ABSTRACT

COPE, SARAH J. Evaluating the Communication of Food Safety to Consumers (Under the direction of Dr. Jackie Bruce and Dr. Benjamin Chapman).

Foodborne illness is a burden to public health and economies around the world because these illnesses can lead to financial loss from long-term health issues, hospitalizations, and even death. In the United States, there are an estimated 48 million cases of foodborne illness per year. There are a variety of recommended methods for controlling the burden of foodborne illness; these include clean, separate, cook, and chill. These four elements should be practiced by consumers in the home to prevent foodborne illness. However, it is difficult to communicate to consumers how to safely prepare foods in their own homes. Consequently, the purpose of this thesis research was to gain insight into consumers’ behaviors, perceptions, and attitudes surrounding food safety in the home, while also analyzing the effectiveness of food safety campaign communication interventions.

A review of related literature was conducted to gain insight into consumer behaviors and perceptions as they relate to clean, separate, cook, and chill within the home followed by an analysis of food safety campaigns on educating consumers how to safely handle food. Research shows consumers are not taking all of the precautions they should be when handling food. Food safety campaigns need to be redesigned and continuously evaluated in order to better reach and impact consumers preparing food in the home and determine efficacy. To address these concerns, several studies were conducted.

A study comprised of a telephone survey and one of focused group discussions were conducted to understand if a pilot of a national food safety campaign (160isgood.com) impacted food safety perceptions, attitudes, and self-reported behavior changes. A second exploratory study was conducted to gain insight into consumers’ knowledge on and how consumers are
handling new and emerging food trends, meat bars, using an online questionnaire. The final study gathered the self-reported perceptions, habits, and behaviors on handwashing practices of consumers using interviews. The results from these studies indicated that more effective campaign methods targeting food safety practices need to be developed. Communicating the importance of digital food thermometer use, how to utilize safe preparation techniques when making meat bars, and communicating the importance and steps of proper handwashing in the kitchen should be topics of focus.

The findings of these research studies all indicate that consumers are not following proper food safety guidelines within home kitchens and that tailored and targeted food safety campaign messages need to be developed and adequately shared with consumers. Overall, a food safety campaign should educate and inform on why food safety is necessary while providing direct and simple solutions to practice proper food safety methods in the home. An ideal food safety campaign would be captivating, prevalent in the target population’s environment, evoke emotion, provide ample food safety solutions to the emotion, and change the consumers’ behaviors so that they feel the need to practice safe food handling techniques when preparing food in the home. Consumers need to be reached on multiple levels and through various means to truly grasp the importance of food safety for overall health and general well-being.
Evaluating the Communication of Food Safety to Consumers

by
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DEDICATION

To my mom, dad, and brother for your endless love, encouragement, and inspiration to always strive to continue to learn, work hard, and be the best that I can be. Thank you for always believing in me, supporting me to follow my dreams, and providing me with the opportunity to grow. I would not be where I am or who I am without you.
BIOGRAPHY

Sarah Cope was born in La Crosse, Wisconsin and raised in Apex, North Carolina. She is the daughter of Greg and Jaimie Cope and younger sister to her brother, Bobby Cope. Sarah has fond memories of growing up baking treats and sewing doll clothes with her grandmother, which is where her love for Family and Consumer Sciences began. When Sarah got to high school, the first class of her first semester was a Family and Consumer Sciences course that introduced the students to foods and nutrition, sewing and fashion, housing and interior design, and money management, alongside many additional life skills. She enjoyed this class thoroughly and the teacher of the course continued to be an inspiration and role model to Sarah throughout her high school career, where she went on to take an additional nine Family and Consumer Sciences courses. Upon her graduation from high school, Sarah went on to receive her Bachelor of Science degree in Family and Consumer Sciences Secondary Education from East Carolina University in 2017, where she dreamed of teaching high school students the important and necessary life skills they would one day need to become impactful members of society. However, while working on her Bachelor’s degree, Sarah began a position as an undergraduate research assistant working in food safety at North Carolina State University. She found her passion learning about food safety, research, and the importance of educating consumers about the risks of food and how to handle food safely. So, with a continued drive to teach and impact the betterment and health of the public through education, Sarah decided to continue her education and pursue a graduate degree that would enable her to become an Extension Agent where she can educate both children and adults about the importance of food safety. Sarah is eager to share her passion for food safety by educating the public on how to stay happy, healthy, and safe.
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INTRODUCTION AND THEORETICAL FRAMEWORK

Foodborne illness is a burden to human health and economies around the world because these illnesses can lead to financial loss from long-term health issues, hospitalizations, and even death (CDC, 2018). Specifically, in the United States there are approximately 48 million cases of foodborne illness per year that occur due to thirty-one known pathogens, as well as additional unspecified agents transmitted through food (CDC, 2018). This equals roughly one in six Americans getting sick from foodborne diseases per year. Of those, approximately 128,000 are hospitalized and 3,000 die from their contracted foodborne diseases (CDC, 2018). Therefore, there are a variety of recommended methods of controlling the burden of foodborne illness including the best practice of clean, separate, cook, and chill (CDC, 2017). These four core elements of food safety should be practiced by consumers in the home to prevent foodborne illnesses (CDC, 2017).

Research on consumer food handling behaviors in the home is generally lacking and often outdated, with the most recent review of consumer food safety studies occurring in 2003 (Redmond & Griffith, 2003). Additional, past research suggests that consumers believe that foodborne illnesses occur most commonly in restaurant and food vendor locations. Further, consumers are also under the impression that it is extremely unlikely to contract a foodborne illness from food prepared in the home (Redmond & Griffith, 2004). Conversely, it is reported that anywhere from approximately 9% to 50% of foodborne illnesses occur due to improper food handling techniques in consumers’ personal home kitchens (Redmond & Griffith, 2003). These consumer perceptions of where foodborne illnesses are commonly contracted are presumed to still be true.
Because consumers don’t understand the risk of foodborne illness in the food they prepare in their homes, they do not practice adequate food handling behaviors. Consumers should be educated that the food they receive to handle and prepare in the home does not come completely free of any foodborne diseases (Wilcock, Pun, Khanona, & Aung, 2004). In a meta-analysis using the findings from twenty different studies, researchers found consumers engaging in a number of risky behaviors, including the consumption of raw or undercooked foods, improper hygiene and cleaning methods, and cross-contamination between raw and ready to eat foods (Patil, Cates, Morales, 2005). Effective outreach efforts are needed to educate the public on safe food handling.

Understanding that consumers do not recognize the risk of foodborne illness from foods in the home and that they do not handle and prepare food safely in the home, many food safety campaigns and educational materials have been developed to attempt to educate the public on food safety. Safe handling instructions on raw meat packages, nationwide campaigns, and smaller campaigns targeting specific populations have all been utilized (USDA FSIS, 2013; Partnership for Food Safety Education, 2019 and Abbot, Policastro, Bruhn, Schaffner, & Byrd-Bredbenner, 2012). However, there is no research that investigates the effectiveness of these methods in educating consumers and changing their food handling behaviors. Therefore, additional research is needed to determine what food safety practices consumers exhibit in the home and also what methods of food safety education are best for consumers.

This research begins with in-depth consumer and campaign studies. The objectives of the studies were to gather consumer behavior and perception data and to evaluate the efficacy of a digital food safety media campaign (160isgood.com) focused on the communication of food safety practices. The campaign focused on the safe handling and the internal cooking
temperature of grilled ground beef hamburger patties in relation to Shiga-toxin producing *Escherichia coli* (STEC). In-depth information was gathered on these topics from community members where the campaign was delivered in (Chapter 2 and Chapter 3). These studies were conducted through a telephone survey for quantitative analysis and focused group discussions for qualitative analysis.

Following those studies, is an exploratory study to gain insight into consumers’ knowledge on, and how consumers are handling, new and emerging food trends (Chapter 4). The research intended to determine who eats meat bars and how consumers make meat bars (if they do not purchase pre-made ones) and determine how to reach consumers to teach them how to safely make meat bars. Meat bars, or bars of meat usually made from organic or grass-fed meat with spices and dried fruit, are savory, soft, and chewy with a hint of natural sweetness.

The final study was a qualitative research study that detailed the self-reported perceptions, habits, and behaviors on handwashing of the general population (Chapter 5). Perceptions, habits, and behaviors were analyzed to compare the participants who had taken a college-level general microbiology course and those who had not taken the course. These findings will aid in analyzing what consumers know about hand hygiene as it relates to food safety and what they still need to know.

Across these studies, insight into consumers’ behaviors, perceptions, and attitudes surrounding food safety was gained. These studies provided a foundation of exploring consumer food safety compliance. Consumers need to be engaged to grasp the importance of food safety and change their behaviors.

**Theoretical framework.** It is important to structure behavior change research on a theoretical framework. Food safety practice is a behavior and motivation driven aspect of one’s
daily routine; therefore, the Reasoned Action Approach (RAA) framework and the Extended Parallel Process Model (EPPM) framework are appropriate foundations. Each of these frameworks can provide insight into consumer food safety behaviors and how food safety campaigns can impact or change these behaviors by stressing the importance and motivation factors of food safety. This is exhibited through the multiple factors and components that play a role in the frameworks. These two frameworks are best applied to this research because of their emphasis on intent to behave and the influence of messaging on behaviors. Behavior is determined by intentions and controlled by one’s actual ability to behave and messages that attempt to persuade audience members to adopt healthy behaviors may have an impact on behaviors. With this understanding insight can be gathered to help determine best practices for developing food safety campaign messaging that will induce behavior change.

The RAA framework states that attitudes towards a certain behavior, plus a persons’ perceived norms regarding that behavior, plus their perceived control over the behavior, all add up to determine people's intent to behave. People's intentions predict their actual behaviors (Fishbein & Ajzen, 2010). Attitudes, perceived norms, and perceived behavioral control, when acknowledged in a positive manner, can all positively impact one’s intent to behave. The RAA framework is rooted in the Theory of Reasoned Action and Theory of Planned Behavior. These two theories were formulated by Fishbein and Ajzen in the 1980s resulting from research attempting to differentiate between attitude and behavior. Fishbein and Ajzen have continued to research these two theories over the years. As researchers have applied the theories in studies Fishbein and Ajzen were able to learn more about human psychology and behavior. Therefore, the RAA framework was developed to help researchers to explain and change behavior. Specifically, when dealing with health promotion the objective of the RAA is to identify the
beliefs that would like to be changed or strengthened in order to change or reinforce that given behavior (Fishbein, 2008). Therefore, a successful food safety campaign should include ways to create positive attitudes towards food safety, address societal norms surrounding food safety, and provide advice on how to control food safety in the home. This concept of using food safety campaigns to influence intent to behave then ties to the goal of EPPM framework.

