades, and back of the head completely touching the back of the stadiometer. The subjects looked straight ahead so that the Frankfurt Plane was horizontal. Youth were asked to take a deep breath and the slide was placed atop their head. Height was recorded to the nearest 0.1 centimeter, and two measurements were taken. If there was greater than a 0.2 centimeter difference between the two measurements, more height measurements were taken until two measurements were within 0.2 centimeter. The two height measurements were averaged together for the final recorded measurement.

In order to take the weight measurement, the scale was placed on a hard, flat surface and zeroed. During the two-hour assessment period, participants refrained from eating or drinking prior to having their weight collected. Youth were asked to remove excess clothing, shoes, and socks prior to being weighed. They stepped fully on the scale with both feet, and researchers recorded their weight to the nearest 0.1 kg. If there was more than a 0.2 kg difference between the two measurements, more weight measurements were taken until two measurements were within 0.2 kg. The two weight measurements were averaged together for the final recorded measurement.

These measurements along with age were used to calculate youth's BMI-for-age percentile ranking in accordance with Centers for Disease Control and Prevention (CDC) growth charts. The Children's BMI Tool for Schools Group Calculator was used to calculate BMI-for-age percentile for each youth participant. This tool, which can be found at

http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/tool_for_schools.html

allows for gender, age, height, and weight to be entered into an Excel spreadsheet that calculated BMI-for-age percentile for each youth participant. This percentile allows for weight category to be determined for each participant as underweight (less than the 5th percentile), healthy weight (5th percentile to less than the 85th percentile), overweight (85th to less than the 95th percentile), or obese (equal to or greater than the 95th percentile). Anthropometric data collection and descriptive statistic procedures are shown in Figure 1.

Statistical Analysis

All analyses were performed using SPSS version 22.0 and our outlined in Figure 2 and Figure 3. Cronbach's alpha was calculated to determine the internal reliability of the questions used to develop the self-efficacy score, and descriptive statistics were then completed. Mean cooking self-efficacy scores and frequencies for cooking frequency responses were calculated in addition to frequencies for weight categories (underweight, healthy weight, overweight, obese), sex (male, female), race (white, non-white), and participation in government assistance programs (yes, no) (Figure 1). Due to the small sample of underweight participants (n=4), underweight participants were excluded from further analyses. To determine if there were significant differences in cooking self-efficacy and frequency by certain characteristics, independent sample t-test were performed. Independent sample t-tests were performed for independent variables race (white or non-white), sex (male or female), and participation in government assistance programs (yes or no) with dependent variables cooking

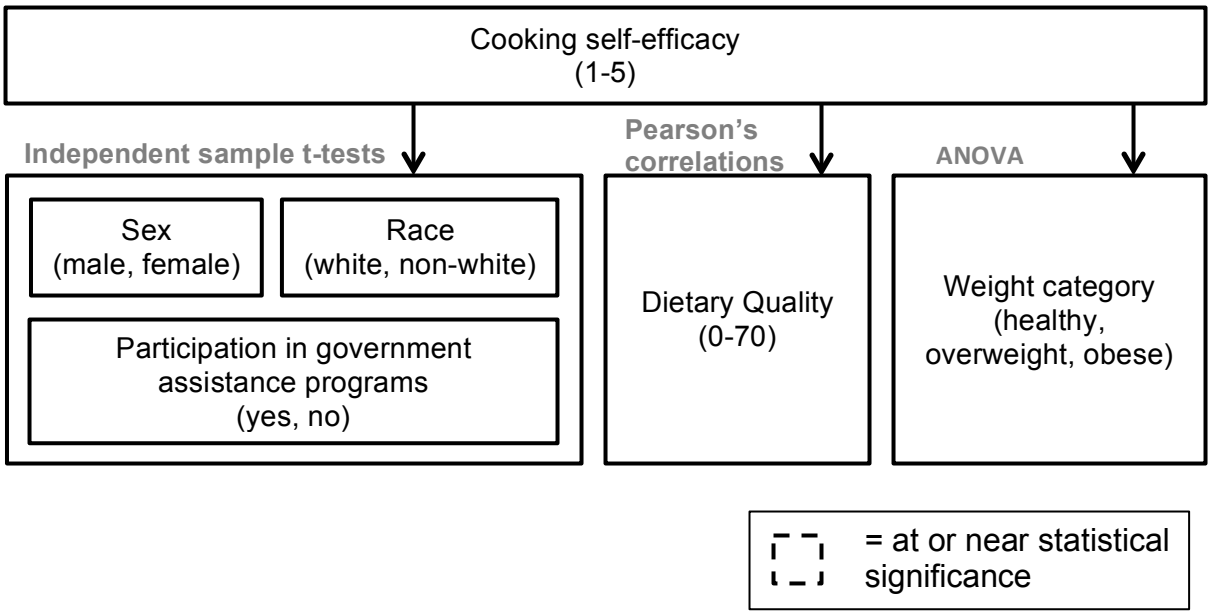

Figure 2. Statistical procedures for cooking self-efficacy.

