AT HOME FOOD SAFETY BEHAVIORS OF OLDER ADULTS: ASSESSING THE
INFLUENCE OF ATTITUDES, SUBJECTIVE NORMS, AND
BEHAVIORAL INTENTION

by

Cataria Davis

B.S., Alabama A&M University, 2008
M.S., University of Arkansas, 2011
M.P.H., Morgan State University, 2013

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Philosophy Degree in Education
In the field of Health Education.

Department of Public Health and Recreation
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Approved by:

Juliane Wallace, PhD, Co-Chair
Saran Donahoo, PhD, Co-Chair
Aaron Diehr, PhD
Cynthia Sims, PhD
Ruopu Li, PhD

Graduate School
Southern Illinois University Carbondale
Date of Approval
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MAJOR PROFESSOR: Dr. Juliane Wallace

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DEDICATION

When I was a little girl, my grandmother taught me the importance of giving back. She always had an open kitchen for hungry souls. I often questioned why giving and feeding people were so important. I watched her freely give to people in the community. As I grew older, I realized that helping others and giving back was necessary and something that I became very passionate about that. To my grandmother, I thank you for teaching me how to extend kindness through service. I thank you for showing me that service is sovereignty. To this end, I chose a career path in public health with a strong interest in food safety and food security, and each and every day I find joy in this journey.
ACKNOWLEDGMENTS

The acknowledgments are brief notes of appreciation for assistance given to the candidate in the research and preparation of the thesis or dissertation. This section is OPTIONAL and should be double-spaced if used in the Thesis / Dissertation.
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CHAPTER ONE

INTRODUCTION

Food safety and foodborne illness are major public health concerns in the United States today. Rapid manufacturing, or mass production, of food in factories increase the risk factors for foodborne illness. As genetically modifying food becomes more common in the food industry, the risk of foodborne illness also increases. With constant changes and modifications in food agriculture, food production, food handling, food transportation, and food preparation, the incidence of foodborne illness increases. While food goes through many processes before consumption, ingestion of toxic food is generally what causes an individual to become infected from the contaminated food (Scallan, Griffin, Anjulo, Tauxe, & Hoekstra, 2011).

Of those who are sickened or die from foodborne illness, individuals who are ages 60 and older suffer the most significant impact. However, foodborne illness is not only due to food production and genetic modification of food. Many foodborne illnesses are also due to lack of food safety knowledge. Food safety is an important element in reducing foodborne illness. In home, food safety behaviors contribute greatly to the incidence of foodborne illness (Hudson & Harwell, 2002). With proper handling, storing, and preparing food, foodborne illness is preventable. Therefore, food safety is an important topic when addressing the health needs of this population.

According to Scallan and colleagues, the United States’ burden of foodborne illness causes 3,000 deaths and 128,000 hospitalizations each year (Scallan et al., 2011). Even though the death and hospitalization rates may appear in relatively low numbers when compared to the total population of the United States, the incidence of foodborne
illness in the United States is extremely high, with more than 48 million reported and confirmed cases of foodborne illness annually (Scallan et al., 2011). These incidence rates mean that one out of six persons is infected with a foodborne illness each year (Centers for Disease Control [CDC], 2011). Out of all cases of foodborne illness in the United States, Scallan and colleagues (2011) discovered that 31 identifiable pathogens cause at least ten million of those cases. The other 38 million cases resulted from unidentifiable pathogens (Scallan et al., 2011). Contamination or cross-contamination of food by any foodborne pathogen can occur during agriculture production, facility processing, commercial transport, commercial or home storage, or restaurant and home preparation (National Center for Emerging and Zoonotic Infectious Diseases [NCEZID], 2017). Some foodborne pathogens contain natural toxins and some are naturally found in soil (NCEZID, 2017). Therefore, the best ways to decrease the risk of being infected by them are to wash and clean the food, separate food according to cooking times, cook food to the required temperature, and chill food after cooking (NCEZID, 2017). While these steps do not guarantee avoidance from all foodborne pathogens, but they may decrease the chances of a true hospital diagnosis of foodborne illness. Not only are individuals greatly affected by the incidence of foodborne illness, but healthcare and the costs associated with foodborne illness are greatly impacted (Hoffmann, 2015; Hoffmann, Batz, & Morris, 2002).

The World Health Organization’s (WHO) 2005 report shows that nearly two million people die annually from diarrheal diseases (WHO, 2007). Among those affected are older aged individuals who are more susceptible to gastrointestinal and diarrheal infections due to their weakened immunity and very low amounts of available stomach
acid, which are merely a small number of risk factors (Barkley et al., Buzby, 2002; 2016; Cates et al., 2009; Julian, Viveiros, Gosciminski, & Bandy, 2016; Kendall, Hillers, & Medeiros, 2006).

**Need for the Study**

Older adults are considered a vulnerable, or at risk, population for several reasons. Older adults’ susceptibility to foodborne illness is multifactorial (Barkley et al., 2016; Buzby, 2002). In regard to foodborne illness, their age and immunity puts them at high risk for foodborne illness. Other factors such as the medications they are taking, chronic diseases they are suffering from, and food safety behaviors at home are all attributable to their risks as well. Reportedly, individuals age 60 and older have the highest incidence rates of foodborne illness (Buzby, 2002; CDC, 2016).

There are many ailments and determinants of health to address surrounding the needs of older adults. Living at home and living independent is sometimes challenging for older adults (Fausset, Kelly, Rogers, & Fisk, 2011). The food preparation process poses the threat of foodborne illness as older adults may hold, store, and cook their food at improper temperatures (Buzby, 2002; Remig, 2009). Even after food has been left out in the danger zone for long periods of time, older adults may still cook and eat it; thus, putting themselves at risk for foodborne illness (Gettings & Kiernan, 2001; Hudson & Hartwell, 2002; Nord, 2002; Remig, 2009; Ryan, 2012). Socioeconomic status is one of the primary reasons for older adults refusing to discard adulterated foods (Darcey & Quinlan, 2011).

Likewise, socioeconomic status plays a role in preventing older adults from discarding foods (Darcey & Quinlan, 2011) that are left in the danger zone all day.
According to Darcey and Quinlan (2011), socioeconomic status is a major indicator in the choices individuals make regarding food handling, preparation, storage, and consumption. Vulnerable populations are often low-income and at risk (Darcey & Quinlan, 2011). Low socioeconomic status puts individuals at risk for foodborne illness; thus, increasing their susceptibility of foodborne illness (Darcey & Quinlan, 2011; Nord, 2002). Income determines the amount of food that an individual can afford to buy unexpired and non-soiled (Darcey & Quinlan, 2011). Income also determines whether low-income individuals can afford to and will dispose of adulterated foods in their home when necessary without having to make the hard choice of eating it anyway (Nord, 2002). When older adults are sickened from foodborne illness, with many already facing health issues, they are either hospitalized, due to severe side effects and symptoms or die due to severe consequences (Barkley et al., 2016; Cates et al., 2009).

**Purpose of the Study**

The purpose of this study is to assess the influence of attitudes and subjective norms of older adults regarding their in-home food safety practices, which in turn affect intent to practice food safety in their home. Very few programs and public health interventions focus on food safety education for older adults who prepare and cook their own meals inside of their homes (Gettings & Kiernan, 2001). Literature and pamphlets that are available through the physician’s office or community centers usually are very basic and sometimes only model the USDA’s clean, cook, separate, and chill idiom, which portrays in a four picture-symbol window (Food and Drug Administration [FDA], 2011; Partnership for Food Safety Education [PFSE], 2016).
Research Questions

This dissertation study seeks to answer the following questions:

1. What knowledge do older adults possess regarding food safety?
2. Does socioeconomic status predict food safety behavior?
3. Do subjective norms differ by gender?
4. Do attitudes towards food safety differ based on ethnicity?
5. Do subjective norms surrounding food safety behaviors predict behavioral intention with respect to proper food safety behaviors?
6. Do attitudes toward foodborne illness predict behavior intention with respect to proper food safety behaviors?
7. Is there a relationship between attitudes, subjective norms, and behavior intention?

Significance of the Study

The incidence of foodborne illness among older adults is higher than any other age group. Few studies exist that have accurately assessed the food safety knowledge and attitudes of older adults (Remig, 2009). The researcher found no studies assessing the attitudes, subjective norms, and behavior attention of older adults in relation to their food safety behaviors. According to Cates and colleagues (2009), over time, the foodborne pathogens that commonly occur will change, which is the case for many older adults. Therefore, it is necessary to thoroughly assess and monitor these pathogens.

The Foodborne Diseases Active Surveillance Network (FoodNet) by the CDC works to monitor and track foodborne illness. However, it only actively tracks nine specific pathogens. These pathogens are: *Salmonella, Campylobacter, E. coli O157:H7,*
Shigella, Listeria, Yersinia, Cryptosporidium, Cyclospora, and Vibrio (Buzby, 2002). Of these nine pathogens, FoodNet (2015) reports that of all hospitalizations due to foodborne illness among older adults in 2015 were: 32% ages 60-69, 46.2% ages 70-79, and 57% aged 80 and older.