EPPM is a framework that utilizes research to determine how individuals will likely react when faced with a fear inducing stimuli (Witte, 1992). The EPPM framework is most commonly applied in health communication campaigns because health communication campaigns typically attempt to persuade audience members to change their behaviors towards a healthier focus. The model of EPPM depicts that first a fear is induced related to the unhealthy behavior through a message and then a solution is provided to encourage the healthier behavior change within the same message. More specifically, in order for fear-based campaigns to be effective, they must induce a moderately-high level of fear that depicts a true need to change behavior and then also include a higher level of self-efficacy and response efficacy (Witte, 1992). If the fear provoked is at a higher level than the level of the audience member’s ability to change the situation, then the campaign message will be ineffective. Therefore, the main goal of the EPPM framework is to evoke a fear and provide an adequate, effective, and plausible solution to reduce the fear all in one campaign message. However, research has been done that supports the EPPM framework can go beyond fear-based campaigns and apply to any emotion-based messages (Lewis, Watson, & White, 2013). This provides context to the development and evaluation of emotion-based health messages for health topics, such as the application to food safety messaging because food safety is a public health matter. There are severe implications of contracting a foodborne illness including possible hospitalization and death, which are typically associated with fear. Feelings of
satisfaction may also arise from practicing proper recommended food safety procedures. Due to the emotions and health benefits that occur from public health campaigns the EPPM framework is commonly tied to these messages.

These two frameworks predict health-related behavioral intention when a health message campaign is being utilized better than other behavior change frameworks because together they explain and predict specific behaviors. It is important to pair these two frameworks together because RAA works towards understanding behavior while EPPM focuses on changing behavior, and a theme of this thesis is to understand the food safety behaviors consumers are performing in their homes and then utilize food safety campaigns to change their behaviors to be healthier and safer. Each of the research studies located within this thesis will be analyzed in accordance with the RAA and EPPM frameworks to provide insight into the successful development of future food safety campaigns.

When applicable for the qualitative research components, the positionality statement includes that the research was conducted with awareness of implicit and subconscious bias. An honest report of personal factors that could have influenced decisions and interpretations of the research and data is included here. The research was conducted by a 23-year-old, white, English speaking, female who was a college-educated first year graduate student, who was located and raised in the southern region of the United States. A reflexivity journal was maintained to document and log assumptions, opinions, and decisions regarding personal opinions about the importance of food safety or the interviewees made throughout the research process that could have affected the research.

Lastly, when applicable for the qualitative research components of this thesis trustworthiness is addressed. Lincoln and Guba (1986) recommend trustworthiness be exhibited
in qualitative research. The four qualities of trustworthiness include: credibility, transferability, dependability, and confirmability (Lincoln, Y. S. and Guba, E. G., 1986). For the current research, credibility was achieved by having members in the profession, yet outside of the research team, review the study for credibility to determine if the results seem to align with the data. Transferability is possible through the application of the described methods to other populations or scenarios. Lastly, dependability and confirmability can be achieved through an audit. The methods are stated in a way that not only make the research transferable, but also in a way that another researcher could follow and implement the study thereby making it dependable. An audit trail of raw data, field notes, and documents were kept should an audit be conducted to prove the confirmability of the research. All four of these qualities are critical to the rigor and trustworthiness of the study.

The research objective of this thesis is to determine best practices for educating consumers how to safely handle and prepare food in their own homes regarding thermometer use in ground beef hamburger patties, thermometer use when making meat bars, and handwashing practices. Within this objective, research will be done to determine what food safety practices consumers exhibit in the home and what methods of food safety education and messaging are best for consumers specific to ground beef hamburger patties, meat bars, and handwashing. Throughout this research, insight will be gained into consumers’ behaviors, perceptions, and attitudes surrounding beef, meat, and handwashing food safety. A foundation of exploring consumer food safety behaviors will be developed and analysis will occur on how to engage consumers so they grasp the importance of food safety. Additional analysis will occur on how to change consumer’s behaviors so they will practice safer food safety procedures in the home. The overall conceptual framework of this research will address the consumer’s responsibility for
preventing foodborne illness through personal food safety handling and preparation behaviors in the home. This insight will help build successful food safety campaigns to reach consumers in the home.
REFERENCES


CHAPTER 1

Consumer Food Handling in the Home and Food Safety Campaigns:
A Review of Related Literature

INTRODUCTION

Consumers do not receive engaging messages and communication regarding food safety measures that they can take when handling and preparing food in their own homes. Additionally, the food safety of consumers in the home is under-researched. Therefore, it is not only difficult to determine the current practices in place by consumers regarding food safety, it is also difficult to deduce what the role of message development, marketing, and communication should be by government agencies, grocery stores, and extension services on educating consumers how to clean, separate, cook, and chill foods safely. With unknown food handling practices occurring in homes across the world, and some that are likely unsafe, there is an evident need for adequate and effective communication, persuasion, and educational outreach methods to inform consumers on how to handle food safely in the home.

In the early 2000s, the topic of consumer food safety behaviors in the home was of higher interest than it is currently due to an influx in food monitoring and microbiological studies surrounding food safety (Infiniti Research, 2018). Since then, minimal research has been done that expands on how consumers handle food in the home. Therefore, past research will be analyzed in conjunction with more current research, where it is available, in order to gather well-rounded insight into current consumer food safety attitudes and behaviors in the home. Following the examination of food safety attitudes and behaviors of consumers, an analysis of past and current food safety campaigns will be done to analyze their components.
The objective of the current review of related literature is to examine past research on consumer food safety perceptions, attitudes, and behaviors in the home, as well as the efficacy of past food safety campaigns geared towards consumers. This examination of the literature will address the objective of the thesis that aims to determine what food safety practices consumers exhibit in the home and what methods of food safety education and messaging are best for consumers. The current review of related literature will collect the positive and negative results and components of each research study and food safety campaign to provide a foundation on the topics, identify relationships amongst research, and provide context as to why the consequent thesis research was conducted.

A structured review of the literature was conducted in order to provide a thorough analysis on a limited literature selection. First, an initial literature search was done using Google Scholar and the key terms “home food safety practices” which yielded 2,460,000 results. Articles were included if they pertained to food safety attitudes and/or behaviors and dealt with consumers in the home. The top article, *Consumer Food Handling in the Home: A Review of Food Safety Studies*, by Elizabeth C. Redmond and Christopher J. Griffith and published in 2003 provided a baseline of information. Then, the list of articles that Redmond and Griffith’s 2003 article had been cited in were first reviewed by title to exclude any irrelevant studies. Abstracts of the articles deemed relevant were then reviewed to determine final inclusion. Following this selection of literature, the first two pages of results from the initial Google Scholar search were reviewed and included following the same criteria. The first two pages of results were reviewed due to the accuracy of the search algorithms that provide rank to the most relevant and useful information on the web (How Search algorithms work, n.d.). Articles on food safety behaviors in the home were analyzed.
To find articles relating to past and current food safety campaigns an additional Google Scholar search was initiated using the key terms “food safety campaign” which yielded 756,000 results, the same inclusion criteria were used. Final inclusion was selected if the article dealt with food safety campaigns geared towards consumer behaviors in the home. Articles were then separated and grouped based off of similar campaigns.

Articles relating to consumer food safety behaviors and perceptions in the home were separated by the core four food safety messages of clean, separate, cook, and chill for analysis. The main focus of this research is on the two elements of clean and cook. The food safety element was searched using the Google search bar to provide more information and background on the element and then consumer attitudes and behaviors were grouped in the analysis. This led to the inclusion of websites and articles. This section is followed by the analysis of past and current food safety campaigns for consumers in the home. All articles and websites were read thoroughly and sections of the articles were highlighted to allow for comprehension, summarization, and comparisons to be made. Mendeley Reference Management Software and Researcher Network was used for article analysis. Mendeley functions such as PDF viewer with sticky notes, text highlighting, full-screen reading, full-text search across papers, and citation creation were utilized for this process.

**STUDIES AND MESSAGES**

**Clean.** Handwashing is the very first line of defense one partakes in when stepping into a kitchen to prepare food in order to prevent the spread of foodborne illness. This cleaning process rids the hands of any diseases that may spread to the food that the hands will touch. Not only is when one washes their hands important, but the practices they implement are also key. In a recent study focused on hand hygiene in relation to food safety that was comprised of twenty
participants, various hand washing conditions were tested in replicates of twenty. The experiment was conducted to examine the effects of the various handwashing variables on the removal of a specific strain of *E. coli*. The participants were exposed to the bacteria and then prompted to wash their hands under a variety of conditions. Water temperature and choice of either antibacterial or basic soap were used did not affect the removal and reduction of the *E. coli* bacteria during handwashing. Lather time did create 0.5-log reduction compared to a baseline wash (Jensen, Macinga, Shumaker, Bellino, Arbogast, & Schaffner, 2017). Additionally, it has been found that handwashing with non-antibacterial soap and water is more effective for the removal of bacteria from hands than handwashing with water alone, or the rinsing of hands, in relation to bacteria of potential fecal origin (Burton, M., Cobb, E., Donachie, P., Judah, G., Curtis, V., & Schmidt, W.-P., 2011). Understanding what factors are critical in the effectiveness of handwashing, researchers can better understand what constitutes proper handwashing, and analyze why populations choose variables including water temperature, scrub time, and type of soap.

Handwashing within the home is a difficult phenomenon to study because of the observer effect. It is extremely difficult to gather unbiased data from general populations on their true habits and behaviors when it comes to hand hygiene just because there is such a stigma surrounding handwashing. In a recent survey where participants were asked to rate how important they feel it is to wash their hands after various activities in the home, 90% of respondents said that it is very important to wash your hands after petting animals, using the restroom, handling raw meat, and taking out the garbage (Scott & Herbold 2010). Therefore, there is an understood need to wash hands after doing various activities, however, when in the actual situation many people may not actually wash their hands after these activities.
Scott and Herbold (2010) surveyed and held observations with consumers within 30 households. Over 50% of respondents said that effective handwashing takes twenty seconds to prevent foodborne illness when they were making a meal. Yet during observations close to 50% of participants washed their hands for ten seconds or less with times ranging from one second to thirty second scrubbing times (Scott & Herbold 2010). The results of the study compare the differences between the participant’s reported beliefs from the questionnaire and their actual practices recorded in the observations and depict that consumer perceptions do not align with consumer behaviors.

Just as pathogens can be spread from hands to food, diseases can also be spread from the surfaces food comes into contact with, including countertops, cutting boards, dishes, and utensils to the food. That is why cleaning is necessary. After cleaning these surfaces that food normally comes into contact with or may drip or splash onto, they should then be sanitized. Sanitization, as defined by the U.S. Food and Drug Administration (FDA) Food Code, is “the application of cumulative heat or chemicals on cleaned food contact surfaces that, when evaluated for efficacy, is sufficient to yield a reduction of 5 logs, which is equal to a 99.999% reduction, of representative disease microorganisms of public health importance” (FDA, 2017).