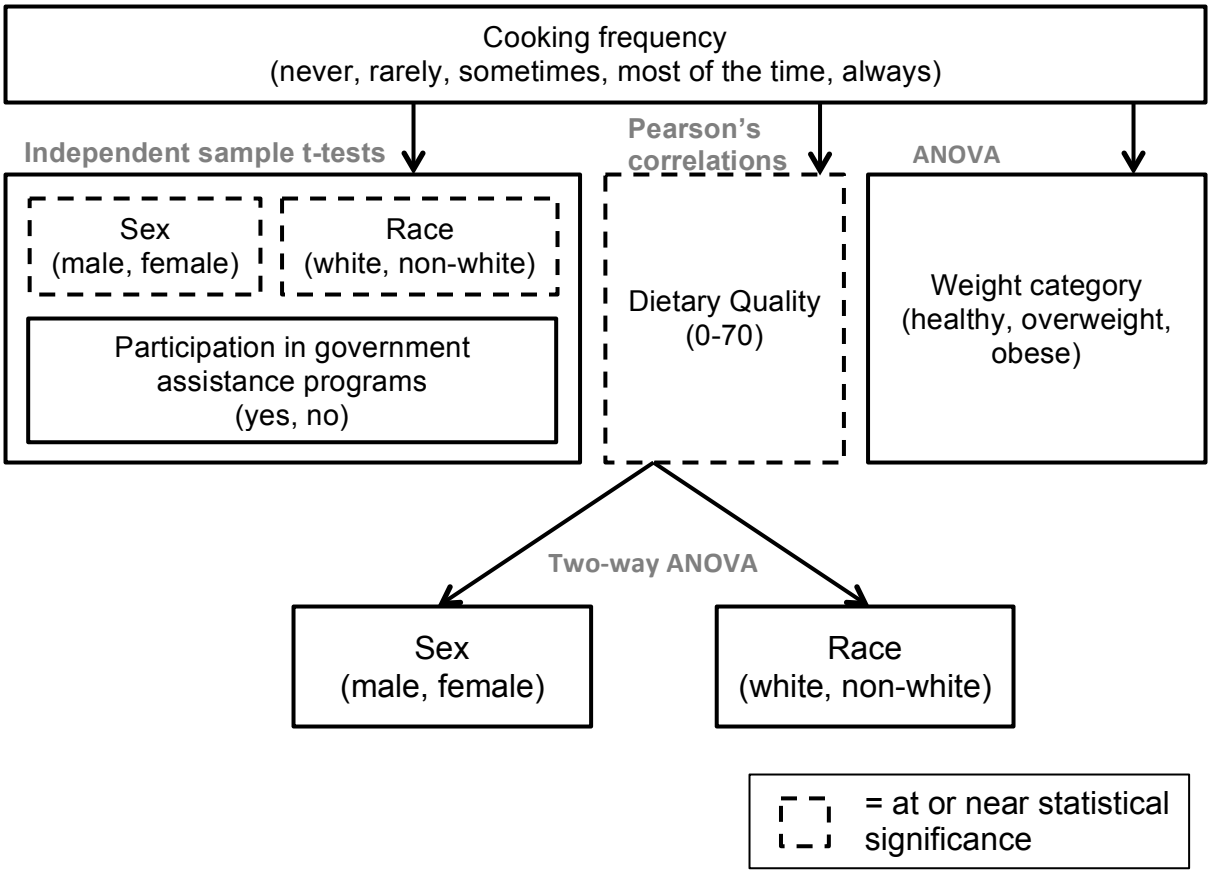

Figure 3. Statistical procedures for cooking frequency.

self-efficacy and frequency Figures 2 and 3. Analyses were then conducted to determine how cooking self-efficacy and frequency related to weight and diet. To determine the association between cooking self-efficacy and weight category and between cooking frequency and weight category, analysis of variance (ANOVA) was used with weight serving as the independent variable. Because no associations were noted between cooking self-efficacy mean with diet or with weight, no further analyses were completed for self-efficacy. Associations between cooking frequency and dietary quality and between cooking self-efficacy and dietary quality were examined through calculation of Pearson's correlations Figures 2 and 3. Because statistical significance was seen for association between cooking frequency and dietary quality, two-way ANOVA was used to test this relationship by sex and by race, as in the independent sample t-tests.

Because the self-efficacy measure for youth was done on an individual basis and because lesson leaders and helpers reported their perceptions for their whole class as a group rather than for each individual student, one-sample t-tests were used to compare the means between youth and lesson leaders. Self-efficacy ratings from youth were averaged for each cooking skill, and ratings from lesson leaders and helpers were averaged for each cooking skill. Differences for each skill between the youth mean and the lesson leader and helper mean were assessed through one-sample t-tests.

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APPENDIX

Appendix A: Sample iCook-4H Recruitment Flyers

Are you 9 or 10 years old?

You are invited to be in the iCook 4-H Food & Fitness Control Study

It's about eating well and being physically active so you grow strong and healthy

Starting late August
Do not have to be a current 4-H member
9 & 10 year old youth and meal-preparing adult
Receive $80 for participating 4 days over a 2-year period

Families will have blood pressure taken and complete surveys and youth will have physical measurements taken 4 times over the next 2 years.

To participate, youth and adults will meet a total of four times during a two-year period. Each time will take around an hour. Both youth and adults will receive a $10 gift card each time they participate.

Space is limited! Call (865) 974-2855 or email icook4h@utk.edu if interested!

Receive $20 for one hour of your time!

When? Saturday, Sept. 21st @ any time from 10 am-3:30 pm

or

Sunday, Sept. 22nd @ any time from 2-3:30 pm

Where? Eternal Life Harvest Center 1801 Western Ave.

Who? 9 or 10 year old youth and meal-preparing adult

Call (865) 974-2855 or email iCook4H@utk.edu

Youth and adult will have blood pressure taken and complete surveys and youth will have physical measurements assessed. The iCook study is about eating well and being physically active so kids grow strong and healthy.