This idea of this research is to understand the attitudes, subjective norms, behavioral intention, and food safety behaviors of older adults. It will highlight the barriers associated with those subjective norms. The research can further assist agencies with an understanding of how to address barriers relative to subjective norms as some of those may be closely related to culture and/or a sense of community. This study will also highlight the need to plan and implement food safety education interventions and public health interventions in hopes of reducing foodborne illness. The researcher hopes that home health care services understand the importance of food safety among older adults and in the future, expand their in-home education to include food safety education. It is hoped that this study will, along with increases in the incidence of foodborne illness, extend home meal delivery services to older adults to decrease the preparation and handling of their own foods. Other researchers will be able to use the data and/or result from this study to either further investigate ways to improve barriers associated with subjective norms, or to create better food safety brochures and pamphlets. Likewise, community resource centers will be able to use the data and results to determine the best practices and approach to designing age-specific food safety education programs.

**Research Design**

This dissertation utilizes a quantitative methods approach. Gliner, Morgan and Leech (2011) describes quantitative studies as studies which uses “objective data and
implies that the behaviors are easily classified or quantified, either by the researcher or the participants themselves” (p. 8). The researcher will also use a cross-sectional design to conduct this study. Described by Aschengrau and Seage III (2007), a cross-sectional study examines a specific population at a specific point in time with no regard to what happened prior to the current research.

**Instrumentation**

The researcher obtained a previously published survey to use for this study. The survey was developed by Cates and colleagues and published in 2009. The 31 item survey measures attitudes, knowledge, and behaviors; thus, assessing food consumption practices and food handling practices. It was created for and initially used on a sample of older adults age 60 and older. Initial use of the survey was online. However, for the purposes of this study, the researcher will use printed surveys to collect self-reported information. The researcher will modify the survey to fit the needs of her selected sample. Therefore, during the pilot study process, the researcher will either add or reduce the number of questions and change some of the wording.

**Sample and Participant Selection**

This research will study older adults. Older adults are defined as individuals age 60 and older (Buzby, 2002). A non-probability convenient sample will be used for the purposes of this dissertation. Recruitment will be done at centers in Jackson and Williamson Counties where the Meals on Wheels programs serve older adults. Permission will be sought from host centers in an effort to assist in reaching a wide range of older adults throughout these two counties.
Theoretical Framework

The theory of reasoned action (TRA) is appropriate for use with this dissertation because it addresses attitudes, subjective norms, and behavioral intention. The Theory of Reasoned Action (TRA) implies that an individual’s behavior is the result of their pre-conceived intent to engage in or perform a behavior; thus, suggesting that behavioral intention is the best predictor of behavior (Fishbein & Ajzen, 1977). This theory looks at the factors that possibly contribute to behavior by examining one’s own beliefs, as well as the beliefs of peers, friends, and family, and one’s motivation to comply (Fishbein & Ajzen, 1977); hence, impacting one’s own intent.

Assumptions

1. Participants will answer questions honestly.
2. Participants know what foodborne illness is.
3. Participants will understand the questions.
4. The survey accurately measures attitudes, subjective norms, behavior intentions, and behaviors.

Limitations

1. The surveys are self-report paper survey; therefore, if participants may not fully complete the surveys.
2. The inclement weather could potentially hinder data collection days.

Delimitations

1. This study is limited to older adults, individuals aged 60 and older.
2. Researcher will collect data from a convenience sample in two counties (i.e., Jackson and Williamson) in Southern Illinois. This is a convenient sample
because the researcher will attend Meals on Wheels locations and senior community centers and ask for voluntary participation.

**Definition of Terms**

*Campylobacter.* This is caused by a gram-negative bacterium and is reportedly the second highest cause of foodborne illness. The incidence is usually caused by eating undercooked meat or poultry (USDA, 2013).

*Cryptosporidium.* It is caused by a parasite that can only be seen under a microscope. It is also the primary agent that causes waterborne disease within the United States. Individuals either ingest contaminated water or eat contaminated food products. Many cases of ingesting contaminated water come from individuals who are swimming in contaminated pool, river, or lake water (USDA, 2013).

*Cyclospora.* This is caused by a parasite that can only be seen under a microscope. Individuals become infected after ingesting contaminated food or water. Individuals may also become infected by traveling outside of the United States to countries where there is a high prevalence of the disease (USDA, 2013).

*Danger Zone.* Temperature range between 40 degrees Fahrenheit and 140 degrees Fahrenheit where bacteria multiplies at dangerous speeds (USDA, 2013).

*E. coli O157:H7.* This is a bacterium that is contained within a large group of bacteria. This particular strain creates toxins called Shiga toxins. It is caused by eating undercooked beef, contaminated produce, and drinking unpasteurized milk and juice. However, it can also be transmitted by person to person contact (USDA, 2013).

*Foodborne Diseases Active Surveillance Network (FoodNet).* This surveillance system is a component of CDC’s Emerging Infections Program, which functions to track, monitor,
and prevent, as well as quantify, the incidence of foodborne illness outbreaks.

Specifically, the following pathogens are tracked and monitored by FoodNet: *Salmonella*, *Campylobacter*, *E. coli O157:H7*, *Shigella*, *Listeria*, *Yersinia*, *Cryptosporidium*, *Cyclospora*, and *Vibrio* (Buzby, 2002).

**Foodborne Illness.** This is a preventable illness that is usually associated with either drinking contaminated water or eating contaminated food. Symptoms range from nausea and diarrhea to death depending on the pathogen and the individual. Symptoms start anywhere from minutes after ingesting the contaminated source or weeks after and may present in the form of the common cold or flu, which may make it difficult for the sick individual to consider foodborne illness. (USDA, 2013).

**Food Safety.** Food safety is a discipline designed to educate and bring awareness about how to properly store food, handle food, and prepare food, as well as how to prevent the spread of food related diseases (USDA, 2013).

**Listeria.** It is caused by a bacterium. It mostly affects pregnant women and older adults or individuals who are immunocompromised. This bacterium is commonly associated with foods that are classified as ready-to-eat such as, but are not limited to luncheon meats and hot dogs (USDA, 2013).

**Multifactorial.** Described as more than one event, such as factors inside and outside of an individual, working together (Buzby, 2002).

**Older Adults.** Individuals age 60 or older are in this category (Buzby, 2002).

**Salmonella (nontyphoidal).** It is a bacterium that causes illness when individual eat raw or undercooked poultry, meat, or eggs. It is also found in unpasteurized milk, cheese,
shellfish, and juice products. It can be found on produce as well if the soil was contaminated with the bacteria or if cross-contamination occurred (USDA, 2013).

*Shigella.* This is a group of bacteria that spreads by person to person contact with fecal matter or from ingesting food or water contaminated with fecal matter. Contamination also occurs when people handle food but did not properly wash their hands after using the restroom (USDA, 2013).

*Vibrio.* This is a bacterium mostly associated with the ingestion of raw or undercooked seafood and shellfish. Individuals can also become infected if they have an open cut or sore and swim in sea or ocean water (USDA, 2013).

*Yersinia.* This is caused by a bacterium. Individuals become infected after ingesting raw or undercooked pork or pork products (USDA, 2013).

**Summary**

This chapter explained the rationale for my research study. It addresses the problems associated with foodborne illness and older adults. It highlights important statistics and the significance of the study itself. This chapter also provides an overview of the research approach and design along with the research questions. A synopsis of the theoretical framework, sample, and survey are also mentioned in this chapter, which are presented before the assumptions, limitations, and delimitations follow. Lastly, a list of definitions that are relevant to this study are defined in detail.

The subsequent chapters in this document are the literature review and the methods sections (i.e. chapter two and chapter three). The literature review covers the most current and up-to-date studies and procedures in the field of food safety. Aging issues attributable to increased incidence rates of foodborne illness are also in chapter two. Chapter
three provides detailed information on the procedures and research designs used in this study. Information ranging from sample selection to data collection and analyses are also thoroughly described and explained in the chapter three. The researcher plans to conduct a pilot study prior to beginning the larger study. Therefore, chapter three also explains to readers why it is necessary to conduct a pilot study.
CHAPTER TWO
LITERATURE REVIEW

Introduction

This chapter provides a review of literature relative to food safety and this research study. Content covers the epidemiology of food safety, the microbiology and epidemiology of *Salmonella*, which has the highest incidence rates among older adults, food regulations, and other important literature specific to older adults. An in-depth explanation of the Theory of Reasoned Action and its application to this study is also provided in this chapter.

**Epidemiology of Food Safety and Foodborne Illness**

The United States has a long history of foodborne illness in the United States. This history also includes foodborne illness being overlooked even though people knew food often became too unsafe to eat and left many people dead on occasion. Prehistorical data suggests that foodborne illness goes as far back as 1500 BCE (Zaccheo, Palmaccio, Venable, Locarnini-Sciaroni, & Parisi, 2017). The first influential fatality due to foodborne illness dates back to 1850 in connection to the 12th President of the United States, Zachary Taylor (Arts & Entertainment, 2009). While President Taylor’s exact cause of death was unknown at the time, doctors who oversaw his case knew that his illness was food related as he had a severe case of gastroenteritis (Arts & Entertainment, 2009). For several days leading to his death, he suffered from diarrhea, nausea, vomiting, and bad abdominal pains (Arts and Entertainment, 2009). Although, doctors knew his death was related to the ingestion of contaminated food and milk products, they still
linked his death to a diagnosis of cholera because foodborne illness pathogens were not yet known (Arts and Entertainment, 2009).