A 1999 Australian study was conducted where food handling practices were observed by video recording within participant households. Prior to the observations, participants participated in a food safety questionnaire where they stated their level of proper hygiene and food preparation techniques. The observations show that observed behaviors differed from questionnaire responses in 10 to 70% of the households regarding safe kitchen techniques (Jay, Comar, & Govenlock, 1999). It is evident that consumers need to be educated on proper food safety. For example, approximately 35% of the participants did not wash their utensils between
the preparation of different foods and approximately 30% of the participants did not clean the food contact surfaces before preparing ready to eat foods (Jay, Comar, & Govenlock, 1999).

A more recent study conducted in 2011 stated that approximately 26% of the participants specifically mentioned that they would clean surfaces and utensils before use as a way of preventing foodborne illness (Phang & Bruhn, 2011). This percentage is quite low because food safety recommendations state that all food preparation surfaces and utensils should be cleaned before use. The study was interested in burger preparation in the home and consisted of a questionnaire and video observation. Questions arise whether it can be inferred that within the 10 years between these 2 studies if food safety messaging surrounding the importance of cleaning and sanitizing food contact surfaces were effective or not.

Separate. Separating raw foods and ready to eat foods prevents cross contamination. Cross contamination is defined as the physical movement or transfer of diseases from one person, object, or location to another (MDH, 2007). Therefore, preventing cross contamination plays an important role in preventing foodborne illness. As mentioned previously, washing hands and food contact surfaces prevents cross contamination. Another method, and one of the most important, is through the use of separate cutting boards for raw foods and ready to eat foods. It is recommended to prepare ready to eat foods, before preparing raw foods, so as to not cross contaminate any possible diseases on the raw food to the ready to eat food (FDA, 2017).

In a research study done in 2004 where ninety-nine consumer’s actions were video recorded while preparing a meal in the home, nearly all of the participants cross contaminated some sort of raw foods with ready to eat foods in multiple instances within one single meal preparation (Anderson, Shuster, Hansen, Levy, & Volk, 2004). Approximately 84% of the cross contamination instances involved potentially contaminated raw meat or eggs contaminating
ready to eat foods (Anderson, Shuster, Hansen, Levy, & Volk, 2004). This large percentage of participants depicts just how reckless and unaware of food safety practices consumers are when they prepare food in the home. In a more recent study (2018), researchers observed each participant practice cross contamination of raw poultry (Mazengia, Fisk, Liao, Huang, & Meschke, 2018). The potentially contaminated raw poultry lead to either the direct or indirect contamination of the hands of the participant, kitchen utensils, the kitchen environment, product containers, and/or devices within the home kitchen (Mazengia, Fisk, Liao, Huang, & Meschke, 2018). These findings reinforce how prevalent cross contamination is in home-kitchens and further how current proper food handling messaging and communication is not effective in reaching consumers.

**Cook.** The most accurate and most reliable way to make sure a food is free from foodborne diseases is by the proper cooking of foods by reaching a safe internal temperature measured with a calibrated food thermometer before removing the food from the heat source (USDA FSIS, 2015). A thermometer should always be used when cooking meat, poultry, and eggs and should be inserted into the thickest part of the food item to ensure the entire product has reached the safe internal temperature (USDA FSIS, 2011b). The temperature at which different pathogenic microorganisms are destroyed varies, therefore, it is critical to check for the correct temperature when cooking different food products (USDA FSIS, 2011b). Many consumers in the home prefer to rely on color as an indicator of doneness, however, color is an unreliable indicator (USDA FSIS, 2011b). For instance, a ground beef hamburger patty may be brown all the way through and still not reach a safe internal cooking temperature that would kill all of the possible microorganisms in the meat. Similarly, a ground beef hamburger patty that has reached a safe internal temperature may still appear pink or red in the center (USDA FSIS, 2011b).
Historically, consumers have never adequately used food thermometers when preparing food in the home due to their lack of presence in homes. From an observation and survey study conducted in 2004, it was reported in the survey portion that very few of the participants owned a food thermometer and of those that did, only about half of them were confident in their ability to use it correctly (Anderson, Shuster, Hansen, Levy, & Volk, 2004). Then, from the observation portion of the study, very few (n=5) of the participants used a food thermometer to check for doneness, while almost 90% relied on visual indicators such as changes in color and texture to determine doneness when cooking an entrée that included a meat product (Anderson, Shuster, Hansen, Levy, & Volk, 2004). People often tend to refer back to the appearance of a product to determine when it is done even though appearance has nothing to do with the overall safety of the product, typically because that is what they have been taught or they feel they are experienced enough to simply know when something is done. However, thermometer use is the only way to determine if a food is safe to consume; therefore, it should be in the interest of food safety educators on all levels to share the importance of using a food thermometer to consumers cooking in the home.

In 2011, a video observation study reported that 53% of participants indicated that they owned a meat thermometer; however, only 33% of those participants said that they knew how to use a thermometer to test the doneness of burgers (Phang & Bruhn, 2011). In the observation portion of the study, actual use of a thermometer to check doneness occurred in only 4% of the households (Phang & Bruhn, 2011). So, while it can seem hopeful that approximately half of the study participants owned a meat thermometer, very few felt confident in their abilities to use it and even fewer actually even attempted to use it when preparing food. In terms of the perceptions and attitudes of these participants, the majority stated that they would not use a
thermometer to check the doneness of burgers and half of them also felt that using a thermometer to do so was not necessary (Phang & Bruhn, 2011). So, not only do food safety educators need to educate on the use of food thermometers but also their importance and how to use them.

In 2016, the Food and Drug Administration conducted a food safety survey of approximately four thousand participants without an observational study, and found that 67% of respondents reported owning a food thermometer (Lando, Varrill, Liu, & Smith, 2016). However, as in previous studies, actual use of the thermometer is much lower than ownership with a reported 38% of participants always using a food thermometer for roasts, compared to 19% for chicken, 10% for hamburgers, and only 6% for baked egg dishes (Lando, Varrill, Liu, & Smith, 2016). This reported thermometer use is very small and quite alarming in terms of food safety.

In 2018, thermometer use is still not prevalent, which indicates consumers are not preparing and consuming safe foods. These actions put consumers at risk for contracting a foodborne illness. In a final study report of research that consisted of a possible intervention, observation, and interview, approximately 60% of the participants in the research study reported owning a food thermometer in their home. However, when the participants were observed in a test kitchen, approximately 30% of the control group that did not receive the intervention attempted to use a thermometer. Although, 75% of participants who were exposed to an educational video on thermometer use (the intervention) attempted to use a thermometer to check doneness (Cates, Thomas, Kosa, Chapman, Shelley, Goulter, et. al., 2018). The thermometer ownership results from the survey portion of the research are consistent with past studies indicating that there has not been a great increase in consumers purchasing food thermometers for their homes.
Chill. Proper cooling and storage of food is necessary to prevent the growth and multiplication of any possible diseases in food. Proper food cooling and storage can inhibit the contraction of a foodborne illness due to eating improperly cooled and stored leftovers. That is because bacteria and viruses multiply at a rapid rate within the temperature danger zone (above 5° Celsius and below 57° Celsius) and also the temperature range where most foods linger when they are left out at room temperature (USDA FSIS, 2011a). Chilling foods and then properly storing them at the correct temperature are the final steps consumers should take in their home to ensure they are providing the safest food for personal consumption.

In Redmond and Griffith’s article (2003) many of the studies analyzed indicated that consumers do not have basic knowledge of proper food cooling and storage. Further, they share that approximately 90% of consumers do not perform all adequate food cooling and storage procedures necessary for the safety of the food. In the same study, large portions of consumers also reported that they leave foods at room temperature for extended periods of time, even overnight, after they have been cooked. These are behaviors that could result in foodborne illness. And while there is minimal recent observational data, it is assumed these behaviors have not changed greatly over the years. Therefore, the risk of leaving foods at room temperature for extended periods of time needs to be adequately addressed to consumer food preparers in the home.

Food Safety Campaigns. Food safety messaging became prevalent in the home in the early to mid 1990’s when safe handling instructions were amended and required to be placed on all raw meat products to inform consumers how to safely handle and thoroughly cook their food. Safe handling instructions are the labels and text on raw meat and poultry packages that state that the item has been inspected, that it may contain bacteria that can cause a foodborne illness if it is
not handled or cooked correctly, and then lists four steps to handle and cook the food correctly and safely (USDA FSIS, 2013). In 1994, safe handling instructions were to be placed on “all ground and/or comminuted raw and partially cooked meat and poultry product” as well as “all other raw and partially cooked meat and poultry products” (USDA FSIS, 1994). Following this amendment to the safe handling instructions guidelines, a study was conducted in 2000 to evaluate the effectiveness of these instructions. In this large study of interviews and survey data with almost fourteen thousand respondents, approximately half of them reported that they had noticed the safe handling instructions label in the past (Yang, Angulo, & Altekruse, 2000). Of those participants, approximately 80% remembered reading the label (Yang, Angulo, & Altekruse, 2000). However, of the participants who reported that they noticed and read the label, only 37% reported that they changed their behaviors when preparing raw meat because of the safe handling instructions (Yang, Angulo, & Altekruse, 2000). These data suggest that safe handling instruction labels have limited influence on consumer behaviors when handling raw foods in the home and that additional educational methods are necessary to inform and motivate consumers to safely prepare food.

Following the influx of awareness surrounding food safety and for food safety education that arose due to the implementation of safe handling instructions, multiple food safety campaigns came about. The first of which was Fight BAC!®, developed by the Partnership for Food Safety Education in 1998, and still in place today. Fight BAC!® was created using scientifically based recommendations and a consumer research process that surrounds the core four food safety messages of clean, separate, cook, and chill (Partnership for Food Safety Education, 2019). This campaign was analyzed in a study in 2004 that focused on its impact on the Latino population in Connecticut. Approximately 75% of the population that were exposed to
at least one portion of the campaign were highly satisfied with it and were more likely to have a higher food safety knowledge score than those that were not exposed (Dharod, Pérez-Escamilla, Bermúdez-Millán, Segura-Pérez, & Damio, 2004). The Fight BAC!® campaign is available through multiple culturally relevant media channels and shows tendency to improve food safety awareness and change food safety knowledge, attitudes, and behaviors among Latino consumers.

Another campaign, Be Food Safe, was developed in 2006 by the United States Department of Agriculture in conjunction with the Partnership for Food Safety Education, the Food and Drug Administration, and the Centers for Disease Control and Prevention (USDA, PFSE, FDA, & CDC, 2006). This campaign was grounded in social marketing, behavior change, and risk communication theories. This theoretical grounding aided in the design of the campaign to be a useful tool for food safety educators to inform consumers about the risks and dangers of foodborne illness while teaching them how to properly handle and cook food (USDA, PFSE, FDA, & CDC, 2006). The Be Food Safe campaign focused on many of the same food safety awareness messages that the Fight BAC!® campaign did, but tried to do so on a larger scale and wider range. This campaign was not evaluated through research, however, because it is so similar to the Fight BAC!® campaign it is likely that it had similar outcomes. Though, while the Fight BAC!® campaign is still ongoing, the Be Food Safe campaign is much less prevalent currently than when it was first employed.