Appendix B: Recruitment Methods outlined in the iCook-4H Study Manual

ELIGIBILITY CRITERIA

Recruiting for the project includes selecting a convenience sample of family dyads of 9-10 year old youth and the primary adult meal preparer (n=200) according to the following inclusion criteria:

- Child age 9 or10 years
  - Focus on 9 year old children
  - Youth in 3rd grade classes
    - As long as child will be 9 before July 28 they are eligible
  - After 3rd grade classes go to fourth grade classes
    - They must not turn 11 before January 1, 2014
- Primary adult meal preparer
- Free from food allergies and/or activity-related medical restrictions that would prevent participation in a face-to-face nutrition and fitness program
- Access to computer with internet connection in the home
- Only one participant per family (no twins, triplets, brother, sister to participate in lessons)
- Eat meat and dairy, as vegetarian options may not be available

RECRUITMENT METHODS

Recruitment at each of the sites will use any of the following methods to recruit a convenience sample

4-H

Nutrition Educators and/or Nutrition Associates will work with their local 4-H agency.

- Emails should be sent through 4-H listservs
- Email a copy of the flyers or provide copies of the flyer to 4-H leaders to hand out to youth and adults
- Posters should be given to 4-H leaders to put up in the community
- Verbal recruitment from 4-H leaders should occur in current 4-H programs, other community meetings, and individual contacts
- Emails with flyers attached should be distributed to other Extension Staff
- Informational news releases in Cooperative Extension publications

Local Schools

Nutrition Educators and/or Nutrition Associates must submit any needed paperwork obtaining permission to recruit in the schools.

- Flyers should be given to teachers to give to children in fourth and fifth grade classrooms.
- Visits to classrooms, school meetings, school events with the distribution of flyers as allowed.

Community
Nutrition Educators and/or Nutrition Associates and/or students can make additional contact by:

- Googling after-school and summer camp programs, pediatricians offices, churches, and community agencies (health departments, Boys and Girls clubs, YMCA, etc)
- Call identified programs and make arrangements to speak with youth, post posters, and provide take home flyers.
- Visit programs and distribute information as allowed.
    - Host informational tables at community family-oriented events (health fairs, fairs, sporting events, etc).
    - Place news releases/announcements in local newspapers.
    - Provide interviews on local television about the program.
    - Send e-mail messages through community agencies, churches, and social network sites.
    - Put posters up in community locations (grocery stores, parks, etc)

Timeline	
Task	Date
Start Recruiting	April 30, 2013
As Recruiting	• Email CC Recruitment Information Form Each Friday • CC will send biweekly messages to recruiters with number of people recruited • CC will let recruiters know when we have reached our recruitment goal
End Recruitment	July 19, 2013
Absolute Deadline	August 3, 2013

Blitz Components

- Release information to local media (Newspaper, radio, and TV)
- Send out emails
- Place posters in identified community locations
- Visit community locals, schools, and programs
- Distribute flyers

Recruitment Materials
PIs or campus coordinators at each state will need to fill in state-specific information before printing or distributing materials. When posting flyers, tear off a few of the perforated tabs from the flyers so it looks like other have already taken the website address.

How will you know when recruitment efforts can stop?
Campus coordinators are the control point for determining state-specific quotas have been reached. Recruiters and campus coordinators should be in constant contact during the recruitment phase updating each other using the provided iCook Participant Recruitment Records form.

Campus coordinators are to inform the recruiters when the study has 200 recruited participants. At that point, all additional potential participants (i.e., names are on list) are to be called by the campus coordinator and informed that the study is full. Names on a "waitlist" should be continued to be collected and maintained until after all assessments have been completed.

Script for In-person Adult Recruitment:

My name is name and I am working with Researcher's name from the Department name from the University of University name to offer a new 4-H program, called iCook 4-H for 9-10 year old children. It's a 4-H program and also a research project to study how to help kids make healthy choices about what they eat and how physically active they are.

Because it is a research study, we will askall families to complete some surveys; have your blood pressure measured; and have your child's height, weight, waist and blood pressure measurements taken four different times over two years. We would also ask some children to wear a monitor to measure physical activity for 1 week at some of the assessment times. You and your child would each get $10 at each assessment. The total amount your family could receive for participating in all four assessments would be $80.

You may be selected to participate in a series of six, two hour lessons focused on culinary skills, family meals, physical activity and goal setting. The classes will be from August until November 2013.

If you decide to be in the iCook research study, you would be helping us to learn more about how to help our children be smart in the kitchen and have healthy, active lifestyles in the future.

To participate:

- You must be at least 18
- Have a child between 9-10 years old,
- Have access to computer with internet connection in the home,
- Be free from food allergies and/or activity-related medical restrictions that would prevent being in a food and fitness program
- Eat meat and dairy, as vegetarian options may not be
- Only one child participant per family may participate (no twins, triplets, other brothers or sisters may participate in lessons).

If you are interested in iCook, please give me your contact information today. I would like to share your phone number another member of our team at the University of _____ who call you with details about the project. I have a flyer and additional handout with information for you to take home. If you are not sure today, you can call the number on the flyer after talking with your child. There are a limited number of spots available, so please respond quickly if you are interested.

Script for In-person Child Recruitment: 2013 Study
My name is _____ and I am with the University of _____ and I am here to tell you about a project called iCook 4-H that we are offering youth, like you who are 9-10 years old and your parents.

It's about helping make choices about what you eat and how physically active you are so that you will grow strong and have a healthy life.