While food related diseases plagued the United States at different times and occurred among different populations, it was necessary for the government to start tracking these diseases, but they failed to initially do so. Because of lack of exposure around contaminated food and unsanitary working conditions in food processing facilities, in late 1905, Upton Sinclair released his famous novel, The Jungle. The Jungle, aimed to highlight the unhygienic conditions of meat processing and packaging facilities (Sinclair, 1988). It also described the contents of adulterated meats along with the unhealthy and unsafe working conditions of laborers within factories throughout the city of Chicago (Sinclair, 1988). The Jungle, and its esteemed author, Upton Sinclair, are revolutionary within the United States for sparking a food safety reform movement within the United States. The Jungle started a much-needed conversation among both, the public and the government, about social economic status and social disparities, which ultimately determined how poor and uneducated workers were treated, as well as the quality of food, within the United States. President Roosevelt engaged two experts, the labor commissioner and a social worker, to investigate the conditions described by Upton Sinclair. The Neill-Reynolds Report of 1906 basically supported what had already been published in The Jungle (FDA, 2009).

President Roosevelt used the knowledge from the report to demand better working conditions in all labor industries, as well as safer and more sanitary food and meat production (FDA, 2009). He also created the Pure Food and Drug Act of 1906. Per the Pure Food and Drug Act of 1906, the act was developed “For preventing the
manufacture, sale, or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and for regulating traffic therein, and for other purposes” (FDA, 2009). Around the very same time, the Federal Meat Inspection Act of 1906 was passed requiring all cattle, swine, sheep, goats, and equine to undergo inspection (FDA, 2009). The initial passing of this act did not include any forms of chicken or poultry.

Although, *The Jungle*, initiated a response from the government, it was not enough to decrease the incidence of foodborne illness. No real food safety measures had been taken other than the major Acts that had been established in Congress and a United States Registry to log deaths due to foodborne illness (Armstrong, Story, & Scott, 1919). In a six-year span, beginning in 1910, the United States Registry logged more than 3,000 deaths from foodborne illness (Armstrong, Story, & Scott, 1919). From 1916 to 1919, there was roughly 874 deaths caused by a foodborne pathogen (Armstrong, Story, & Scott, 1919). By the time of the next large outbreak of foodborne illness, scientists had begun to identify and name those pathogens linked to illness and death. In 1919, an outbreak of botulism among a group was identified and linked to canned olives from the state of California (Armstrong, Story, & Scott, 1919).

While there were only seven deaths from this outbreak (Armstrong, Story, & Scott, 1919), registering deaths related to contaminated food seemed more important to the masses. The United States Registry for food poisoning was only the start of tracking food related illness and deaths. Today, foodborne illness caused by 9 specific pathogens is monitored by a system called FoodNet (Henao, Jones, Vugia, & Griffin, 2015).
The Centers for Disease Control and Prevention houses the Foodborne Diseases Active Surveillance Network, which is also known as FoodNet. This surveillance system was created and enacted in order for the CDC to track and monitor foodborne illness and their relation to foods (Henao et al., 2015). It also monitors the distribution of these diseases, as well as inform policies surrounding food safety by conducting investigations and population research studies (Henao et al., 2015). FoodNet was started in 1995 by CDC (Henao et al., 2015). Currently, state hospitals report confirmed foodborne illnesses to health departments and health departments report to the CDC (Henao et al., 2015). This was also the process prior to the commencement of CDC’s FoodNet. This method of transferring information often left the Centers for Disease Control with unreliable data about the true incidence and prevalence for several pathogens (Henao et al., 2015), which left the CDC in need of a better surveillance system. Because of FoodNet, researchers, academics, and scientists have the ability to use and analyze reliable and specific data, such as by age and by disease, for each of the foodborne illnesses monitored by FoodNet.

FoodNet only tracks those nine bacterial and parasitic pathogens that doctors routinely screen for in an emergency room, urgent care, or primary care facility (Henao et al., 2015). Those pathogens are: *Campylobacter*, *Listeria*, *Salmonella*, Shiga toxin–producing *Escherichia coli* (STEC) O157 and non-O157, *Shigella*, *Vibrio*, and *Yersinia* and parasitic infection caused by *Cryptosporidium* and *Cyclospora* (Henao et al., 2015). Of those nine pathogens, older adults are most impacted by and have the highest incidence and mortality rates of *Salmonella enteritidis* (Kosa, Cates, Godwin, Ball, & Harrison 2011). Older adults also have the highest cases of severe hospitalizations for *Salmonella* than any other age group (Kosa, Cates, Godwin, Ball, & Harrison 2011),
whether progression through the illness or death from the illness. In Illinois, from 1998 to 2015, *Salmonella* caused 187 outbreaks, 12,969 illnesses, 2,269 hospitalizations, and 35 deaths (CDC, 2016).

**Salmonella Enteritidis**

**Introduction**

Older adults are affected by *Salmonella* at a rate of 10.8 cases per 100,000 (Kosa, Cates, Godwin, Ball, & Harrison 2011), which makes individuals age 60 and older have the highest incidence rates of any other age group. For more than 100 years, salmonella has plagued the population of the United States, causing numerous Americans to get sick each year. Salmonella is one of the most common foodborne illnesses experienced in the United States. So common that more than one million individuals are infected and sickened each year (Cianflone, 2008; Voetsch et al., 2004). The high incidence rate comes along with almost 20,000 hospitalizations and more than 300 deaths (Cianflone, 2008; Voetsch et al., 2004). While decades and even centuries before *Salmonella* was identified, people died from many of the symptoms associated with *Salmonellosis*. However, after *Salmonella* was identified, the first recorded outbreak of *Salmonellosis* is said to have happened in 1968, but Dr. Daniel Salmon first discovered strands in 1962 by (National Center for Emerging and Zoonotic Infectious Disease, 2011).

**Microbiology**

*Salmonella* is a diverse group of gram-negative, anaerobic bacteria (Cianflone, 2008). There are two different species for *Salmonella, enterica* and *bongori* (Cianflone, 2008; Hunter & Watkins, 2017; NCEZID, 2015; Voetsch et al., 2004). *Salmonella enterica*, is a non-typhoidal species associated with human consumption of raw,
undercooked, and contaminated foods, as well as direct contact with contaminated birds, animals, or humans (Hunter & Watkins, 2017; NCEZID, 2015; Cianflone, 2008; Voetsch et al., 2004). Non-typhoidal *Salmonella* has more than 2,500 serotypes (Hunter & Watkins, 2017; NCEZID, 2015; Cianflone, 2008; Voetsch et al., 2004), which are useful in tracing the source of outbreaks. *Salmonella enteritidis* is the serotype identified in infections within the United States. When a human is infected with *Salmonella*, he or she acquires *Salmonellosis*. The National Center for Emerging and Zoonotic Infectious Diseases (2015) defines *Salmonellosis* as a “bacterial disease caused by *Salmonella*, which is most often spread when a person eats contaminated food” than any other transmission route.

**Epidemiology**

*Salmonellosis* is mostly acquired from the consumption of chicken, eggs, beef and dairy products, as well as fruits and vegetables that are cross-contaminated by infected meats, animal manure, or human or animal feces (Cianflone, 2008; NCEZID, 2011; Voetsch et al., 2004). Although *Salmonella* is normally transmitted from animal sources, the infection is occasionally transmitted through water (Cianflone, 2008; NCEZID, 2011; Voetsch et al., 2004). Most types of *Salmonella* commonly exist in the intestines of birds and animals (NCEZID, 2015). When these animals eliminate waste, the *Salmonella* is evacuated within their stool, which is where the contamination process occurs (NCEZID, 2015). Most birds and animals contaminate their fur, feathers, or scales during the excretion process (NCEZID, 2015). Likewise, anything in the vicinity of the contaminated waste also becomes contaminated with *Salmonella*, no matter if it is a chicken coop or a garden (NCEZID, 2015).
Beginning in the early 1980s, the incidence of *Salmonella* outbreaks rapidly increased, mainly due to the ingestion of contaminated eggs (Boonmar et al., 1998; Cianflone, 2008). Research suggests that eggs are contaminated prior to hatching (Boonmar et al., 1998; Braden, 2006; Cianflone, 2008; Hogue et al., 1997). Thus, indicating that the diseased pathogen was transmitted to the egg from the parent (Braden, 2006; Cianflone, 2008; Hogue et al., 1997). Generally, this results from an infection in the ovaries of the chicken. Sanitation is very important when trying to prevent the spread or development of *Salmonellosis*. It most often occurs because of poor hand hygiene or the consumption of raw and undercooked foods due to improperly cooking foods. According to Cianflone (2008), “*Salmonellosis* can be acquired by direct personal contact, nosocomial transmission, or contaminated drugs/solutions” (p. 3). Not every case of *Salmonellosis* is the result of contaminated food. When an individual is colonized by *Salmonella*, he or she is liable to transmit the infection to other individuals. Hence, another reason hand hygiene is particularly important, especially if the colonized individual works in a food service establishment or grocery store preparing or handling food (Cianflone, 2008; Kimura et al., 2005).