In 2011, the United States Drug Administration’s Food Safety and Inspection Service partnered with the Food and Drug Administration, the Centers for Disease Control and Prevention, and the Ad Council to debut a joint, national, multimedia public service campaign called Food Safe Families (Vilsack, 2011). The Food Safe Families campaign’s goal was to shift consumer’s thinking and perspectives about food handling as a way to encourage them to take a
more proactive, preventive approach when preparing food at home to help reduce foodborne illnesses (Vilsack, 2011). This campaign, much like the Be Food Safe campaign, focuses on the core four food safety messages of clean, separate, cook, and chill outlined in the Fight BAC!® campaign. It was not studied in scientific research through surveys, interviews, or focus groups and is not currently a common campaign employed in food safety education.

Just a few years later in December of 2015, Australia’s Queensland Health developed the Food Safe in Seconds campaign that utilized similar campaign aspects as the Food Safe Families campaign and attempted to encourage positive behaviors and provide more proactive tips through a series of short videos depicting the quick and simple ways to be food safe in just a few short seconds (Queensland Health, 2019). This campaign is ongoing and continues to be updated by Queensland Health on an active website and Facebook page.

Lastly, on a smaller scale, research has been done that focuses food safety campaigns in specific communities. For example, in 2006 in the United Kingdom, a small-scale food safety strategy using targeted interventions was developed and evaluated through food preparation observations immediately after the intervention and again between four and six weeks after the intervention (Redmond & Griffith, 2006). This intervention was found to be more effective immediately after it had been implemented, suggesting that social marketing approaches to food safety campaign interventions typically result in short term behavior changes of consumers (Redmond & Griffith, 2006). Additionally, a study conducted in 2012 found that food safety campaigns are more likely to be effective if the messages are tailored to the needs of a specific audience (Abbot, Policastro, Bruhn, Schaffner, & Byrd-Bredbenner, 2012). The results of this study indicated that the targeted campaign towards college students significantly increased self-reported and actual ratings of food safety knowledge and skills (Abbot, Policastro, Bruhn,
Schaffner, & Byrd-Bredbenner, 2012). So, from these two studies we can infer that small-scale, social marketing, targeted-audience, food safety campaigns are effective in ensuring health messages are retained and cause attitude and behavior changes.

**DISCUSSION**

From the current research available, it is evident that the majority of consumers are not practicing proper food safety handling and preparation techniques in the home. Additionally, there were few active food safety campaigns attempting to improve the food safety behaviors of consumers in the home. Therefore, researchers must continue to observe and gather data on consumer food safety practices in the home and gather continuous feedback on food safety campaigns and update them as needed. This review of related literature provides a concise and in-depth insight into consumer behaviors surrounding the four core food safety components and food safety campaigns. Researchers can use this information to identify what areas of consumer food safety behaviors and campaigns need to be researched further. Additionally, food safety advocates including, government officials, food safety industry workers, social media influencers, chefs, food magazine editors, grocery store owners and employees, restaurant managers and employees, university professors, extension agents, and Family and Consumer Science educators, can use this research to determine what food safety practices consumers need to be most educated on. There is an evident need to continue to educate consumers on food safety practices and to influence their perceptions surrounding food safety.

Consumers hold all of the responsibility when making decisions regarding food safety preparation techniques in the home. It is the responsibility of food safety advocates at all levels to promote and educate about food safety practices in the home. However, from the literature it is unclear whether or not the four core elements of food safety, clean, separate, cook, and chill,
should be the topics that food safety advocates work to educate consumers on. These four core
food safety elements either need to be developed in a way that is more understandable and
relatable to consumers or altered to include different elements. These suggestions are based on
the literature that shows current food safety campaigns are not currently effectively working to
change consumer food safety behaviors as exemplified by continuous poor food safety practices
in the home. This ineffectiveness could be due to the emphasis on the elements themselves or the
ways in which they are being messaged to consumers. Effective messaging of food safety
elements would include the improvement of self-efficacy and response-efficacy. This would
improve the consumer’s beliefs and expectations of themselves to be able to practice food safety
and their beliefs of their ability for food safety practices to protect themselves from the harm of
foodborne illness.

Further insight into consumer food safety practices in the home in regards to food
thermometer use, new food trends, and handwashing is needed to determine what practices food
safety advocates need to emphasize when researching and educating consumers on food safety
practices. These data will help food safety advocates deduce what effective measures may be in
terms of educating and informing consumers on how to safely handle food in their homes.
REFERENCES


CHAPTER 2
Investigating the Impacts of a Media Campaign Targeting Food Safety Practices

INTRODUCTION

The most effective way to prevent foodborne illness is the proper cooking of foods by reaching a safe internal temperature measured with a calibrated food thermometer before removing the food from the heat source (USDA FSIS, 2015). Focusing in on a more specific realm of foodborne illness, an estimated 265,000 Shiga toxin-producing Escherichia coli (STEC) infections occur each year in the United States. Between 2003 and 2012 beef was the cause of 55% of STEC O157 outbreaks (CDC, 2018 & Heiman, Mody, Johnson, Griffìn, & Gould, 2015). Between 2009 and 2015 STEC was the third most common single confirmed etiology reported with 191 outbreaks at 6% and was listed along with Listeria spp and Salmonella spp as the most common cause of hospitalizations and deaths reported among persons in outbreaks with a single confirmed etiology (Dewey-Mattia, Manikonda, Wise, & Crowe, 2018). STEC is a foodborne illness causing pathogen most commonly found in cattle that occurs naturally within the flora in animal gastrointestinal tracts and hides, thus it can easily contaminate the meat of the animal during the slaughter and processing process. STEC in beef has been known to cause serious gastrointestinal illnesses, such as Hemolytic Uremic Syndrome, in consumers who are children, elderly, or immunocompromised. Due to the slaughter and processing process of beef, any STEC pathogens would be found on the surface of whole cuts of meat. However, when whole cuts of meats are ground, a form of mechanical tenderization, the pathogens located on the surface of the meat may then be internalized and become present in the center of the meat (Luchansky, Phebus, Thippareddi, & Call, 2008). Therefore, when dealing with ground beef hamburger patties the
United States Department of Agriculture Food Safety and Inspection Service recommends a minimum internal temperature of 160°F (USDA FSIS, 2015).

Because of the burden of STEC on public health, in combination with the understanding that cooking foods to their proper internal temperatures is not a widely implemented practice, there is a need to increase action-based ground beef food safety knowledge. This action and skill basis will act as a preventative measure to reduce the number of future STEC infections. One way to impact a large quantity of consumers, and hopefully increase knowledge and change behavior, is through mass media campaign advertising. Messages related to food safety are most effective when they are meaningful to the intended audience, contain accurate information, are delivered repeatedly, and are distributed at appropriate times (Jacob, Mathiasen, & Powell, 2010). When considering mass media campaign advertising as a method of increasing food safety knowledge and creating behavior change, it is important to consider behavior change models and what might influence and resonate with the public when they are exposed to these advertisements.

The purpose of this study was to investigate whether the pilot of a national food safety message campaign, 160 is Good, impacted perceptions, food safety attitudes, and self-reported behavior changes. The campaign focused on the safe handling and the internal cooking temperature of grilled ground beef hamburger patties to remove potential STEC contamination. The 160 is Good food safety campaign intervention that focused on the importance of grilling ground beef hamburger patties to a safe 160°F internal temperature was implemented to protect public health against STEC.

The primary objective of this research was to gather insight into consumers’ behaviors, perceptions, and attitudes surrounding ground beef hamburger patties. A secondary objective
was to explore the efficacy of a large-scale food safety campaign. The hypothesis states that when consumers come in contact with the 160 is Good campaign they will practice safer food handling and preparation techniques due to the effective messages in the campaign. This research objective addresses the objective of the thesis that explores consumer food safety behaviors and determines what methods of food safety education are best for consumers.

Campaign. The consumer education campaign was created and implemented by Firespring Inc., which is a marketing, printing, and software company, in conjunction with the research team. The campaign included an interactive website, display and video banner advertisements on webpages, radio advertisements, press releases, broadcast interviews, movie theater pre-roll advertisements, and a web-based responsive quiz. Each of these elements contained the various aspects of specific food safety wording regarding thermometer use when grilling beef hamburger patties and the specific 160 is Good logo.

The interactive website, banner advertisements, and web-based responsive quiz made up a portion of the digital components of the campaign, which resulted in approximately 2,226,000 spots/impressions (Table 2.1 and 2.2). The interactive website consisted of five categories, the first was all about STEC, the second provided good handling and cooking practices, the third was the video, the fourth was contact information and comments or concerns, and the fifth was the responsive quiz. The banner advertisement was the animated logo with a burger, digital thermometer, and the 160 is Good slogan (Figure 2.1). The banner advertisement would appear horizontally along the top or bottom of webpages or vertically down the sides of webpages. The web-based responsive quiz begins by challenging quiz takers to find out if they are a five-star beef consumer. It then leads through a series of five questions regarding STEC and the safe handling and cooking of ground beef hamburgers. At the end of the quiz, the quiz taker receives
a star for each question they got correct. Also, at the end of the quiz, the quiz questions and correct answers are all available with a prompt to share quiz results and challenge family and friends to take the quiz via Facebook or Twitter. An additional piece of the digital component of the campaign were pre-roll showings of the video advertisement on YouTube, a video streaming website.

The radio advertisements were two thirty second audio clips containing a poor food safety scenario and then a good food safety scenario of grilling a hamburger to the safe internal temperature of 160°F, then prompting listeners to learn more at the website. The radio advertisements were played on three urban radio stations, one country radio station, one pop radio station, one adult hits radio station, and one mainstream radio station. In total the radio spots/impressions totaled approximately 2,300. Additionally, the same audio clips accompanied by the picture logo and slogan were shared on the Pandora digital music radio application via audio everywhere and mobile display. This method of campaign reached 935,000 spots/impressions.