- **It's a 4-H program and also a research project**
- We would be starting this fall and we would get to see how you grow over 2 years
- You would be asked to answer some questions about your cooking skills and family meals
- We will measure your height, weight and waist
- You and your parent will each get $10 each time you answer the questions and have your measurements taken (like your height and weight).

We will have 2 groups in the project. One group will only answer the questions and be measured four different times. The other group will answer the questions and be measured four times but will also participate in six cooking classes with their parents this fall and have online activities on the iCook website.

To be in iCook, you must be between 9-10 years old and have your parent's permission.

If you want to be in iCook, you will be in an important project because you will be helping to see how a project with children and parents working together and focused on healthful eating and physical activity can help children be strong and healthy.

To be in iCook, please take this flyer and letter home to your parents to see if they are interested and ask them to call the number on the flyer to register you.

Email/letter to Community Agency, Church, or Other Organization

Dear Organization Representative's name,

We are enrolling children ages 9-10 years old and the adult that cooks most of the child's meals in a special 4-H cooking program. This is an IRB-approved study (iCook 4-H). The 4-H approach to "learn by doing" is at the heart of this project. Youth, 9-10

years old, will learn the importance of a healthful lifestyle by doing activities that contribute to good health. Through the iCook program and website, youth will collaborate with their primary meal preparer to develop cooking skills and increase and enhance family mealtime and activity.

The purpose of this letter is to request your permission for us to recruit in your organization. Enclosed is a copy of the informational flyer a copy of some frequently asked questions about iCook 4-H.

The objective of this study is to test whether a 24-month study, based on increasing culinary skills, family meals and physical can positively impact weight in children. We intend to enroll the sample of 200 participants in name of state. Targeting the children through your organization is one way we hope to reach our recruitment goal.

Would it be possible for us to inform parents and children about this study in one of the following ways by date?

- Distribution of an informational flyer to children for them to take home, AND/OR
- Come in to briefly (5 minutes) speak with the children, AND/OR
- Attend events to speak with parents and distribute flyers

I appreciate your consideration of this request. Please contact me by email or phone to let me know if I may recruit through your organization.

Sincerely,
(name),
(email)
(phone number)

Example County Schools Permission Document from UT:

1. Principal Investigator: Dr. Sarah Colby
Email Address: scolby1@utk.edu
Mailing Address: 1215 W. Cumberland Ave
229 Jessie Harris Building
Knoxville, TN 37996

Graduate Research Assistant: Kelsey Shanklin
Email Address: kelseyshanklin@gmail.com
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3. Position of Principal Investigator:
Assistant Professor of Public Health Nutrition
University of Tennessee, Knoxville

4. Name of Principal Investigator's Instructor: N/A (PI is Dr. Sarah Colby)

5. Title of Proposed Study: iCook-4H

6. Description of Study
The 4-H approach to "learn by doing" is at the heart of this project. Youth, 9-10 years old, will learn the importance of a healthful lifestyle by doing activities that contribute to good health. Through the iCook 4-H program youth will collaborate with their primary meal preparer to develop cooking skills and increase and enhance family mealtimes and physical activity. Culinary skills and physical activity of youth will be increased to help prevent childhood obesity.

a.) Purpose for data- Data collected through iCook-4H will be used for publications and national presentations

b.) Targeted population- One hundred 9-10 year olds and their adult primary meal preparer (Dyads). Targeted recruitment in Knox County Schools- 4th and 5th graders.

c.) Data collection procedures-
Recruitment in Knox County Schools- Flyers would be given to teachers to give to children in fourth and fifth grade classrooms. Visits by researchers to classrooms, school meetings, school events with the distribution of flyers as allowed.

Fifty of the 100 Dyads will be randomly assigned to be in a control group. The control group participants will participate in research assessments at 0, 4, 12, and 24 months. Outcome measures for youth include physical measurements (blood pressure, height, weight, and waist circumference), physical activity, diet quality, cooking knowledge, family meal characteristics, and quality of life. Accelerometer data will be gathered on 25% of youth. Adults will be asked to complete surveys on physical activity, diet, cooking, and family meals and have blood pressure measurements assessed. The remaining 50 Dyads will be assigned to be in the treatment group. The treatment group will also be assessed at 0, 4, 12, and 24 months with the same outcome (physical measurements, physical activity, diet quality, cooking knowledge, family meal characteristics, and quality of life). Accelerometer data will be gathered on 25% of youth. Adults will be asked to complete surveys on physical activity, diet, cooking, and family meals and have blood pressure measurements assessed.

d.) Time requirements-
Time requirements related to recruitment in Knox County Schools- 5-10 minutes to distribute flyers to children in fourth and fifth grade classrooms. 5-15 minute visits by researchers to classrooms, school meetings, school events with the distribution of flyers as allowed.

Time requirements for participants in study- Four assessment points, approximately one hour per assessment point, will require a total of 4 hours of participants' time over a two year time period. In addition to assessments, the Dyads in the treatment group will also be asked to participate in six 4-H cooking classes (two hours each lesson) that will include a focus on physical activity, family mealtimes, and preparation and sampling of recipes for a total of 12 hours per intervention participant. In addition, youth in the treatment group will be asked to create and upload cooking demonstration videos to the iCook-4H website. Time required for this activity will vary by participant. The website is a secure website accessible to iCook participants only. The iCook-4H project is being conducted in 5 states, Tennessee, West Virginia, Maine, South Dakota, and Nebraska, as part of a large multi-state USDA funded research project. After the 6 cooking lessons, treatment group youth will be asked to visit the interactive 4-H cooking website for 2 years. The website includes nutrition and physical activity games, healthy recipes, and a chat forum that will be managed by a team of researchers. Time required for this activity will vary by participant.

e.) Statement of confidentiality- All information that is provided is confidential. The participants will be seen by some of the recruiters, the educators and the researchers. All data collected will be kept on the researcher's password protected computer for up to eight years and in the Nutrition Laboratory for up to eight years and then destroyed.