**Clinical Manifestation and Prevention**

The symptoms associated with *Salmonella* are diarrhea, fever, and abdominal cramps. Diarrhea is sometimes extremely uncontrollable and causes the infected person to be hospitalized. *Salmonella* may spread to a person’s blood system, which results in death. Normally a person who is hospitalized from the infection spreading to the bloodstream is one with an already compromised immune system. Older adults generally have a weakened or compromised immune system. Therefore, they are more susceptible
to *Salmonella* and usually suffer a more invasive infection. Symptoms usually begin within 12 hours after contact with the bacteria and last up till one week after (NCEZID, 2015). In order for a person to know if he or she is infected with *Salmonella*, a series of symptoms must first manifest. However, severe gastroenteritis is the most common of symptoms (NCEZID, 2015).

According to the National Center for Emerging and Zoonotic Infectious Diseases (2015), roughly five percent of the individuals who are infected and diagnosed with *Salmonellosis* further develop another bacterial infection such as meningitis. After probable symptoms, a doctor visit is made and the doctor will request for a bowel sample to be given (Voetsch et al., 2004). Once the laboratory tests and confirms that the infection is in fact *Salmonellosis*, the person is treated for it. However, the lab must also test to determine the serotype of the *Salmonella* (Cianflone, 2008; Voetsch et al., 2004). When the serotype is determined, the information is reported to the Centers for Disease Control, specifically FoodNet (Voetsch et al., 2004). Serotype identification is an important factor in identifying and classifying cases of certain bacteria structures, that ultimately links the two together, which also makes it easier for researchers to treat, track, and monitor the distribution of that pathogen during an outbreak (Voetsch et al., 2004).

*Salmonella* like any other foodborne pathogen is preventable by thoroughly washing, cleaning, and cooking foods. Older adults need proper food safety training and education in their homes in order to understand the severity of foodborne illness, but specifically, *Salmonella* as they tend to have higher incidence and mortality rates due to *Salmonellosis* infections. Older adults need in home guides that provide instructions and information that reinforce proper cooking temperatures, food handling, and food storing.
As mentioned, *Salmonella* illness is more than preventable with proper education and practices as simple as hand hygiene. However, many of these prevention methods will only work when older adults prepare and cook their own meals in their own homes. Restaurants are also attributable to the high incidence rates of *Salmonella* infections among older adults.

**Food Safety Regulations**

**Introduction**

Food safety is a major issue public health issues within the food industry today, including congregate meal sites and restaurants. As food products is rapidly manufactured in factories for mass production, food safety, such as food handling and storing become more of a concern for both restaurants and congregate meal programs. FoodNet reported data from 1998 to 2004 that shows 52% of foodborne illness outbreaks were attributable to restaurants and delis (Jones & Angulo, 2006). When foods are not safely prepared, handled, cooked, or stored the risk of foodborne illnesses increases drastically. Foods undergo many temperature changes before it is even reaches the household of the consumer. Therefore, it is important to ensure that food goes through proper safety mechanisms before consumption to decrease risk factors associated with foodborne illness. Washing and cooking foods to proper temperatures, or storing the foods in the refrigerator until preparation, significantly reduces the risk of foodborne illness.

**Congregate Meal Programs**

Sites Since 1972, congregate meal services (i.e., Meals on Wheels) have existed. As Meals on Wheels are independently operated in each state and county, some of them may or may not provide food safety guidelines. However, there are some who provide a food safety checklist for older adults who are serviced by their programs. This
information concerns temperature control (i.e. danger zones and reheating instructions). The Administration for Aging’s provider services receives funding based on the Older American Act. These funds provide support for older adults age 60 and older (Lee & Gould, 2011; Porter & Cahill, 2015). While many states offer these programs, very limited research exists regarding the food safety and foodborne illness measures and outcomes of older adults who use congregate meal services (Almanza, Namkung, Ismail, & Nelson, 2007). Also, little research exists on whether or not congregate meal services provide some form on baseline food safety guidelines to older adults (Almanza et al. 2007; Lee & Gould, 2011). Most studies were conducted on the nutritional supplement offered by congregate meal programs. According to Albrecht, Purcell and Munyon (2009), Meals on Wheels programs typically do not provide older adults with food safety information. Lee and Gould (2011) reported that some of the congregate meal programs they studied had food safety issues such as temperature control and food handling, which are both critical issues. In another study conducted by Roseman (2007), at least 44% of older adults self-reported that they usually carry food home from congregate meal sites to eat later. Results from these studies suggest that congregate meal programs should offer food safety education to both older adults and the workers who prepare the meals.

**Food Service Establishments and Inspections**

Food safety education is needed in food service establishments where workers lack knowledge about appropriate food safety procedures. When workers lack knowledge, food preparing and handling practices are solely based on the worker’s personal experience. A cross-sectional study was done in conjunction with the University of Illinois at Chicago’s School of Public Health and authors Manes, Liu, and
Dworkin (2013) where baseline food safety knowledge was assessed. The study population only included interviews with 729 food service operators within the suburbs of Chicago (Manes et al., 2013). The operators participated in a 50-question survey (Manes et al., 2013), which only asked questions regarding basic, standard food safety practices. Basic food safety practices included but were not limited to: food handling, food temperatures, cooking, and sanitation. Survey results showed that knowledge gaps strongly existed in cooking temperatures, hand hygiene, and working while ill (Manes et al., 2013).

In 2009, the Food and Drug Administration (FDA) reported that it is not uncommon for food service workers to not wash their hands before preparing and handling food. The FDA (2009) also reported that food service workers poor food safety habits such as hand hygiene, cooking temperatures, cross contamination, and food holding are the primary factors that contribute to foodborne illness outbreaks. With food service workers not having proper training and knowledge of food safety, education can fill that gap. When it comes to actual practices and behaviors in the establishment, health departments must intervene in order to provide feedback and critical analysis of food service establishments whose workers fail to comply with health code regulations.

All food service establishments undergo annual inspections by food safety officers. When they receive an unfavorable number of critical violations, a re-inspection, or follow-up inspection is warranted. Follow-up inspections generally occur one week from the initial inspection, but time can be much longer depending on the workload of the health department. Research is limited regarding the effectiveness of follow-up inspections. A retrospective analysis was done to assess if follow-up inspections reduce
critical violations. The analysis included a total of 5,255 initial inspections and 1,322 follow-up inspections, limited to only fast food and full-service restaurants (Waters et al., 2015). Only five known critical violations were considered, which were: poor hygiene, food holding errors, un-sanitized food prep equipment, cross-contamination issues, and incorrectly concentrated sanitizer solution (Waters et al, 2015). Results showed that follow-up inspections provided provisional improvements in conditions (Waters et al., 2015). However, this does not signify that workers will continue to practice appropriate food safety behaviors once the inspector is no longer present. Thus, the high rates of food service establishment associated foodborne illness outbreaks.

Older adults who maintain their independence, not only prepare and cook their own meals; but however, many economically stable adults frequently eat out at food service establishments, or places other than their home. According to Blisard and Stewart (2007), American’s spend at least half of their food budget on eating out. It is evident from previous studies that food service establishments are attributable to the incidence of foodborne illness (Blisard & Steward, 2007; Bogard, Fuller, Radke, Selman, & Smith, 2013; Jones & Angulo, 2006). A population-based telephone survey completed by FoodNet sites from 1998-1999, which analyzed the responses of 12,755 individuals, suggested that there is some association between the frequency people eat from food service establishments and the incidence and frequency of gastroenteritis symptoms (Jones & Angulo, 2013). As older adults are more susceptible to foodborne illness, any improper safety protocol or failure to cook food to the required temperature, can result in severe illness or even death. Even though there are limitations when suggesting restaurants are attributable to many foodborne illnesses, research findings by researchers
and allegations and reports by consumers to the Centers for Disease Control and Prevention suggest a strong association (Blisard & Steward, 2007; Bogard et al., 2013; FDA, 2004; Jones & Angulo, 2006; Sharkey, Alam, Mase, & Ying, 2012). Because of these risk factors, it is important for older adults to understand how their health is impacted by lapses in judgment by food service establishments and workers.

**Older Adults: Foodborne Illness and Food Safety**

Foodborne illness and food safety are inherently the most overlooked areas of importance by consumers. People often do not see the importance of practicing food safety in their homes. Even though individuals may not deem it important, this does not indicate that foodborne illness is neither acquired in the home nor does it have a low incidence rate. According to the Centers for Disease Control and Prevention (2011), one out of every six persons in the United States are sickened from a foodborne illness causing pathogen each year. This data includes individuals of all ages; however, incidence and mortality rates are higher for some age groups or populations of people than others.

As of 2012, statistics show that the estimated populations of older adults, or individuals age 60 and older, was roughly 45 million. This number is expected to grow rapidly by the year 2050, doubling in the size of the population (Ortman, Velkoff, & Hogan, 2014; Wunderlich, Bai, O’Malley, & Chung, 2015). In the state of Illinois, between 1998 and 2015, there were approximately 1,228 foodborne illness outbreaks leading to roughly 35,991 illnesses, 3,123 hospitalizations, and 84 deaths (CDC, 2016).