Lastly, the movie theater pre-roll advertisement was an animated video that depicted two poor food safety scenarios including eating food after it has fallen on the ground and chewing gum from the bottom of a movie theater seat. It goes on to depict the good food safety scenario of a family grilling ground beef hamburgers to the safe internal temperature of 160°F and then prompts watchers to go to the website to learn more. The video was shown in a total of four movie theaters in Fayetteville, North Carolina on a total of fifty-one screens to create a total of 675,000 spots/impressions. Together, the display, video, and Pandora advertisements reached a total of 3,174,418 impressions (Figure 2.2)
METHODS

Campaign evaluation. To evaluate the impact of the campaign, two structured random
dial phone surveys were conducted by an outside marketing agency before and after the
campaign was launched including multiple choice, short response, and open-ended free response
questions. A variety of question formats were used to provide ease to the respondent when
completing the survey and also allow the respondent with opportunities to expand when sharing
his or her beliefs and behaviors. Additionally, the Food and Drug Administration periodically
holds a nation telephone survey on food safety that utilizes similar question formats (Lando,
Varrill, Liu, & Smith, 2016). Dial phone surveys are effective in gathering information for
geographically dispersed samples, useful for collecting information on health-related behaviors
and attitudes, and reducing data transfer error that can occur with paper surveys (Boland,
Sweeney, Scallan, Harrington, & Staines, 2006). The full phone survey questionnaire is located
in Appendix A. The total sample for this study consisted of n=305 respondents in the pre-test and
n=305 respondents in the post-test comprised of Fayetteville, North Carolina residents who
prepare meals at home and cook ground beef hamburger patties specifically. With a sample size
of 305 respondents and a population with approximately 210,000 citizens, the confidence level
for the results are 95% with 5.61 confidence interval (Ryan, 2013). This market research work
was conducted on behalf of the advertising company and the results were provided to the
campaign development team. The questions focused on perceptions of beef food safety,
thermometer usage, and handling practices. The baseline pre-test survey was completed in May
2017 prior to the launch of the 160 is Good campaign as a method to uncover current beliefs and
behaviors associated with cooking ground beef hamburger patties. The phone calls averaged 13.3
minutes. Once the campaign ended, the post-test survey was conducted to measure advertising
effectiveness and visibility as well as identify any attitude or behavior changes that may have occurred as a result of the campaign. The phone calls averaged 17.2 minutes. It is recommended that phone surveys last approximately 15 minutes (Steber, 2018). Pre-test and post-test surveys are reliable ways to gather insight when measuring outcomes after a treatment or intervention has occurred (Salkind, 2010).

**Sample.** The campaign, 160 is Good (160isgood.com), was conducted during the summer of 2017 between Memorial Day and Labor Day for a 16-week period in the sample population of Fayetteville, North Carolina, which has an approximate population of 210,000. The Fayetteville test market was defined by zip code and the proportions of respondents interviewed per zip code in each study wave were relatively consistent (Table 2.4). Demographic characteristics of the sample included age group, gender, marital status, children under age 18 in household, number of people in household, employment status, Hispanic, Latino, or Spanish, race, education level, and household income (Table 2.3). There were no significant differences in the demographic characteristics between the pre- and post-test, and, therefore, shifts in attitudes or behaviors are not likely due to sample fluctuations but rather real changes that have occurred among the population that was surveyed (Table 2.3).

**Data collector training.** All calls took place from the Wiese Research Associates (WRA) central interviewing facilities in Omaha, Nebraska. Trained and experienced interviewers from WRA’s staff collected the data. Each interviewer who worked on this project was fully briefed on the proper administration of the questionnaire prior to sample contact and supervisors monitored interviews in progress to ensure accuracy and completeness of the data collected. Trained and experienced interviewers were used to collect the data because it is critical that the
interviews use best practices to achieve high-quality, reliable, and valid information for research (Lavrakas, 2008).

**Data analysis.** Weise collected all phone survey data and input the data into comprehensive tabular results. Weise used Excel for data collection and data input. Weise then analyzed the tabular results to compare the pre- vs. post-test responses for changes in attitudes, beliefs, and behaviors regarding food safety using paired t-tests.

**Limitations.** When dealing with self-reported behaviors and perceptions, the participant had the opportunity to lie to the interviewer and make up responses that are untrue. There is no way to determine what responses were true or untrue; therefore, all responses were coded and analyzed as if they were true.

**RESULTS**

A large majority of study participants in both the pre- and post-test cooked ground beef hamburger patties at least once a month, with approximately 36% doing so about once a week or more. Additionally, 13% and 15% of meal preparers in the pre- and post-test, respectively, were screened out because they “never” grill, fry, or cook ground beef hamburger patties. Those who were screened into the survey then provided information on how often they cook ground beef hamburger patties (Figure 2.3). When asked to describe, in their own words, how they typically determine when hamburgers patties are done, the most common reply in the post-test was cut it open (up significantly from the pre-test), followed by looking at the outside or inside color (down from the pre-test) (Table 2.5). “Use thermometer” was a distant third mention in both waves, and while this reply was mentioned slightly more often by those who recalled the 160 is Good campaign (n=72) versus those with no recall (n=233), this difference was not statistically significant. When the total sample is considered, these results did not vary pre versus post
campaign, with still about two-thirds of meal preparers indicating that they “never” measure the internal temperature with a food thermometer when cooking hamburger patties (Figure 2.4). 15% of post-test respondents with aided recall of the 160 is Good campaign always used a food thermometer to determine if hamburger patties are done more often than those with no ad recall (11%).

When asked to rate their overall concern with the safety of the ground beef they eat, about 50% of respondents, pre- and post-test, gave a rating of 7 or higher, indicating at least a moderate level of concern (with 37% highly concerned; 9-10 rating). More specifically, respondents who rated their level of concern as “4 or higher”, pre-test (n=215) and post-test (n=211), they volunteered that these concerns were often related to bacteria, *E. coli* and other contaminants or illnesses. However, the majority of meal preparers are not aware of the internal temperature at which ground beef is considered safe to eat, pre-test 68% (n=201) and post-test 65% (n=195). Among those that ever use a food thermometer when cooking beef hamburger patties, pre-test (n=78) and post-test (n=64), there were no statistically significant shifts found in the pre versus post results when gauging the minimum temperature at which ground beef patties are cooked (Figure 2.5). Of those that do not always use a thermometer, 40% of pre-test respondents and 41% of post-test feel their reasons for not always or never using a food thermometer when cooking hamburgers revolve primarily around perceptions that it is not needed or they feel they know when it is done because they are experienced. Quite a few meal preparers, 32% of pre-test and 35% of post-test respondents, feel they have “at least a moderate amount of control” over how safe it is to eat the ground beef hamburger patties they cook themselves and nearly one-half, 45% of pre-test and 44% of post-test respondents, believe they have “a great deal of control” in this regard.
The entirety of the 160 is Good campaign was estimated to have resulted in 2.2 million impressions within the target sample community. However, 24% (n=72) of 305 post-test respondents recalled the 160 is Good beef safety advertisements and only 44% of post-test respondents recalled any advertising related to food safety at all (Figure 2.6) Additionally, 11% (n=12) of post-test respondents who recalled hearing or seeing a beef safety and/or 160 is Good advertisement (n=107) reported purchasing a new food thermometer and 23% (n=25) of post-test respondents who recalled hearing or seeing a beef safety and/or 160 is Good advertisement (n=107) reported that they started using a thermometer on ground beef patties. Of those that recalled hearing or seeing a beef safety and/or 160 is Good advertisement that purchased a new food thermometer (n=12), 75% (n=9) purchased a digital thermometer, 17% (n=2) purchased a dial thermometer, and 8% (n=1) purchased a glass thermometer. Those that recalled a beef safety advertising remembered the messaging being about making sure it cooked or done, temperatures concerns, and other topics (Table 2.6). Overall, very few interviewed respondents recalled any of the 160 is Good beef safety campaign messaging, and there was a very minimal increase in the amount of thermometer usage due to the campaign.

**DISCUSSION**

More effective campaign methods targeting food safety practices need to be developed to communicate the importance of digital food thermometer use to determine doneness and safety of beef hamburger patties to large populations. The 160 is Good campaign did not have a major impact on food thermometer use behaviors, but there is evidence to suggest that those who were able to recall this advertising did have increased awareness of the importance and need to use a food thermometer for safety purposes. Therefore, response-efficacy surrounding food
thermometer use was increased. This supports the hypothesis that the campaign influenced food safety behaviors, however, there is room for improvement.

The campaign was not developed with the intentions to utilize emotion-based messaging that would promote response-efficacy or the portrayal of the information to promote self-efficacy. The campaign did not effectively contribute to behavior change due to the low awareness of the internal cooking temperature of ground beef hamburger patties and infrequent use of food thermometers to determine doneness after the conclusion of the campaign. The purchasing of a thermometer and improved thermometer use relate to intent to behave, which is the main outcome of the RAA framework. Increased awareness and felt importance to practice food safety procedures tie to emotions, which is the main objective of the EPPM framework. However, multiple components of the RAA framework were lacking from the 160 is Good campaign including impacts on attitudes and the ability to use a food thermometer. The campaign did not have enough impact to change attitudes and did not provide consumers with the physical resources, such as food thermometers, to change their behavioral control. Food safety campaigns should also be made available as widespread as possible in multiple facets of life so that food safety communication and the concept of using a food thermometer become a norm in society. The more comfortable consumers are with talking about food safety and practicing safe food procedures, the more likely they may become to exhibit safe food handling and preparation behaviors due to the tie to attitudes, a factor in the RAA framework. The campaign did not evoke enough emotion to persuade consumers to practice food safety behaviors as depicted in the EPPM framework. This could be because the campaign message did not emphasize the health risks of contracting a foodborne illness, the message components were not relatable to the audience, or the audience did not engage with the campaign thus creating no
emotional ties to the information. A food safety campaign should induce a memorable emotion that will be remembered by consumers when they are grilling ground beef hamburger patties so that they feel the need to use a food thermometer to check for doneness. A beef food safety campaign should not create a fear in the cattle and livestock industry, but should instead place emphasis on the importance and responsibility the consumer assumes once the raw beef product is in their possession during preparation and cooking. It is important for consumers to understand the role they play in their health and well-being and to not place food safety concerns on the industry. Food safety advocates can help consumers realize this by stressing the responsibility consumers have to practice food safety procedures in their homes.

This research contributes to other research on consumer food safety behaviors by providing insight into thermometer use on grilled ground beef hamburger patties and insight into behavior changes due to a food safety campaign. There is a need for food safety advocates and researchers to partner with campaign marketing programmers to continue to research this phenomenon of utilizing food safety campaigns to educate consumers on food safety behaviors. Food safety advocates can also use this research to determine where consumer understandings of food safety concepts are incorrect or lacking as to educate them on topics that are needed. Additionally, further research can be done to create more research studies that dive into food safety behavior change due to food safety campaigns.

Future food safety campaigns should provide solutions to the risks of contracting a foodborne illness, such as using a food thermometer, and also provide positive and beneficial results of using a thermometer including not over-cooking or drying the food out. By providing solutions to food safety issues, attitudes and perceived norms may be affected; these are two of the main components of the RAA framework that suggest intent to behave. Additionally, by
tying food safety tips to the improved quality of food and the level of satisfaction with the food consumers are preparing, an emotion is tied to the behavior, which is a significant portion of the EPPM framework.