Website data collection and educational intervention will be password protected. The participant created videos will be viewed on the password protected website. Participants will be asked to not share their website login information with any other people. Participant contact information will be requested for payment purposes and for contacting them for follow up assessments. This information will be destroyed once they are paid at the end of the study. All data will be reported in summary format and no names will be used.

f.) Projected benefit to Knox County- Participants will gain knowledge and experience to improve culinary skills, child feeding practices, family meal times, and physical activity. Participation in this study will help to assist in creating healthier habits for children.

Children will receive $10 for participation in each assessment point (at 0, 4, 12, and 24) for a total of $40.

Adults will receive $10 for participation in each assessment point (at 0, 4, 12, and 24) for a total of $40.

Dyads in the intervention group will receive $10 at each of the 6 lessons to support intervention specific costs (e.g. travel) for a total of $60.

7. Single copies of all questionnaires, surveys, tests, answer sheets, structured interviews, or other instruments that will be used by Knox County participants. Each instrument needs to contain a statement indicating that all responses are voluntary. See Appendices

8. Single copies of cover letters, copies of instructions, parent permission statements (for voluntary student participation). See Appendices

9. Approximate proposed times for the beginning and end of the study: Grant funded 08-01-12 to 07-31-17. Recruitment through Knox County Schools- upon approval until 8-15-13.

Recruitment Flyer Information-

Youth, aged 9 and 10, and the adult who prepares most meals in the home are invited to take part in a 4-H Food and Fitness research study. It's a special offering and youth do not have to be current 4-H members to be part of the program.

The program purpose is to learn about food and physical activity habits of youth to help them grow strong and have healthy lives.

Together, youth and adult family members will receive up to $80 for being in the 2 yearlong study, which starts in late August.

Some families will be asked to attend 4-H cooking classes this fall. All families will have blood pressure taken and complete surveys on cooking, eating, and physical activity 4 times over the next 2 years. Youth will also have physical measurements taken. To participate, youth and adults will need to:

- Be free from food allergies and/or activity-related medical restrictions that would prevent being in a face-to-face food and fitness program
- Eat meat and dairy, as vegetarian options may not be available in the food and fitness program.
- Have a computer at home with Internet

Space is limited, so please call _____ as soon as possible if you are interested or have questions. Only one youth and one adult per family may be in the study.

Registration Phone Call

Once the 4H staff provide names and contact information for recruits, the CC will call them and review the informed consent, confirm interest, and make an appointment for the parent and child to be (physical and online). (Refer to following Scripts)

Script for Campus Coordinator. Use when calling the name of a potential participant, given to the campus coordinator by the Extension Recruiter.
(Participant Contact and Appointment Sheet Appendix R)

**NOTE: Before starting this call all participants should already be randomly assigned using the randomization protocols.

Name of recruit_____

Hello, _____. My name is name from the University name and I am working with Extension partner and she/he told me that you are interested in the iCook-4H project. Is this a good time to talk to you about the project. If not, when would be a good time to call again.
_____enter time for another call.

If yes, continue.

Would you prefer to participate in the Orono or Ellsworth area?

_____ (put on google drive randomization list as appropriate before going further)

Just confirming, our requirements for the project. (must check yes for each item)
YES
_____ you are at least 18
_____your child is between 9-10
_____you prepare most of the family meals
_____you have a computer at home with Internet
_____eat meat and dairy
_____you can participate in iCook activities between Late August and Thanksgiving

If no to any of the above, say, I am sorry but you are not eligible for our study. Thank you for your interest in our work. Good-bye

Continue if meet eligibility.

iCook is a 4-H program and also a research project to study how to help kids make better choices about what they eat and how physically active they are to

strengthen their growth and development so they will have healthful lifestyles now and in the future.

For Treatment Participants
You have been randomly chosen to participate in iCook Classes. The unique aspect is that it is designed for both the child and the parent to participate together. You will be able to cook and take some food home. The focus is on being active together through cooking and eating as a family and having fun together. Your child will be given a video camera during the project to make cooking show videos of their home activities to upload on our study website. The program will start in September and last until Thanksgiving. The classes will be 2 hours long, every other week.

Because it is a study, we are asking you and your child to complete some questionnaires, about health habits and cooking skills and your child to have physical measurements taken at the beginning and end of the project. We will have you come back in August of 2014 and 2015 to complete the same surveys. We may also ask your child to wear a monitor to measure physical activity for 1 week during the study. You and your child will each get $10. In addition, you will get $10 at each session you attend. The total amount is $140.

iCook is not only about cooking and having fun with your child, you will also be helping us because there are 4H groups in 5 states all working together to learn more about helping our children be smart in the kitchen, physically strong and have healthy, active lifestyles.

Would you like to sign up for iCook and make an appointment for the assessments and schedule your class days?
_____ yes _____no

Use schedule on google drive to schedule appointment day/time.

Here is your scheduled time _____

Would you rather be called or emailed the day before as a reminder?