The population of older adults in the United States is not shrinking. In fact, it is constantly growing. According to the United States Census, the population will exceed
more than 70 million by the year 2050. With new technology, the push for more active and healthier lifestyles, people are expected to live longer. However, with an increasing population, the demand for food increases. With an increase in food demand, mass production of food is expected to increase, as well as the amount of food purchased in restaurants. Likewise, the number of older adults who prepare their own foods and eat away from their home will increase also. Older adults are more likely to be diagnosed with a foodborne illness. There are many factors that contribute to these high incidence rates. However, the primary reason is a lack of knowledge about food safety. A study conducted by Cates and colleagues (2009) showed that older adults do consider themselves knowledgeable about food safety but they do not comply with food safety guidelines. This is an issue because older adults are more susceptible to foodborne illness. Therefore, it is necessary to educate them, not only on food safety, but the health consequences for non-compliance (Cates et al., 2009).

**Health Outcomes**

There are many factors that contribute to ill health or death for older adults. Many of these factors are multifactorial. Unlike a healthy young adult, an older adult generally has a weaker immune system. Having a weak immune system can lead to death as most foodborne infections are very severe on older adults. The average older adult is on some type of medication (Ruscin & Linnebur, 2018). According to Ruscin and Linnebur (2018), “90% take at least one drug per week, more than 40% take at least five different drugs per week, and 12% take ten or more drugs per week” (p. 1). Medications have been known to have certain side effects. Side effects can range from physical symptoms to just causing an individual’s immune system to grow weaker (Remig, 2017).
Thus, making individuals more susceptible to other diseases. Many older adults are already living with co-morbidities or multiple morbidities, which are normally chronic conditions such as diabetes, hypertension, and kidney disease (Remig, 2017; Ruscin & Linnebur, 2018). Not only do having multiple morbidities make older adults more susceptible to foodborne illness, but the numerous amounts of medication do also. Older adults also have lower production in their stomach acids (Busby, 2002; Remig, 2017; Smith, 1998). Where a young adult is able to fight off infections of the stomach, an older adult may not be able to do so. Gastroenteritis is the main diagnosis for older adults who are infected by a foodborne pathogen (Busby, 2002; Smith, 1998). Research shows that older adults are more susceptible to gastroenteritis, which mostly leads to death for older adults (Busby, 2002; Smith, 1998) as the immune system is too weak and bacteria lives in their gut for extended periods of time (Busby, 2002; Remig, 2017).

Nutrition becomes a matter of importance with aging (National Council on Aging [NCOA], 2018). It is especially important if older adults already suffer from chronic illness (NCOA, 2018). The World Health Organization (WHO) (2018) suggests that nutrition is somewhat subjective as health needs and requirements are different for each individual. The amount of nutrients older adults need vary as well; but however, when an older adult receives less than the amount of nutrients required for sustenance and healthy, malnutrition occurs (WHO, 2018). Malnutrition is defined as “a state in which a deficiency, excess or imbalance of energy, protein and other nutrients causes adverse effects on body form, function and clinical outcome” (Tanvir & Haboubi, (2010), (p. 207). Malnutrition does not only affect people in developing countries. In the United States, at least one percent of older adults who live independently suffer from
malnutrition (Evans, 2005). In a previously published study, Rauscher (1993) described four different types of malnutrition that affect older adults:

- specific malnutrition, frequently associated with clinical disease, such as osteomalacia or scurvy; sudden malnutrition, resulting from marked changes in food intake following physical trauma, such as surgery, or mental trauma, such as bereavement or an unwelcome retirement; recurrent malnutrition, which is severe malnutrition following a worsening cycle of illness and poor nutrition; and long-standing malnutrition, characterized by chronic poor eating habits and a long latent period between the nutritional deficiencies and their clinical appearance. (pp. 1395-1396)

Although Rauscher (1993) described several types of malnutrition among older adults, this does not limit the causes of malnourishment. When older adults are malnourished, they are more susceptible to disease and infection. Therefore, having risky eating behaviors increase the incidence of foodborne illness.

Circumstances may also be the reason for older adults to become malnourished. Socioeconomic status is a major factor in what is eaten and how often eating takes place (Darcey & Quinlan, 2011; Nord, 2002). Older adults who have low socioeconomic status are more likely to eat expired foods than to discard them. They are also more likely to eat other adulterated foods as funds to buy food may be limited, as well as their in-home food supply. Being subjected to these conditions make older adults very vulnerable (Darcey & Quinlan, 2011; Nord, 2002). Therefore, when infection occurs, it is often very hard for older adults’ immune systems to fight them off (Darcey & Quinlan, 2011; Nord,
Thus, making health complications very severe, many times resulting in death (Darcey & Quinlan, 2011; Nord, 2002).

**Prevention of Foodborne Illness**

With the current older adult population greater than 40 million, it is important to incorporate some food safety education and prevention mechanisms to decrease the incidence of foodborne illness among them. Foodborne illness is a preventable illness. While many older adults seek to maintain an independent lifestyle, they sometimes face barriers with health, neglect for family, and socioeconomic factors that make their independence difficult to maintain (Busby, 2002; Darcey & Quinlan, 2011; Nord, 2002; Remig, 2017). Thus, increasing their susceptibility to disease and illness, specifically, foodborne illness.

There are many programs that assist independent older adults with maintaining their lifestyle. Some programs include but are not limited to: Meals on Wheels and local senior day centers. The Meals on Wheels America [MOWA] (2017) operates throughout the United States and are all locally and independently owned. The purpose of this program is to provide nutritious meals to older adults who may not want to cook three meals per day or may be in need of a small amount of assistance (MOWA, 2017). However, this program is not available to everyone in every city within the United States, and each program operates differently. There may be other meal delivery programs owned and operated by local organizations as well. However, no program is a substitution for the needed interventions and food safety education.

Baseline food safety information includes: cleaning foods properly before preparation and cooking, separating food by cooking temperatures, cooking foods to the
required temperatures, and chilling foods properly in small batches (United States Department of Health and Human Services [USDHHS], 2017). Other basic knowledge includes: washing hands thoroughly and between touching raw foods and equipment, defrosting food correctly, and storing food in the proper temperature ranges (USDHHS, 2017). Many older adults leave foods out on the counter tops for numerous hours (Kosa et al., 2011). Many reported that the place the food back into the refrigerator overnight if they do not cook it, even after it has sat on the counter top all day (Kosa et al., 2011). Having the smallest amount of baseline knowledge for storing, preparing, and cooking foods can significantly reduce the chances of getting foodborne illness. According to Kosa and colleagues (2017), older adults should also avoid eating and preparing foods that have a high chance of causing foodborne illness. Older adults should also reheat foods to the recommended temperatures before eating them.

Previous studies have shown that older adults do not follow food safety guidelines even when they are given by a health provider (Cates et al., 2009). However, this further suggests that food safety education and prevention interventions are needed among this population. There are a wide range of activities that can be created in order to serve older adults in many different communities. Some interventions may require more resources than others as low-income and disadvantaged communities do exist. These are also the communities where individuals are often the most vulnerable and most susceptible to disease.
Theoretical Framework

The section provides a general overview of the Theory of Reasoned Action. More so, this section provides a comprehensive explanation of the relationship between this current study and the Theory of Reasoned Action.

The Theory of Reasoned Action (TRA)

Food safety and foodborne illness are two complimentary issues. Thus, suggesting that if food safety is not practiced, then there is the potential of acquiring a foodborne illness. While these are both pressing issues of health for older adults, there is also a need to understand their attitudes and subjective norms relative to food safety and foodborne illness in order to better address their intent to follow recommended guidelines and practice food safety. The Theory of Reasoned Action posits that attitudes and subjective norms predict, or highly influence, an individual’s intent to engage in a certain behavior (Fishbein & Ajzen, 1977). The Theory of Reasoned Action is widely used among public health practitioners for health programming. A wide range of programs have been created using this theory, including but not limited to, HIV interventions and smoking cessation programs. Numerous programs have shown success in predicting behaviors, as well as explaining the factors that influence the behaviors individuals chose to engage in.

Fishbein developed the Theory of Reasoned Action in 1967 to understand the interconnectedness of attitudes, intentions, and behaviors (Fishbein & Ajzen, 1977). In the initial development phase of the theory, Fishbein distinctively explained the difference between an individual’s attitude towards an object and an individual’s attitude toward a behavior relative to that object, which he proposed was a far better predictor of
behavior (Fishbein & Ajzen, 1977). According to the TRA, individual’s attitudes depend on his or her behavioral beliefs and the evaluations of outcomes towards a behavior (Fishbein & Ajzen, 1977). If an individual has a strong belief about the outcome of engaging in a behavior, this belief ultimately determines the individual’s attitude toward that behavior, negative or positive. These two concepts, behavioral beliefs and evaluation of behavioral outcomes, support individual attitudes according to the Theory of Reasoned Action. Subjective norms are determined by the influences of the people in relation to the individual as well as their motivation to comply with what these important people think (Fishbein & Ajzen, 1977). Therefore, if an important person in an individual’s life approve of a certain behavior, then the individual is likely more motivated to comply with or engage in the behavior. While this theory is utilized in this research study to understand attitudes, subjective norms, and behavioral intention of older adults, the goal after research is to create interventions that will strengthen older adults’ attitudes, normative beliefs, and motivation to comply.