Few people recognized, remembered, and grasped the information in the 160 is Good campaign suggesting that future food safety campaigns may benefit from more catchy, repetitive, and memorable elements in what is shared through locations where consumers commonly are found. It would be beneficial to conduct further research and testing that analyzes the effects of making campaigns commonly available on packaging of food products, in grocery stores, on social media, and in other media outlets such as television and magazines. Extension agents are also great resources to utilize to promote and advocate for food safety and food thermometer use. Extension agents have the ability to reach the community through sharing food safety campaign information and resources. Food safety campaigns need to be extremely memorable, share the need to change behavior, and provide mechanisms to make that change.
Table 2.1: Placement Breakout Table

<table>
<thead>
<tr>
<th>Placement</th>
<th>Ad Sizes</th>
<th>Ordered Impressions</th>
<th>Cost Per Thousand Impressions (CPM)</th>
<th>Delivered Impressions</th>
<th>Completed Views</th>
<th>Video Completion Rate (VCR)</th>
<th>Clicks</th>
<th>Click Through Rate (CTR)</th>
<th>Cost Per View (CPV)</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Moms in the Kitchen/Cooking &amp; Food Enthusiast, High Impact Units</td>
<td>300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>619,979</td>
<td>$11.00</td>
<td>651,617</td>
<td>N/A</td>
<td>N/A</td>
<td>759</td>
<td>0.12%</td>
<td>N/A</td>
</tr>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Moms in the Kitchen/Cooking &amp; Food Enthusiast, High Impact Units</td>
<td>Video</td>
<td>273,011</td>
<td>$24.54</td>
<td>268,596</td>
<td>205,807</td>
<td>76.76%</td>
<td>114</td>
<td>0.04%</td>
<td>$0.03</td>
</tr>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Moms in the Kitchen/Cooking &amp; Food Enthusiast, High Impact Units - ADDED VALUE</td>
<td>300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>150,000</td>
<td>ADDED VALUE</td>
<td>147,779</td>
<td>N/A</td>
<td>N/A</td>
<td>103</td>
<td>0.07%</td>
<td>N/A</td>
</tr>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Contextual targeting Food &amp; Beverage Cooking Sites, High Impact Units</td>
<td>300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>711,875</td>
<td>$9.41</td>
<td>719,049</td>
<td>N/A</td>
<td>N/A</td>
<td>851</td>
<td>0.12%</td>
<td>N/A</td>
</tr>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Contextual targeting Food &amp; Beverage Cooking Sites, High Impact Units</td>
<td>Video</td>
<td>301,494</td>
<td>$22.86</td>
<td>293,717</td>
<td>235,490</td>
<td>80.18%</td>
<td>183</td>
<td>0.06%</td>
<td>$0.03</td>
</tr>
<tr>
<td>Centro</td>
<td>A18+, Fayetteville MSA, Contextual targeting Food &amp; Beverage Cooking Sites, High Impact Units - ADDED VALUE</td>
<td>300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>150,000</td>
<td>ADDED VALUE</td>
<td>149,133</td>
<td>N/A</td>
<td>N/A</td>
<td>95</td>
<td>0.06%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Centro Totals and Averages**
- 2,226,358 | $12.30 | 2,229,891 | 441,297 | 78.48% | 2,165 | 0.09% | $0.03 | $27,283.45

| Pandora Audio Everywhere | 850,000 | $17.65 | 858,642 | N/A | N/A | 829 | 0.10% | N/A | $14,080.80 |
| Pandora Mobile Banners- ADDED VALUE | 85,000 | N/A | 85,885 | N/A | N/A | 563 | 0.06% | N/A | ADDED VALUE |

**Pandora Totals and Averages**
- 955,000 | $16.04 | 944,527 | N/A | N/A | 1,392 | 0.15% | N/A | $15,060.80

**Totals and Averages**
- 3,181,358 | $13.41 | 3,174,418 | 441,297 | 78.48% | 3,497 | 0.11% | $0.03 | $42,283.45
Table 2.2: Creative Breakout Table

<table>
<thead>
<tr>
<th>Creative</th>
<th>Ad Sizes</th>
<th>Delivered Impressions</th>
<th>Completed Views</th>
<th>Video Completion Rate (VCR)</th>
<th>Clicks</th>
<th>Click Through Rate (CTR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centro</td>
<td>Version 1 300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>883,863</td>
<td>N/A</td>
<td>N/A</td>
<td>911</td>
<td>0.11%</td>
</tr>
<tr>
<td>Centro</td>
<td>Version 2 300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>833,715</td>
<td>N/A</td>
<td>N/A</td>
<td>897</td>
<td>0.11%</td>
</tr>
<tr>
<td>Centro</td>
<td>Video :30s 300x250, 728x90, 300x600, 160x600, 320x50</td>
<td>562,313</td>
<td>441,297</td>
<td>78.48%</td>
<td>297</td>
<td>0.05%</td>
</tr>
<tr>
<td>Totals and Averages</td>
<td></td>
<td>2,229,891</td>
<td>441,297</td>
<td>78.48%</td>
<td>2,105</td>
<td>0.09%</td>
</tr>
<tr>
<td>Pandora</td>
<td>Audio Everywhere :30s 300x250</td>
<td>858,642</td>
<td>N/A</td>
<td>N/A</td>
<td>829</td>
<td>0.10%</td>
</tr>
<tr>
<td>Pandora</td>
<td>Mobile Banners-ADDED VALUE 300x250</td>
<td>85,885</td>
<td>N/A</td>
<td>N/A</td>
<td>563</td>
<td>0.66%</td>
</tr>
<tr>
<td>Pandora Totals and Averages</td>
<td></td>
<td>944,527</td>
<td>N/A</td>
<td>N/A</td>
<td>1,392</td>
<td>0.15%</td>
</tr>
<tr>
<td>Totals and Averages</td>
<td></td>
<td>3,174,418</td>
<td>441,297</td>
<td>78.48%</td>
<td>3,497</td>
<td>0.11%</td>
</tr>
</tbody>
</table>
Table 2.3: Pre-test vs. Post-test Sample Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% Of Total</th>
<th>Characteristic</th>
<th>% Of Total</th>
<th>Characteristic</th>
<th>% Of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n=305)</td>
<td>(n=305)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 to 24</td>
<td>5%</td>
<td>3%</td>
<td>One</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>25 to 34</td>
<td>9%</td>
<td>9%</td>
<td>Two</td>
<td>37%</td>
<td>36%</td>
</tr>
<tr>
<td>35 to 44</td>
<td>20%</td>
<td>23%</td>
<td>Three</td>
<td>21%</td>
<td>20%</td>
</tr>
<tr>
<td>45 to 54</td>
<td>23%</td>
<td>24%</td>
<td>Four</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>55 to 64</td>
<td>21%</td>
<td>21%</td>
<td>Five Or More</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>65+</td>
<td>22%</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of People In Household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
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<td></td>
<td></td>
<td>White/Caucasian</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Black/African-American</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>American Indian/Alaskan</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other</td>
<td>2%</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
<td></td>
<td>Education Level</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High School Or Less</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Some College</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Trade/Technical</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Associates Degree</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bachelors Degree</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Household Income</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Under $25,000</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$25,000 - $39,999</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$40,000 - $59,999</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$60,000 - $100,000</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Over $100,000</td>
<td>25%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39%</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>61%</td>
<td>59%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Partner</td>
<td>16%</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single, Never Married</td>
<td>64%</td>
<td>63%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed/Divorced/Separated</td>
<td>20%</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children Under Age 18 In Household</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic, Latino, Spanish</td>
<td>37%</td>
<td>39%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>61%</td>
<td>61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>61%</td>
<td>61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 2.4: Pre-test vs. Post-test Sample Location Characteristics

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>% Of Total Sample</th>
<th>Pre-test (n=305)</th>
<th>Post-test (n=305)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28303</td>
<td>17%</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>28304</td>
<td>16%</td>
<td></td>
<td>17%</td>
</tr>
<tr>
<td>28305</td>
<td>4%</td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td>28306</td>
<td>20%</td>
<td></td>
<td>22%</td>
</tr>
<tr>
<td>28311</td>
<td>17%</td>
<td></td>
<td>17%</td>
</tr>
<tr>
<td>28314</td>
<td>26%</td>
<td></td>
<td>27%</td>
</tr>
</tbody>
</table>
Table 2.5: How Respondents Determine When Ground Beef Hamburger Patties Are Done

<table>
<thead>
<tr>
<th>Volunteered Replies</th>
<th>% of Total Sample</th>
<th>% of Post-test Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test (n=305)</td>
<td>Post-test (n=305)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Those Who Recalled a Food Safety Advertisement (n=72)</td>
</tr>
<tr>
<td><strong>Cut It Open</strong></td>
<td>16%</td>
<td>32%</td>
</tr>
<tr>
<td><strong>Outside/Inside Color</strong></td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td><strong>Use Thermometer</strong></td>
<td>14%</td>
<td>19%</td>
</tr>
<tr>
<td><strong>Juices Run Clear</strong></td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Timing</strong></td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Texture/Firmness/By Touch</strong></td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>By The Look (Unspecified)</strong></td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>By Experience</strong></td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>When No Juices Come Out</strong></td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Temperature (Unspecified)</strong></td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Don’t Know/Nothing</strong></td>
<td>--</td>
<td>1%</td>
</tr>
</tbody>
</table>
Table 2.6: Description of the Message of Those Who Stated Recall of Beef Safety Advertising

<table>
<thead>
<tr>
<th>Volunteered Main Message</th>
<th>% Of Base Sample Mentioning</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test (n=33)</td>
<td>Post-test (n=51)</td>
<td></td>
</tr>
<tr>
<td>Make Sure It’s Cooked/Done</td>
<td>30%</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>GMO’s</td>
<td>12%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Hormones</td>
<td>12%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Handling Instructions</td>
<td>9%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>E. coli</td>
<td>9%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Contaminants</td>
<td>9%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Temperature Concerns</td>
<td>6%</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Grain Fed</td>
<td>6%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Food Recall</td>
<td>6%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td>6%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td>6%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Mad Cow Disease</td>
<td>6%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Grass Fed</td>
<td>6%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Cook To 160</td>
<td>--</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Keep Refrigerated</td>
<td>--</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Use Thermometer</td>
<td>--</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>21%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>None/Don’t Know</td>
<td>--</td>
<td>22%</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2.1: 160 is Good Banner Advertisement
Figure 2.2: Digital Campaign Impressions
Figure 2.3: Frequency with Which Household Cooks Ground Beef Hamburger Patties
Figure 2.4: Techniques Used to Determine if Hamburger Patties are Done

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th></th>
<th></th>
<th>Post-test</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Color Of The Burger</strong></td>
<td></td>
<td>63%</td>
<td>14%</td>
<td>12%</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
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<td><strong>Firmness Of The Burger</strong></td>
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- Always
- Often
- Sometimes
- Rarely
- Never
Figure 2.5: Stated Awareness of and Internal Temperature Given at Which Ground Beef is Considered Safe to Eat
Figure 2.6: Unaided Recall of Advertising Related to Food Safety Issues
REFERENCES


CHAPTER 3
Evaluating the Elements of a Media Campaign Targeting Food Safety Practices

INTRODUCTION

Food safety is a shared responsibility among government, industry, producers, academia, and consumers (WHO, 2016). In order to educate consumers in effective ways, food safety experts need to combine their resources to develop informational and useful food safety campaigns. With effective food safety campaigns, consumers will then have the opportunity to make informed choices when handling food to prevent foodborne illness. In order to address what food safety campaigns should contain, the current study will assess the 160 is Good food safety campaign described in Chapter 2 that focuses on the safe handling and the internal cooking temperature of grilled ground beef hamburger patties related to STEC.