Enter contact_____

For Control Participants
You have been randomly chosen to participate in the survey and anthropometric measures. We are asking you and your child to complete some questionnaires, about health habits and cooking skills and your child to have physical measurements taken at the beginning and end of the project. We will have you come back in August of 2014 and 2015 to complete the same surveys. We may also ask your child to wear a monitor

to measure physical activity for 1 week during the study. You and your child will each get $10 every time you take an assessment. For the total project you will each get $40.

Would you like to sign up for iCook and make an appointment for the assessments?

_____yes _____no

Here is your scheduled time _____.

Would you rather be called or emailed the day before as a reminder?

Enter contact_____

After the registration phone call, the campus coordinator will create an account on the website for the participants. In this set up a username will be assigned. Please use the following style for creating usernames: First Initial Last Name State Number if needed (i.e. dmathewsme or dmathewsme1). More details will be explained.

Appendix C: iCook-4H Informed Consent and Assent Forms

Consent Form-Intervention Treatment Group

Thank you for your interest in the iCook Project, which is a 4-H program and a research study. Adrienne White and her team at the University of Maine, including Cooperative Extension staff, are studying health and fitness of children between 9-10 years old and the adult in their home who makes most of the food. To participate, you and your child must be free from food allergies and/or activity-related medical restriction that would prevent participation in a face-to-face food, nutrition and fitness program. We want to study you and your child over 2 years to help understand the impact of physical growth, nutrition and physical activity on health and fitness.

The purpose is to study how to help children make choices about what they eat and how physically active they are so that they will grow strong and have healthy lives.

You will be part of a 5-state study about children's nutrition and physical health. The four other researchers are at South Dakota State University, the University of Nebraska, University of Tennessee, and West Virginia University.

There will be 6 cooking classes every other week from August through November. Each cooking session will take about 2 hours and will take place at _____. In addition to the cooking sessions, you will be asked to participate in other activities that will be primarily online thorough an educational community for parents and children. The project will last for 2 years so that eating habits and physical activity can be assessed long term to see their impact on health and fitness.

What Will You Be Asked to Do?
You will be asked to have your blood pressure measured and complete a 30-minute online survey at the start of the program, and then at 4 months, 12 months and 24 months.

Sample questions for the online survey are:

- How often do you compare prices before you buy food?
- How concerned are you about your child eating too much when you are not around him or her?
- During the past 30 days, for how many days have you felt very healthy and full of energy?
- I worry about what will happen to me.

You will be asked to visit the program website regularly, at least once per week during the fall sessions, and help upload videos your child has made about cooking, being physically active and eating as a family. You will be given a login and password for security.

You will be asked to be assessed in August and November of this year and then in August of 2014 and August of 2015 to complete the 2 year study. At each assessment period we will ask you to take the 30 minute survey and have your blood pressure measured.

What will your child be asked to do?
Your child will be asked to complete a 50 minute assessment that includes 30 minutes for an online survey and 20 minutes for physical assessments (e.g. height, weight, waist circumference; blood pressure). Your child will be asked to pick the outline of a girl's/boy's body that looks most like she/he does. The reason for this assessment is because children often grow and mature very quickly between 9-10 years old and we want to measure that growth. The body outline question will be asked by an older female researcher or a male researcher for boys and a female researcher for girls. Assessments will be at the start of the program, and then at 4 months, 12 months, and 24 months.

Sample questions for the online survey your child will be asked are:

- During the past week, how many days did you eat breakfast?
- I can follow a recipe by myself (answer from agree to disagree)
- I worry about what will happen to me (answer from never to almost always)

In addition your child will be asked to make and share video clips with camera equipment provided by the program staff about themselves and your family cooking, eating, and being active together. These videos will be hosted on a private YouTube channel and will only be accessible to other people participating in the project.

During the 2-year period, your child may be asked to wear a waistband that contains an activity monitor for a week each time physical assessments are taken. This device records your child's activity (e.g., step and movement during day and night).

What will both of us be asked to do?
For the first twelve weeks you and your child will be asked to participate in 2-hour cooking sessions every other week with your child. Between sessions you and your child will be asked to cook together, participate in family meals, and be physically active.

Following the first twelve weeks, you and your child will be asked to participate for 22 months in an online community website that is developed just for this study. The website will have educational sections designed for both the adult and the child. You will be able to interact with your peer group in forums moderated by program staff. Your child will also be able to continue creating and sharing videos. Online activities can be done from home or anywhere you have an Internet connection. The site is mobile friendly.

Benefits to Participation
You will gain knowledge and experience to improve culinary skills, child feeding practices, family meal times, and physical activity. Your family's participation in this study may lead to better understanding of the role of nutrition and fitness in childhood obesity.

Risks to Participation
There is minimal risk to participating in the study, primarily due to time and inconvenience. Normal kitchen risk is possible.

Compensation
You and your child will receive $10.00 each time you complete the assessments for a total of $80.

Program Resources
You will receive $10 each time you come to one of the six cooking sessions for a total of $60. Your child will receive a video camera to shoot the requested videos on family activities around cooking, mealtime and recreation. This camera will be the child's to keep.

Confidentiality
All information that is provided is confidential and protected. All data collected will be kept on the researcher's password protected computer and in the University of Maine, Nutrition Education and Behavior Laboratory, for up to four years and then destroyed. Not identifiable information will be stored indefinitely in an electronic version accessible to the researchers who are part of the 5-state study.

Website data collection and educational intervention will be password protected. Your contact information will be requested for payment purposes and for contacting you for follow up assessments. This information will be destroyed once you are paid at the end of the study. All data will be reported in summary format and no names will be used.