**The Theory of Reasoned Action in the Current Study**

Each of the constructs of the Theory of Reasoned Action align with this study in terms of older adults’ intent to follow food safety guidelines and practice food safety at home. The major constructs are: attitudes, subjective norms, and intention. The external variables, which also include the demographic variables, are also critical to this study as they may provide insight or explanation for older adults’ rationale for not practicing safety at home. However, the expectation is that they are independent of the other variables. The intrapersonal level will measure the attitudes, knowledge, behaviors, and beliefs. The interpersonal level will measure factors that influence the individual that the individual normally does not control. Some of these
influences may include peers, family, friends, and community. Sociocultural factors will measure socioeconomic status (i.e. educational attainment, income, and employment status).

Attitudes toward foodborne illness and food safety will be measured, as well as subjective norms regarding foodborne illness and food safety. Intentions to practice food safety in the home and intentions to follow food safety guidelines will also be measured. Chapter three provides in-depth information on the application of the constructs in this study. Figure 1 shows a path analysis model of the Theory of Reasoned Action applied to this research study regarding food safety and foodborne illness.

**Figure 1**

*Path Analysis of Theory of Reasoned Applied in the Current Study*
Figure 1 provides a visual of the major constructs of the Theory of Reasoned Action. It provides a closer look at the factors that are necessary components to each of the constructs. Each factor is specifically important in assessing older adults’ in this study and can also be linked to the research questions associated with this study. The pathway from one construct to another, shows how each factor affects the other, ultimately affecting behavioral intention, which in turns directly affects behavior.

**Summary**

Foodborne illness is preventable. While it is preventable, many older adults lack the knowledge and skills necessary to prevent such illnesses. From 1998 to 2015, more than 35,000 people became ill from foodborne illness in the state of Illinois. The older adult population is growing all throughout the United States, including Illinois. Illinois is rural in geography. These programs offer a population of individuals who still maintain their independence in their own homes and prepare and cook most of their own meals. A thorough review of the literature suggests that food safety and foodborne illnesses are still major concerns among this population. This research study aims to reduce barriers such as those subjective norms that drive older adults’ intent to either practice and follow baseline food safety guidelines or not.
CHAPTER THREE

METHODS

Introduction

This chapter provides a detailed overview of the research methodology applied in this study. Detailed information is provided on the following sections: research approach and design, study sample, survey instruments, data collection procedures, and data analyses. This chapter also explains the pilot study process of for this research study.

Research Approach and Design

This research study uses a quantitative design. According to Gliner, Morgan, and Leech (2011), a quantitative research design involves objective data analyses for measurement purposes. Creswell (2014) describes quantitative research as “An approach for testing objective theories by examining the relationship among variables” (p. 32). Theories operate so that bias is reduced and the study is generalizable to larger population (Creswell, 2014).

This study also uses a cross-sectional research design. A cross-sectional study is as an assessment of only a “snapshot” of a proportion of the population at a specific point in time (Aschengrau & Seage III, 2007). Cross-sectional data does not depend on data collected prior to the current study (Aschengrau & Seage III, 2007). However, it informs or implicates future research projects by providing a close look at disease or behaviors from the current study (Aschengrau & Seage III, 2007). Thus, indicating that the current research sample and data are also generalizable to the population (Aschengrau & Seage III, 2007).
Several different research approaches are necessary to critically assess the hypotheses of the current study. The associational approach examines the relationship between two or more variables (Gliner et al., 2011). In this study, the associational approach examines the relationship between the construct variables and either food safety or a specific demographic variable. The comparative approach tests differences in groups (Gliner et al., 2011). For the current study, the comparative approach tests the difference between demographic variables and construct variables.

**Research Questions and Hypotheses**

Seven research questions guide this study. Each question has a hypothesis associated with it, which directly follows the research question.

1. What knowledge do older adults possess regarding food safety?

2. Does socioeconomic status predict food safety behavior?
   
   **H1a:** Lower levels of educational attainment will predict food safety behaviors.
   
   **H1b:** Low levels of income will predict food safety behaviors.
   
   **H1c:** Employment status will predict food safety behaviors

3. Do subjective norms differ by gender?
   
   **H2a:** There will be a difference in subjective norms between males and females.

4. Do attitudes towards food safety differ based on ethnicity?
   
   **H3a:** There will be a difference in attitudes among ethnicities.

5. Do subjective norms surrounding food safety behaviors predict behavioral intention with respect to proper food safety behaviors?
H4a: Subjective norms will predict intent to practice food safety or follow food safety guidelines.

6. Do attitudes toward foodborne illness predict behavior intention with respect to proper food safety behaviors?
   
   H5a: Attitudes will predict intention to practice food safety.

7. Is there a relationship between attitudes, subjective norms, and behavior intention?
   
   H6a: There is a correlation between attitudes, subjective norms, and behavior intention.

**Study Sample**

**Sample Size Estimation**

Calculating the sample size in any study is an important factor. This is an important step that is necessary for calculations to be made prior to starting a study, which is considered a power analysis as statistical power is calculated (Gliner, Morgan, & Leech, 2009). There are many resources available for calculating the sample size, which is commonly known as a power analysis (Gliner et al., 2009). A power analysis is performed prior to the start of a study and is used to estimate the sample size and detect parameters associated with the change, or effect, the researcher wants. Defining the sample size before starting the study decreases the chances of research bias and misinterpretation of study results, which can also be due to bias. According to Kadam and Bhalerao (2010), sample size estimation almost always depends on: “acceptable level of significance, power of the study, expected effect size, underlying event rate in the population, and the standard deviation in the population” (p. 55). The significance level
is generally set before a study begins (Kadam & Bhalerao, 2010). It is the percent probability that the results are due to chance. Power deals with the error associated with a study (Kadam & Bhalerao, 2010). The most commonly seen errors are Type I and Type II. Type I errors occur when the null hypothesis is rejected but it is indeed true (Kadam & Bhalerao, 2010). Type II errors occur when the null hypothesis is accepted but was indeed false, which is also known as Beta (Kadam & Bhalerao, 2010). As power, or \(1-\beta\) increases, the likelihood of committing a Type II error decreases (Kadam & Bhalerao, 2010). Researchers successfully increase power by making the sample size in a study larger (Gliner et al., 2009). While some study mechanics are conventional, the underlying event rate in the population stems from previously published literature. Although it may require the researcher to adjust the sample size after the study has already started, this procedure is very important in estimating the initial sample size (Kadam & Bhalerao, 2010). Standard deviation is necessary for any study because it measures the variation between the dependent and independent variables, which is necessary to detect differences among the data (Kadam & Bhalerao, 2010).

Several authors provide recommendations for sample size estimates. Gliner et al. (2009) suggests, at minimum, no less than 30 participants for both comparative analyses and associative studies. Gliner et al. (2009) also recognize that the most important factor in dealing with sample sizes is having a representative sample and making sure your sample size is sufficient enough for study results to show findings that are relative and significant to the study.

For the current study, the researcher uses the free software program Raosoft to conduct a power analysis. Raosoft is for calculating sample sizes according to the
researcher’s guidelines for the study, i.e., the margin of error, the confidence level, the population size, and the distribution response. Raosoft determined that the researcher needs 278 participants for this study as the analysis included power specifications given by the researcher. According to McGrath (2006), incentives help to increase participation in cross-sectional studies. To increase response rate, the researcher will provide monetary incentives in the form of Walmart gift cards to participants who voluntarily complete the survey.

Sample Recruitment

The researcher decided upon a non-probability sampling method for the current study. The researcher will recruit participants via a convenient method from locations throughout rural counties in Southern Illinois where attendance by potential participants who meet the age demographics of the current study. The recruited sample will also be a purposive sample as the participants must be age 60 and older and still cook and prepare their own meals at home.

Instrumentation

The researcher is using a previously published survey for the current study. Researchers from Research Triangle International developed the Senior Food Safety Survey in 2008. The initial survey had 31 items, which asked participants about their food safety knowledge, attitudes, and behaviors. The questionnaire addressed individuals aged 60 and older who are at an increased risk of foodborne illness.

Constructs

The researcher developed this study’s framework around the Theory of Reasoned Action. This theory has four main constructs that are important when measuring specific
social and behavioral norms that lead to behavior change. The single most important
construct associated with this study is behavioral intention as it is a determining factor in
whether or not an individual actually changes his/her behavior.

For the current study, the researcher grouped questions into four main categories
to create subscales: knowledge, attitudes, subjective norms, and behavioral intention.
The researcher added a demographic subscale (i.e., questions 1-8) with questions that
align with the goals of the current study. The knowledge subscale (i.e., questions 9-17)
measures food safety knowledge on a true or false scale. The subjective norms subscale
measures the likelihood to which an important person in the individual’s life is likely to
approve of certain food safety behaviors. This sub-scale has nine questions on a 4-point
semantic differential scale. The rating of the subscale ranges from highly unlikely to
approve to highly likely to approve (i.e., questions 26-34). The behavioral intention
subscale measures participants’ intent to follow specific food safety guidelines.
Questions measure on a semantic differential scale that either ask participants’ likelihood
to follow the recommended guidelines or ask if they already follow that guideline (i.e.,
questions 35-43). The attitudes subscale (i.e., questions 18-25) measures attitudes toward
food safety on a 4-point Likert scale to assess participants’ opinions and attitudes on
different food safety topics. The researcher is piloting and using expert reviewers for the
purposes of validity, bias, and reliability.