Theoretical framework. This study will analyze the connection between the RAA and the EPPM frameworks with insight into the general populations’ perceptions and beliefs surrounding the 160 is Good food safety campaign. These frameworks will aid in providing understanding to how the population perceived the 160 is Good campaign and will help to discern the effective aspects of the campaign that can be utilized in future creation of food safety campaigns. This theoretical framework is vital to the current qualitative study because it will impact how the researchers gather insight into the perceptions people have of the campaign, and how the researchers approach data collection. Understanding what influences behaviors and fear induced reactions using the data from the responses in the focus groups, future food safety campaigns can be developed in a way that directly influences the behaviors and impacts the targeted populations in effective ways.
Focus groups. Qualitative research provides insight into understanding how people interpret the things they experience, how they construct and view the world they live in, and also what meanings they attribute to varying experiences (Merriam & Tisdell, 2016). Therefore, qualitative research is ideal when a researcher’s goals are to gather insight into motivations and perceptions. More specifically, focus groups are a type of qualitative research utilized to provide insight into the attitudes, perceptions, and opinions of participants in a more natural environment where participants are influenced by each other, similar to real life scenarios (Krueger, 1994). Focus groups are an especially effective way to get research participants comfortable with sharing their true perceptions and beliefs on certain topics. Focus groups have been utilized in prior food safety research including research done by the USDA on the Be Food Safe campaign (USDA, PFSE, FDA, & CDC, 2006). The current research was conducted using focus groups to gain insight into the effectiveness of the 160 is Good food safety campaign.

Research objectives. The research objectives of the current evaluation of the 160 is Good campaign elements is to deduce the positive and negative aspects of the campaign that would be useful to create food safety behavior changes in consumers. The hypothesis states that the 160 is Good campaign is not effective in changing food safety behaviors. This hypothesis was drawn from the results of the 160 is Good phone survey. So, by gathering in depth insight into reactions to the different components of the campaign via qualitative focus group conversations, the results will address the objective to determine what methods of food safety education are best for consumers.

METHODS

Qualitative Justification. This qualitative research was conducted using six focus groups of approximately ten participants each on the opinions and perceptions of the 160 is Good
food safety campaign materials. Six focus groups were conducted because research states that 90% of all themes are discoverable within three to six focus groups (Guest, Namey, & McKenna, 2017). Focus groups are composed of between four and twelve people, but typically include six to ten, are conducted in a series and in varying locations, and the participants are unfamiliar with one another (Krueger, 1994). Focus groups were selected so that information on personal opinions and perceptions could be gathered as they relate to possible behavior change due to the 160 is Good campaign. The current research is rooted in interpretive and constructivist epistemological perspectives in order to provide description, understanding, and interpretation of the perceptions of consumers related to the 160 is Good food safety campaign that derive from the four primary epistemological perspectives that are identified in research (Merriam & Tisdell, 2016).

IRB approval. A research study was developed at North Carolina State University to mine perceptions and behaviors related to the grilling of beef hamburger patties. The following methods for this research were reviewed and accepted by North Carolina State University Institutional Review Board Protocol #12341.

Sample selection and recruitment. The six, one-hour focus groups were held in three locations around the United States between November and December of 2017. The first location was Fayetteville, North Carolina, the sample population, the second location was Souderton, Pennsylvania, and the third location was Charlotte, North Carolina. Participants were recruited through Cooperative Extension Listservs, local school Listservs, promoted via Facebook and Twitter advertisements, and Craigslist advertisements. Recruits were guided to a Google Form where they signed up for their preferred time slot. Twelve slots were available for each focus group in anticipation that some participants may not show up the day of the focus groups. The
Google Form was closed once all available slots were filled then all recruits were sent a confirmation email after they signed-up, a reminder email one week before the focus group, and an additional reminder email one day before the focus group was to be held. This creates a convenience sample based on volunteers, which is typically used when conducting focus groups because this allows individuals with characteristics of the overall population to participate and contribute to a deeper understanding of the topic (Nagle & Williams, 2013).

**Data collection.** After the campaign concluded and all phone survey data were collected, focus groups were developed and conducted as a method to gather more in-depth information on perceptions, attitudes, and self-reported behavior changes in regards to the campaign and gain insight on the campaign message content and quality. The focus group protocol was semi-structured and the atmosphere was extremely informal to promote conversation and openness in the discourse. Semi-structured discussions are recommended when there is one single chance or opportunity to communicate with a group (Bernard, 1988). This is because a semi-structured discussion provides a clear set of talking points that are reliable and meet the research objectives but also allow the participants the freedom to express their thoughts in their own terms. The protocol consisted of nine open-ended questions. This protocol guaranteed that the moderator covered vital topics and questions during the conversation while still allowing for diversion and open sharing. The focus group moderator guide is available in Appendix B. The focus group protocol started by introducing the participants to the campaign and then covered topics including effective food safety advertisements, motivation to use a food thermometer, thoughts on each component of the campaign, the overall impact of the campaign, and if the group was to design a successful and effective food safety campaign how it would look and what the components would be.
**Data analysis.** The focus groups were audio recorded with written consent of all participants and then transcribed via TranscribeMe, a high-quality speech-to-text service provider. Once all of the transcriptions were completed, the data were coded to determine common themes using constant comparison analysis. The data were divided into units determined by participant quotations, attached a code, the codes were grouped into categories, and themes were developed that express each of the categories. This emergent-systematic focus group data analysis design promotes exploratory and verified analysis of data sets when multiple focus groups are being analyzed (Strauss & Corbin, 1998). Additionally, the primary researcher kept a reflexive research diary throughout the data analysis process to document the coding, theme, pattern, and cluster decisions being made. A reflexive research diary is beneficial because it acknowledges the problem of bias in qualitative research that is stated in the positionality statement (Ortlipp, 2009).

**RESULTS**

Many themes arose from the focus group sessions that were held. These themes address different components of the 160 is Good campaign and provide positive and negative feedback to the differing elements of the campaign. While there were obviously contradictory perceptions and opinions on many of the components of the campaign, the overall consensus was that it would likely not evoke enough interest to promote behavior change as related to food thermometer use on ground beef hamburgers when grilling.

The first and most prevalent theme included the desire for a correlation between burger internal temperature and color. This ties to the wish for a correlation between temperature and color of the burger, there was also confusion about the temperature other meats should be cooked to and their related level of doneness of the scale of rare, medium rare, medium, medium well,
and well done. Focus group participants stated, “overall I think [the campaign message] just leaves more questions than answers,” “is 160 just good for burgers?,” “does one-hundred and sixty degrees mean medium well?,” “could one-hundred and sixty degrees be for any ground meat products?” depicting general confusion over the main message of the campaign. Other participants mentioned, “I don’t think there was enough in the campaign to tell me what to do. How do I temp the food?” and “there is a little mixed-messaging to me” The confusion surrounding the targeted food safety messaging solely encouraging thermometer use on grilled ground beef hamburger patties was stated about carry-over to other foods: “does this information apply to all other foods, or is it just beef?”

Similarly, there was also general confusion related to the overall purpose of the campaign (e.g., why it only focused on beef burgers and grilling), as well as general curiosity about other meat internal temperatures, if the campaign was just trying to sell thermometers, or if it intended to scare people from eating burgers. For example, participants stated, “I think the goal was to sell meat thermometers, right? I don’t know that it’s as educational is it is a sales pitch for a good reason to buy a meat thermometer so you don’t poison your family.” Questions arose surrounding other food products, correlations were sought after for common cooking terms, and the purpose of the campaign was blurred to consumers.

Specifically, regarding the video advertisement there were positive reactions related to the voice, animation, humor, scare tactic, and relatable aspects. For example, one participant shared that, “I thought the video was cute and to the point, but it still made you think.” Participants were also able to grasp the point of the message with the video advertisement by stating, “I think the video is trying to show you that not using a meat thermometer is just as gross as eating off of the floor.” Lastly, regarding the video there was high agreeance that it was a
great location for health campaign messaging, “a movie theatre is a good venue because it’s a captive audience.” Along this similar topic, suggestions arose that other good places to message to captive audiences are the video screens on gas pumps that people watch when pumping gas.

In contrast, participants were not fond of the radio advertisement and thought that it did not make sense and was not funny or scary without the video, thus it would not motivate them to visit the website to learn more about food safety. One participant stated, “had I not seen the video advertisement first, the radio spots would have been a little ambiguous and it didn’t really talk through the positive aspect of the food safety message.” Another participant shared that, “I might not change the station when the radio advertisement came on but I definitely wouldn’t go look up the website when I got home.” One suggestion was made surrounding the negative views of the radio advertisements and that was to, “find a different way to present the same information that is more audio friendly.” So, without the visual aspect of the video advertisement, the audio from the advertisement was not enthralling to the participants.

Additionally, participants generally had negative reactions and skepticism about the banner advertisement not being catchy enough to risk clicking on a scam. One participant shared that “[the banner advertisement] doesn’t have that eye-catching appeal and there’s nothing there to validate that is a safe something to click on.” Participants also shared that, “I’m just leery about clicking on things” and “I just won’t click on anything unless I know specifically it’s associated with a well-known website that it will take me to.” With all of the viruses, scams, and safety concerns surrounding the internet currently, the majority of the participants were hesitant to click on banner advertisements on webpages.

Overall, participants assessed the campaign logo and website as informational, concise, and educational in a fun way. “It was to the point, colorful, and easy to read. It also had a lot of
facts without sounding like you were reading a journal.” While there were positive and negative reactions to different portions of the 160 is Good campaign, the overall consensus was that it was not strong enough to evoke a large-scale behavior change among the majority of the population that would come in contact with it.

Suggestions from the focus groups include advertising on social media because that is where the population can be reached, placing the video advertisement on monitors located in the meat department of grocery stores, having a food thermometer coupon as a portion of the advertisement, placing the advertisements on grocery store phone applications and online ordering websites, placing a 160 is Good sticker on ground beef packages, educating kids who will then encourage their parents to use a food thermometer, providing a pamphlet with a grill purchase, and encouraging television chefs and recipe websites to include internal temperatures and advertise the campaign. These suggestions provide insight into where consumers themselves feel food safety advertising would be most effective in reaching the population.