Voluntary
Participation in this study is voluntary. If you choose to take part in this study, you may stop at any time. If you choose to stop you will only receive incentives for the assessments and program activities that you have completed.

CONTACT INFORMATION
Contact Adrienne White for questions about the research project at 581-3134, at the University of Maine. For questions about your rights as a study participant, contact Gayle Jones, Assistant to the Maine's Protection of Human Subjects Review Board, at 581-1498.

Your signature below indicates that you have read, understand the above information, and that you agree that you and your child will participate in the iCook-4H Research Program. You will receive a copy of this form for your records.

_____ _____
Printed Name Signature

_____
Date

_____
Your child's first and last name

Consent Form- Control Group

Thank you for your interest in the iCook Project, which is a 4-H program and a research study. Adrienne White and her team at the University of Maine, including Cooperative Extension staff, are studying health and fitness of children between 9-10 years old and the adult in their home who makes most of the food. To participate, you and your child must be free from food allergies and/or activity-related medical restriction that would prevent participation in a face-to-face food, nutrition and fitness program. We want to study you and your child over 2 years to help understand the impact of nutrition and physical activity on health and fitness.

The purpose is to study how to help children make choices about what they eat and how physically active they are so that they will grow strong and have healthy lives.

You will be part of a 5-state study about children's nutrition and physical health. The four other researchers are at South Dakota State University, the University of Nebraska, University of Tennessee, and West Virginia University. We want to study you and your child over 2 years to help understand the impact of physical growth, nutrition and physical activity on health and fitness.

What Will You Be Asked to Do?
You will be asked to have your blood pressure measured and complete a 30-minute online survey at the start of the program, and then at 4 months, 12 months and 24 months.

Sample questions for the online survey are:

- How often do you compare prices before you buy food?
- How concerned are you about your child eating too much when you are not around him or her?
- During the past 30 days, for how many days have you felt very healthy and full of energy?
- I worry about what will happen to me

What will your child be asked to do?
Your child will be asked to complete a 50 minute assessment that includes 30 minutes for an online survey and 20 minutes for physical assessments (e.g. height, weight, waist circumference; blood pressure). Your child will be asked to pick the outline of a girl's/boy's body that looks most like she/he does. The reason for this assessment is because children often grow and mature very quickly between 9-10 years old and we want to measure that growth. The body outline question will be asked by an older female researcher or a male researcher for boys and a female researcher for girls. Assessments will be at the start of the program, and then at 4 months, 12 months, and 24 months.

Sample questions for the online survey your child will be asked are:

- During the past week, how many days did you eat breakfast?

- I can follow a recipe by myself (answer from agree to disagree)
- I worry about what will happen to me (answer from never to almost always)

During the 2-year period, your child may be asked to wear a waistband that contains an activity monitor for a week each time physical assessments are taken. This device records your child's activity (e.g., step and movement during day and night).

Benefits to Participation
We will provide you and your child with your blood pressure assessment in writing within a month of each assessment period. Your family's participation in this study may lead to better understanding of the role of nutrition and fitness in childhood obesity.

Risks to Participation
There is minimal risk to participating in the study, primarily due to time and inconvenience.

Compensation
You and your child will receive $10.00 each time you complete the assessments for a total of $80.

Confidentiality
All information that is provided is confidential and protected. All data collected will be kept on the researcher's password protected computer and in the University of Maine, Nutrition Education and Behavior Laboratory, for up to four years and then destroyed. Not identifiable information will be stored indefinitely in an electronic version accessible to the researchers who are part of the 5-state study.

Your contact information will be requested for payment purposes and for contacting you for follow up assessments. This information will be destroyed once you are paid at the end of the study. All data will be reported in summary format and no names will be used.

Voluntary
Participation in this study is voluntary. If you choose to take part in this study, you may stop at any time. If you choose to stop you will only receive incentives for the assessments that you have completed.

CONTACT INFORMATION
Contact Adrienne White for questions about the research project at 581-3134, at the University of Maine. For questions about your rights as a study participant, contact Gayle Jones, Assistant to the Maine's Protection of Human Subjects Review Board, at 581-1498.

Your signature below indicates that you have read, understand the above information, and that you agree that you and your child will participate in the iCook-4H Research Program. You will receive a copy of this form for your records.

_____ _____

Printed Name Signature

_____

Date

_____

Your child's first and last name

Appendix D: Cognitive Interview Guide

Q1:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q2:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q3:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q4:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q5:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q6:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q7:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q8:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q9:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q10:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q11:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q12:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q13:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q14:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q15:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Q16:
In your own words what do you think the question is asking?

Are there any changes that you think need to be made to the way the question is worded?

Follow Up:
Are there any questions that you think we should be asking to learn more of what kind of cooking kids do and how confident they are cooking?