Variables

There is one dependent variable and nine independent variables associated with
this research study. The dependent variable is older adults’ intent to follow the
recommended food safety guidelines or practice food safety at home. While this study
has no active independent variables, all the independent variables within this study are attribute independent variables because they do not change and are non-experimental (Gliner et al., 2011). Table 1 gives more detail on the independent variables used in the instrument.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level of Measurement</th>
<th>Instrument and Research Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Norms</td>
<td>Interval</td>
<td>SFSS</td>
</tr>
<tr>
<td>Behavior</td>
<td>Interval</td>
<td>SFSS</td>
</tr>
<tr>
<td>Attitudes</td>
<td>Interval</td>
<td>SFSS</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>Interval</td>
<td>SFSS</td>
</tr>
<tr>
<td>Education</td>
<td>Ordinal</td>
<td>DI, Q:6</td>
</tr>
<tr>
<td>Income</td>
<td>Ratio</td>
<td>DI, Q:7</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Nominal</td>
<td>DI, Q:8</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Nominal</td>
<td>DI, Q:4</td>
</tr>
<tr>
<td>Gender</td>
<td>Nominal</td>
<td>DI, Q:2</td>
</tr>
</tbody>
</table>

Note: Q = question number; DI = demographic instrument; SFSS = Senior Food Safety Survey

Subjective norms, behavior, attitudes, and behavioral intention are constructs directly related to the theory used in this study. Each construct has a series of questions designed to gage participants’ level of food safety knowledge, attitudes, or intention. Education, income, employment status, ethnicity, and gender come from the demographic subscale, which address descriptive statistics necessary to explain some of the demographic characteristics of the sample.

Pilot Study

Before commencement of the current study, the researcher plans to conduct a pilot study. A pilot study precedes the researcher’s larger study (Connelly, 2008). The purpose is to work out any potential issues to test the current study’s instruments for
validity and reliability purposes (Connelly, 2008). The recommended sample size for a pilot study is 10% of the estimated sample size for the larger study (Connelly, 2008). According to Connelly (2008), it is not necessary to conduct a pilot study at more than one location. After approval from the Southern Illinois University Human Subjects Committee, the researcher intends to recruit 28 participants to participate in the pilot study. While the survey that is being used for the current study was initially developed for individuals age 60 and older, the current study is being conducted in a rural setting. Therefore, other demographic variables are likely to be different from the original study data.

The pilot study data allows the researcher to conduct two important analyses: Cronbach Alpha and factor analysis. Cronbach alpha is a measure of internal consistency (Tavakol & Dennick, 2011). The Cronbach alpha analysis yields a result between zero and one (Tavakol & Dennick, 2011). The analysis measures whether or not the constructs associated with the survey questions are related and reliable (Tavakol & Dennick, 2011). Factor analysis is a procedure that increases the interpretability of the relationships between variables in a study (Pohlmann, 2004). For the current study, the researcher will utilize an exploratory factor analysis. Exploratory factor analysis allows the researcher to observe which variables are better suited together (Pohlmann, 2004). Once the researcher collects data from the pilot study, she will analyze the data in SPSS.

Data Collection

Participant Selection

Rural geographical areas are often associated with low socioeconomic status, lack of resources, and disadvantaged communities. Determinants such as socioeconomic status and
access to resources are vital in reducing the incidence of foodborne illness. Jackson and Williamson Counties in Southern Illinois are rural areas with some limitations on resources but not as many as most rural areas. Both of these counties provide several either a Meals on Wheels America program or an older adults’ day center throughout the area. Within these counties, the following cities were chosen to collect data: Murphysboro, Carbondale, and Marion. The researcher chose these locations because they all have both of these programs and actively serve older adults.

The researcher identified several organizations and centers throughout Southern Illinois where adults age 60 and older congregate. The researcher will contact the appropriate liaison at each center after the human subjects committee at Southern Illinois University has approved this study. During operation hours, the researcher will attend meetings and recruit potential participants for the study. For an individual to qualify for the study, he or she must still prepare and cook their own foods at home and be at least age 60 or older.

The researcher will approach potential participants and thoroughly explain the concept of the study. The researcher will inform each subject that participation is voluntary and he or she may withdraw at any time. The researcher will provide any subject who chooses to participate in the study a voluntary consent form before the actual survey. After giving consent, each subject will receive a printed survey with all necessary subscales including the demographic instrument.

**Data Analysis**

After data is collected, the researcher will add all items from each instrument into the software program, Statistical Package for the Social Sciences (SPSS) version 24, and
stored until the duration of the research study. The researcher will use SPSS 24 to conduct all statistical analyses relative to the current research study. Since the researcher has an active license for the SPSS 24 software program, data will be stored on a password protected, personal laptop and kept in the possession of the researcher. No other individual has access to the data or the laptop.

After the pilot study, the researcher will assess the reliability and validity of the instruments used for the study. The researcher will also conduct a Cronbach alpha and factor analysis on each of Likert type scales. Cronbach alpha, also called the coefficient of reliability, is a necessary component of survey research (Cronbach, 1951). Cronbach alpha is a measurement tool designed to assess the relatedness (i.e. consistency) of items on a subscale within a survey (Cronbach, 1951). Nunnally (1967) suggests that a reliable and consistent coefficient is .70 or greater. However, the closer alpha is to 1.00, the more relatedness of items; thus, indicating that the questions on the scale address the same concept (Nunnally, 1967). The researcher will run a linear regression analysis to test if one variable predicts food safety behavior. Linear regression involves on two variables, a dependent variable and an independent variable (Gliner et al., 2009). Therefore, after an established relationship, the objective of a linear regression model is to further examine the relationship of those two variables by applying a line along the point of the observations (Gliner et al., 2009). The researcher will analyze differences between groups with an independent samples t-test under the assumption that the variances are equal and the data is normally distributed. The purpose of an independent samples t-test is to compare the means of two groups (Gliner et al., 2009). The independent variable typically has two levels (Gliner et al., 2009). The researcher will run an ANOVA to
compare differences in means based on Ethnicity. According to Gliner et al. (2009), the purpose of an ANOVA is to compare means when the independent variable has more than two levels, which could otherwise be accomplished by way of the independent samples t-test. The researcher will utilize Pearson’s correlational (i.e. correlation coefficient) test to assess if there is a relationship between variables (i.e. main constructs). The correlation coefficient establishes a relationship or an association between two variables, the independent variable and the dependent variable (Gliner et al., 2009). The coefficient ranges from -1 to 1, which indicates either a strong or weak association among the two variables (Gliner et al., 2009). For each of these analyses described, there is a 95% confidence level (\( \alpha = .05 \)). Table 2 summarizes the research questions and data analyses associated with the current study.

Table 2

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Instrument</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What knowledge do older adults possess regarding food safety?</td>
<td>SFSS</td>
<td>Descriptive</td>
</tr>
<tr>
<td>2. Does socioeconomic status predict food safety behavior?</td>
<td>SFSS</td>
<td>Linear Regression</td>
</tr>
<tr>
<td></td>
<td>DI, Q:6-8</td>
<td></td>
</tr>
<tr>
<td>3. Do subjective norms differ by gender?</td>
<td>SFSS</td>
<td>T test</td>
</tr>
<tr>
<td></td>
<td>DI, Q: 2</td>
<td></td>
</tr>
<tr>
<td>4. Do attitudes towards food safety differ based on ethnicity?</td>
<td>SFSS</td>
<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td>DI, Q: 4</td>
<td></td>
</tr>
<tr>
<td>5. Do subjective norms surrounding food safety behaviors predict behavioral intention with respect to proper food safety behaviors?</td>
<td>SFSS</td>
<td>Linear Regression</td>
</tr>
<tr>
<td>6. Do attitudes toward foodborne illness predict behavior intention with respect to proper food safety behaviors?</td>
<td>SFSS</td>
<td>Linear Regression</td>
</tr>
<tr>
<td>7. Is there a relationship between attitudes, subjective norms, and behavior intention?</td>
<td>SFSS</td>
<td>Pearson’s Correlation Coefficient</td>
</tr>
</tbody>
</table>
Summary

The purpose of this chapter was to provide the methodological details of the current study. This chapter provided detail information on the quantitative study design, as well as information regarding how the researcher intends to recruit participants. The researcher also shares where the survey for the current study were adopted and modified as per request granted from the original authors. The final portion of this chapter included data analysis for each of the research questions associated with study. The researcher also provided two tables that summarize variables, research questions, and data analysis methods.
References


Dickinson, A., Wills, W., Meah, A., & Short, F. (2014). Food safety and older people:


adjusted life year losses in the United States due to 14 foodborne pathogens. *Journal of food protection, 75*(7), 1292-1302.


adults. Clinical Infectious Diseases, 42(9), 1298-1304.