Appendix E: Dietary Quality Scoring System Modified from 2005 and 2010 HEI

2005 HEI Tool			
Component	Max Points	Standard for Max Score	Standard for Min Score of Zero
Adequate			
Total Fruit	5	≥0.8 cup equiv. per 1,000 kcal	No Fruit
Whole Fruit	5	≥0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables	5	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Dark Green & Orange Vegetables & Legumes	5	≥0.4 cup equiv. per 1,000 kcal	No Dark Green Vegetables, Beans, or Peas
Whole Grains	5	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Total Grains	5	≥3 oz equiv. per 1,000 kcal	No Grains
Milk	10	≥1.3 cup equiv. per 1,000 kcal	No Milk
Meat and Beans	10	≥2.5 oz equiv. per 1,000 kcal	No Meat and Beans
Oils	10	≥12 grams per 1,000 kcal	No Oils
Moderation			
Saturated Fats	10	≤7% of energy	≥15% of energy
Sodium	10	≤0.7 gram per 1,000 kcal	≥2.0 grams per 1,000 kcal
Calories from SoFAAS	20	≤10% of energy	≥50% of energy

2010 HEI Tool			
Component	Max Points	Standard for Max Score	Standard for Min Score of Zero
Adequate			
Total Fruit	5	≥0.8 cup equiv. per 1,000 kcal	No Fruit
Whole Fruit	5	≥0.4 cup equiv. per 1,000 kcal	No Whole Fruit
Total Vegetables	5	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Greens and Beans	5	≥0.2 cup equiv. per 1,000 kcal	No Dark Green Vegetables, Beans, or Peas
Whole Grains	10	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Dairy	10	≥1.3 cup equiv. per 1,000 kcal	No Dairy
Total Protein Foods	5	≥2.5 oz equiv. per 1,000 kcal	No Protein Foods
Seafood and Plant Proteins	5	≥0.8 oz equiv. per 1,000 kcal	No Seafood or Plant Proteins
Fatty Acids	10	(PUFAs + MUFAs)/SFAs >2.5	(PUFAs + MUFAs)/SFAs <1.2
Moderation			
Refined Grains	10	≤1.8 oz equiv. per 1,000 kcal	≥4.3 oz equiv. per 1,000 kcal
Sodium	10	≤1.1 gram per 1,000 kcal	≥2.0 grams per 1,000 kcal
Empty Calories	20	≤19% of energy	≥50% of energy

Modified Dietary Quality Tool			
Component	Max Points	Standard for Max Score	Standard for Min Score of Zero
Adequate			
Total Fruit	10	≥0.8 cup equiv. per 1,000 kcal	No Fruit
Total Vegetables	10	≥1.1 cup equiv. per 1,000 kcal	No Vegetables
Whole Grains	10	≥1.5 oz equiv. per 1,000 kcal	No Whole Grains
Dairy	10	≥1.3 cup equiv. per 1,000 kcal	No Dairy
Total Protein Foods	10	≥2.5 oz equiv. per 1,000 kcal	No Protein Foods
Moderation			
Calories from SoFAAS	20	≤10% of energy	≥50% of energy

Appendix F: iCook-4H Lesson Leader and Helper Questionnaire

1. At which iCook sessions were you present in the fall 2013 intervention?

□Session 1 □Session 2 □Session 3
□Session 4 □Session 5 □Session 4
□None

2. At which state(s)/site(s) were you present for iCook sessions in the fall 2013 intervention?

State(s):_____

Site(s): _____

3. On average, how would you rate the skill level of your students prior to instruction in Session 1?

	Strongly Disagree	Disagree	Agree nor Disagree	Agree	Strongly Agree
I am sure my students could cook.	☐	☐	☐	☐	☐
I am sure my students could follow a recipe.	☐	☐	☐	☐	☐
I am sure my students could use a knife safely.	☐	☐	☐	☐	☐
I am sure my students could use an oven.	☐	☐	☐	☐	☐
I am sure my students could use a stovetop.	☐	☐	☐	☐	☐

4. On average, how would you rate the skill level of your students at the conclusion of Session 6?

	Strongly Disagree	Disagree	Agree nor Disagree	Agree	Strongly Agree
I am sure my students can cook.	☐	☐	☐	☐	☐
I am sure my students can follow a recipe.	☐	☐	☐	☐	☐
I am sure my students can use a knife safely.	☐	☐	☐	☐	☐
I am sure my students can use an oven.	☐	☐	☐	☐	☐
I am sure my students can use a stovetop.	☐	☐	☐	☐	☐

5. On average, how much do you feel that the confidence of your students changed from the start to conclusion of the iCook program?

□Strongly declined
□Declined
□Stayed the same
□Increased
□Strongly Increased

6. What do you feel had the biggest impact on your students' cooking abilities?

7. Do you have any other comments on the cooking abilities of your youth participants at baseline?

8. Please select your gender.

□Male
□Female

9. In what age range do you fall?

□18-24
□25-35
□36-45
□46-55
□>55

10. What is/was your position in the iCook project?

□ Principal Investigator
□ Student Researcher
□ 4-H Staff/Volunteer
□ Undergraduate Student
□ Campus Coordinator
□ Lesson Leader
□ Other (please specify):

VITA

Amber Ford is originally from Dyersburg, Tennessee. She obtained her Bachelor of Science in Nutrition from the University of Tennessee in May 2013, where she also received a culinary arts certificate through The Culinary Institute at the University of Tennessee. Before graduating with her undergraduate degree, Amber received the Chancellor's Award for Extraordinary Professional Promise in Spring 2013. As a dual degree graduate student seeking a Master's of Science in Public Health Nutrition and a Master's of Public Health, she was able to continue her undergraduate research work with the multi-state, USDA funded research project iCook 4-H, which led to the development of the work for this thesis. She aided in the facilitation of the iCook-4H program in the state of Tennessee in addition to working on the curriculum committee to develop and refine the iCook-4H lessons and associated materials. Amber also played the role of *Chef iCook* for numerous educational videos for the iCook-4H website and lesson materials. During this time, Amber was able to serve as president of the Graduate Nutrition Student Association and as a graduate assistant through Maternal and Child Health Leadership Training program.