1. Do you cook and prepare your own meals at home?
   □ Yes □ No

2. What is your gender?
   □ Female □ Male

3. What is your age?
   □ 60-65 □ 66-70 □ 71-75 □ 76-80 □ 81-85 □ 86-90 □ 91 or older

4. What is your Ethnicity?
   □ African American/Black □ Asian/Pacific Islander □ American Indian/Alaskan Native
   □ Caucasian/White □ Hispanic/Latino

5. Do you suffer from a chronic disease (high blood pressure, diabetes, high cholesterol, etc.)?
   □ Yes □ No

6. What is your highest level of education?
   □ Less than high school □ High school diploma □ Bachelor’s degree
   □ Master’s degree or higher

7. What is your income range?
   □ Less than 10,000 □ 11,000-20,000 □ 21,000-30,000 □ Greater than 30,000

8. Are you employed?
   □ Yes □ No
APPENDIX B

KNOWLEDGE SCALE

9. Adults aged 60 years and older should reheat hot dogs and deli meats to steaming hot before eating.
   □ True □ False

10. Adults aged 60 years and older should not eat cold deli salads.
    □ True □ False

11. Adults aged 60 years and older should not eat soft cheeses (blue, feta, Camembert, Brie, or queso fresco) made from unpasteurized milk.
    □ True □ False

12. Adults aged 60 years and older should not eat raw or undercooked seafood (e.g., sushi, ceviche, raw oysters, etc.).
    □ True □ False

13. Adults aged 60 years and older should not eat refrigerated smoked seafood.
    □ True □ False

14. Adults aged 60 years and older should avoid eating raw or undercooked meat or poultry (e.g., rare or medium-rare hamburger, steak tartar, etc.).
    □ True □ False

15. Adults aged 60 years and older should cook eggs until both the yolk and whites are firm.
    □ True □ False

16. Adults aged 60 years and older should avoid foods that contain raw or undercooked eggs (e.g., raw homemade cookie dough and homemade Caesar salad dressing).
    □ True □ False

17. Adults aged 60 years and older should only drink fruit juices, vegetable juices, or ciders that have been pasteurized.
    □ True □ False
APPENDIX C

ATTITUDES SCALE

18. I am knowledgeable about how to keep the food I prepare and eat at home safe.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

19. I know I could do more to keep the food I prepare and eat at home safe.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

20. I am interested in learning more about how I can keep the food I prepare and eat at home safe.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

21. I think contamination of food by bacteria or viruses is a serious problem.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

22. Because I am 60 years old or older, I am at an increased risk of getting food poisoning or food-borne illness.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

23. I am concerned about getting food-borne illness or food poisoning from food I prepare at home.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

24. I am concerned about getting food-borne illness or food poisoning from food I eat away from home.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

25. I am concerned about getting foodborne illness if I don’t practice food safety at home.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree
APPENDIX D

SUBJECTIVE NORMS SCALE

The next set of questions will ask you questions about how likely or unlikely people close to you approve of you doing certain things in your home.

26. I thaw perishable food on the kitchen counter.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

27. I do not use cheese and yogurt made only from pasteurized milk.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

28. I do not cook my hamburger patties until the temperature in the middle is 150 degrees.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

29. I use raw eggs in recipes that will not be cooked.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

30. I leave cooked rice at room temperature for more than 4 hours.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

31. It is okay for me to prepare food for others and family if you I diarrhea, if I wash my hands first.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

32. I do not cooking eggs until both the yolk and white are firm.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

33. If I use a dishcloth to wipe up liquid from meat or chicken, I can safely continue to use the cloth for washing dishes if I rinse the dishcloth in hot water.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely

34. I may get sick if I eat hot dogs right out of the package.
   - Highly Unlikely
   - Unlikely
   - Likely
   - Highly Likely
APPENDIX E

BEHAVIORAL INTENTION SCALE

The next set of questions will ask you questions about your intent to practice food safety or follow certain food safety guidelines in your home.

35. After preparing raw meat, poultry, seafood, or eggs, wash cutting boards, utensils, dishes, and countertops with soap and water before using again.
   - Will Not Follow
   - Already Follow
   - Will Follow

36. Wash hands for 20 seconds with soap and warm water before handling food.
   - Will Not Follow
   - Already Follow
   - Will Follow

37. Wash hands for 20 seconds with soap and warm water after handling raw meat, poultry, seafood, or eggs.
   - Will Not Follow
   - Already Follow
   - Will Follow

38. Do not use the same dish for raw and cooked meat, poultry, seafood or eggs.
   - Will Not Follow
   - Already Follow
   - Will Follow

39. Use a food thermometer to be sure food has reached a safe/required minimum internal temperature to destroy harmful bacteria.
   - Will Not Follow
   - Already Follow
   - Will Follow

40. Reheat leftovers containing meat, poultry, seafood, or eggs to 165F or until steaming hot before serving.
   - Will Not Follow
   - Already Follow
   - Will Follow

41. Thaw raw meat, poultry, or seafood in the refrigerator, using the microwave, or in constantly running cold water (proper drainage).
   - Will Not Follow
   - Already Follow
   - Will Follow

42. Store leftovers containing meat, poultry, seafood, or eggs in the refrigerator for no more than 5 days.
   - Will Not Follow
   - Already Follow
   - Will Follow

43. Store large amounts of leftovers, such as soups or stews, containing meat, poultry, seafood, or eggs in small and shallow (2 inches or less) containers in refrigerator.
   - Will Not Follow
   - Already Follow
   - Will Follow
APPENDIX F

CONSENT FORM

Consent for the In-home Food Safety Behaviors of Older Adults Study

Consent to Participate in Research

I agree to participate in this research project conducted by Catarina Davis, SIU-Carbondale.

I understand the purpose of this study is to assess the influences, of attitudes, subjective norms, and behavioral intention regarding my food safety practices at home.

I understand my participation is strictly voluntary and I may refuse to answer any question without penalty. I am also informed that my participation in the survey will take approximately 15 to 30 minutes.

I understand that my responses to the questions will be kept confidential and secured for 5 years or 1 year after publication in a locked file on my personal laptop.

I understand questions or concerns about this study are to be directed to Catarina Davis, cadav2015@siu.edu or her advisors Dr. Juliane Wallace, juliane@siu.edu and Dr. Saran Donahou, donahoo@siu.edu.

Completion of the survey indicates your voluntary consent to participate in this study. There are no anticipated risks for your participation in this study. I am over the age of 18 and have read the information above and any questions I asked have been answered to my satisfaction. I understand a copy of this form will be made available to me for the relevant information and phone numbers.

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. Email:siuhsc@siu.edu.
APPENDIX G

MEALS ON WHEELS PERMISSION LETTER

Dear Program Director:

It was a pleasure speaking with you over the phone. I am writing a follow-up letter to our phone conversation per your request.

When I first contacted you over the phone, I explained to you that I am a PhD candidate at SIU Carbondale who is planning to conduct research on the in-home food safety practices of older adults who are ages 60 and older. I asked for your permission to come into your center asking participants if they would voluntarily complete my survey. You gave me verbal permission over the phone.

Therefore, this letter serves as a written permission slip for you to sign so that I may submit this letter to the human subjects committee for review before I am able to actually come into your facility and start surveying.

I greatly appreciate your assistance.

Sincerely,

Cataria Davis
PhD Candidate
Department of Public Health
Southern Illinois University

I, ____________________________________________, program director, give Cataria Davis permission to come into our center and ask clients to voluntarily participate in her survey.

If there are any questions please contact me Cataria Davis cadav2015@siu.edu or my advisors Dr. Julianne Wallace, julianne@siu.edu and Dr. Suan Donahoo, donahoo@siu.edu.

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu
Older Adults Survey

Cataría Davis

Wed 5/3/2017 12:56 PM
Sent items

To: scc@rti.org <scc@rti.org>

Mrs. Cates,

I am a PhD candidate in public health education. I am writing in regards to a survey you used in a study on older adults and their food safety habits. I'm preparing for my dissertation and I am looking for a survey that may fit my study. Is it possible for me to use your survey that you used for the study entitled "Food Safety knowledge and Practices among Older Adults: Identifying Causes and Solutions for Risky Behaviors"?

Thanks,

Cataría Davis, MS, MPH, CHES
Undergraduate Instructor, HED
Ph.D. Student, Health Education & Health Behaviors
Department of Health Education and Recreation
Southern Illinois University
Carbondale, IL

"An ounce of prevention is worth a pound of cure"
Benjamin Franklin
RE: Older Adults Survey

Cates, Sheryl <scc@rti.org>

Tue 5/9/2017 9:20 AM

To: Cataria Davis <cadav2015@siu.edu>

Yes, thank you for checking.

From: Cataria Davis [mailto:cadav2015@siu.edu]
Sent: Tuesday, May 09, 2017 10:15 AM
To: Cates, Sheryl <scc@rti.org>
Subject: Re: Older Adults Survey

Mrs. Cates

Thank you for your response. May I have your permission to modify your survey as needed for the purposes of my study?

Thanks

Cataria Davis, MS, MPH, CHES
Undergraduate Instructor, HED
Ph.D. Student, Health Education
Department of Health and Recreation
Southern Illinois University
Carbondale, IL

On May 9, 2017, at 8:26 AM, Cates, Sheryl <scc@rti.org> wrote:

Ms. Davis,
Thank you for your interest in my research. I apologize for the delayed response. The questionnaire for our survey is attached.

Thank you,
Sheri Cates