DISCUSSION

The results gathered in the focus group portions of the research suggest that a mass media campaign structured in this way may not be the most effective method of communicating beef safety practices in regards to thermometer usage while grilling hamburger patties. The research hypothesis was not fully supported in the findings due to some positive reactions to some components of the campaign. The information and message of the 160 is Good campaign were positively received, however, the campaign structure and components were not effective in changing behavioral intention of the focus group participants. Positive reactions to the information of the campaign contribute to positive response-efficacy meaning the message was able to convey the message that using a food thermometer will improve the safety of the food
consumers eat. This response also suggests that the core food safety element that educates consumers to cook their foods to the proper internal temperature by use of a food thermometer is beneficial to the public because it educates that there is a simple step they can take to avoid the threat of contracting a foodborne illness. However, self-efficacy was not evoked from the campaign components. This could be due to the lack of emotion induced from the campaign components. The video advertisement was the only component of the 160 is Good campaign that sparked any emotional response in the focus group participants. For some participants that response was fear and for other participants that response was humor, however, the emotional aspect did make the video advertisement component of the campaign the most memorable and relatable to the majority of the focus group participants. This is important to emphasize because emotion is what drives behavior change according to the EPPM framework.

Additional ways to induce self-efficacy through food safety campaigns derive from the suggestions made in the focus groups. It might be beneficial to conduct a needs assessment to determine where the target population spends the majority of their time, whether this is on social media, watching television, on the internet, listening to the radio, in stores, outdoors, or other locations, so that the main campaign components can be delivered to them in a location they commonly are in and are comfortable in. Advertising a food safety campaign to a captive audience where consumers must engage with the campaign, such as self-checkout lines at grocery stores after a raw ground beef hamburger product has been purchased, would guarantee some awareness of food safety concern. Providing consumers with the physical resources they need in order to have the ability to change their behavior, or simply making these physical resources more easily accessible. For instance, provide coupons for food thermometers or free food thermometers as a food safety campaign component. This increases perceived behavioral
control, a main factor of one’s intent to behave according to the RAA framework. Additionally, grocery store managers could make food thermometers more prevalent in grocery stores, thus creating a societal norm for food thermometers to be seen and used. The concept of creating societal norms also relates to the RAA framework because one’s perceived norms play a role in his or her intent to behave. Lastly, targeting food safety campaigns towards children and young adults may be beneficial because children are likely to talk about what they have learned with their parents and guardians creating more of a norm surrounding food safety communication while also addressing the emotional component of the EPPM framework. There is an emotional tie between children and their parents and guardians, therefore when a child shares information with their parent or guardian that will keep them healthy and safe the parent will feel an emotional pull to follow those recommendations. Also, children are easily impressionable and the future cooks and consumers, so if they grow up understanding that they should practice food safety they may be more inclined to keep practicing these behaviors as they grow older.

Overall, more effective media campaign methods targeting food safety practices need to be developed to communicate the importance of using a digital food thermometer to determine doneness and safety of beef hamburger patties to large populations. Future research should determine how to promote behavior change and produce a higher level of emotional stimuli through a food safety campaign, as defined in EPPM. This may be done by targeting populations and advertising to the populations in areas where they spend the majority of their time, by testing various emotional responses to the food safety messages, by creating a campaign that encourages food safety communication to become a norm in society, or by challenging consumers to engage in their responsibility of practicing food safety behaviors.
This research contributes to other research in the field surrounding insight into how consumers perceive different components of food safety campaigns. It has been found that different people react differently to the same food safety campaign component suggesting future research combining food safety, psychology, and communication could provide further depth and insight into behavior driven food safety campaigns. Additionally, researchers should continually evaluate and receive in-depth, qualitative feedback on food safety campaigns that are available to the public as a way to assess their effectiveness. Food safety campaigns need to be supported on a variety of levels by all food safety advocates starting at a national level funneling down to a local level to encourage transparency in the food safety world. This research can also be utilized to encourage television chefs and food magazine editors to change their habits and cooking suggestions to include more food safety information and support food safety campaigns.
REFERENCES


CHAPTER 4
Consumer Knowledge and Handling: Investigating a New Food Trend, Meat Bars

INTRODUCTION

Meat bars, or bars of meat usually made from organic or grass-fed meat along with spices and dried fruit, and are savory, soft, and chewy with a hint of natural sweetness, are a new and emerging food trend making their way through the United States. Meat bar sales increased 67% between 2009 and 2014 and are still trending upward (Erickson, 2016). Overall, the meat snack market is projected to grow worldwide by an estimated 9% over each of the next 5 years (Crews, 2017).

It can be assumed that meat snacks are becoming more popular because of a recent increase of consumer preferences for living healthier lifestyles and diets that encourage the nutritional benefits of foods that are more healthy, lower in calories, and higher in protein (Gustafson, 2017). In recent years, there has been a growing interest, and in some cases a medical need, among consumers for special diets such as vegan, gluten-free, low-fat, and paleo or pemmican. Paleo and pemmican diets consist of foods likely eaten by early humans or Native Americans, and are low in fat, but high in protein (Erickson, 2016). One off-shoot of this movement has been the development of meat bars, a nutrient-dense, protein-rich, portable snack food.

However, with a new meat snack on the market comes new concerns with their food safety, especially of those attempting to make them in their homes. So, while both jerky and meat bars are subjected to dehydration during processing, these products differ significantly in formulation. Although meat bars also contain a lean protein source (e.g., beef, bison, turkey), in contrast to jerky, the other main ingredients are dried fruit (e.g., cranberry, apricot, peach), spices
(e.g., paprika, black pepper, nutmeg), and nuts (e.g., pecans, sunflower seeds): meat bars typically contain celery powder instead of nitrates or other ingredients deemed artificial; therefore, making the composition of meat bars quite different from jerky. Consequently, making meat bars in the home calls for different food safety guidelines than making home-made jerky.

Currently, and with very little research available, meat bars are considered a shelf stable food. This is due to the process to produce meat bars including a heat step and enough acidity to likely prevent the growth of foodborne diseases (USDA FSIS, 2014). Therefore, manufacturers of meat bars must validate that their processes to achieve a 5.0-log reduction for cells of the seven regulated serotypes of Shiga toxin-producing *Escherichia coli* (STEC) and a 6.5-log reduction for Salmonella, while achieving a “zero tolerance” for *Listeria monocytogenes* (USDA FISIS, 2016 & USDA FSIS, 2004). However, there is no research on the microbiological safety of recipes for meat bars made in the home.

Given that some meat bars are made in homes by consumers, with little knowledge of key food safety risks, research is needed to determine the how consumers are creating meat bars in their home. Then, with that information, and additional information on how consumers are eating meat bars, food safety educators will be able to target meat bar making populations with the appropriate food safety messaging outreach methods.

With a new meat snack on the market comes new concerns with their safety, especially of those attempting to make them in their homes. So, the research objective for the current investigation of the new food trend, meat bars, is to provide a foundation for exploring consumer food safety compliance when making new food trends. The hypothesis for this research states that when consumers make meat bars, they do not practice safe food handling and preparation techniques. Therefore, the primary goal of this study was to assess consumer awareness of meat
bars, gather information on who eat meat bars, if they purchase them pre-made or if they make them at home, the steps they use to make them in the home, and gain insight on how to educate those making meat bars about food safety.

**METHODS**

Two online surveys were designed to gather insight into consumer familiarity with meat bars, to determine the characteristics of those that consume meat bars, and establish how meat bars are made in the home. The surveys were implemented using Qualtrics, a market research software company for collecting and analyzing data.

**IRB Approval.** The combined surveys entitled “Habits and Risk Perceptions Related to the Purchasing and Consumption of Meat Bars” were reviewed and accepted by North Carolina State University IRB Protocol #12265. These online surveys can be found at: http://go.ncsu.edu/meatbars1 and http://go.ncsu.edu/meatbars2.

**Survey I.** This survey was conducted to gain insight on how many people, nationally, are familiar with meat bars through the Qualtrics omnibus survey platform. Omnibus surveys allow researchers to gather information quickly and with little resources, that is particularly applicable for gathering exploratory data in an area that is under researched, such as the general awareness of meat bars among consumers. Omnibus surveys are conducted by collecting data on a wide variety of topics within the same, shared survey. Qualtrics clients are able to contribute their individual research questions to a general demographic survey resulting in a survey consisting of a series of unrelated questions. This allows Qualtrics clients to share the cost of conducting the research.

Using this omnibus platform, multiple researchers added their survey question(s) to a pooled questionnaire that also included a variety of demographic questions, such as respondent
age, gender, ethnicity, household income, and census region. Additionally, there were also questions related to a respondent’s education level, employment status, and number of children in the household. Qualtrics distributes an omnibus survey once each month to a randomized sample of 10% of the total number of potential respondents registered in their portfolio, as is customary with market research (Berinsky, Huber, & Lenz, 2012).

The question for this research that was contributed to the omnibus survey was, “Are you familiar with meat bars?” Respondents could answer only “yes” or “no” to this question. Qualtrics provided the raw data of the responses to our single question; however, other questions included on the same survey were considered proprietary and were not made available to anyone but the persons who contributed each question. Meat bar familiarity results were then analyzed in comparison to the demographic results.

A large-scale survey using the Qualtrics Omnibus method is effective in gathering national awareness because Qualtrics samples are compiled using overall demographic quotas based on census percentages for representation of age, gender, ethnicity, household income, and census region. (Omnibus, n.d.). Omnibus surveys are very effective in gauging public awareness (U.S. Omnibus Surveys, n.d.).

**Sample Selection and Recruitment.** A national nonprobability sample of participants was recruited by Qualtrics from their internal portfolio of several thousand panel members. A national nonprobability sample is appropriate for this research because it is exploratory work (Kelley, Clark, Brown, and Sitzia, 2003). Potential survey takers were recruited from a list of participants that apply monthly to be included in various Qualtrics panels. Potential participants were contacted daily via e-mail until a minimum response rate of at least 1,000 total participants was reached to achieve sufficient statistical power for a nationally-representative sample. Using
a sample of at least 1,000 diverse survey participants has been accepted as a representative sample of the entire U.S. population for decades, and it is recognized in social science and polling research as being the minimum number of respondents required for statistical relevance (Gelman & Hill, 2007). In addition to several other benefits that Qualtrics panelists typically receive for participating on a panel, including entry into a drawing or raffle for prizes, the direct incentive from Qualtrics for participation in this study was $0.50 per respondent.

**Survey II.** Survey I was supplemented with an additional in-depth survey on consumer’s perceptions of meat bars and how consumers make their own meat bars. An in-depth online survey is appropriate to gather perceptions of a large population because of the access to unique populations, the rich domain for conducting research, and the time and cost advantages (Wright, 2006). For this survey individuals who were not familiar with meat bars were screened out. Survey II was a multi-question survey used to gather demographic information about respondents who consume meat bars and their reasoning behind consuming meat bars, where meat bars are purchased, and the process of making meat bars at home. The questionnaire was subjected to at least five rounds of edits to determine the appropriate wording of questions and to determine what questions to include and exclude. Five rounds of edits were conducted to the wording of the questions to improve survey reliability by ensuring the question meant the same thing to every respondent (DeFranzo, 2016).

To limit our margin of sampling error to ±5%, we sought to recruit a panel of at least 500 participants (Gelman & Hill, 2007). There was a soft launch/pilot of this survey by Qualtrics with the screener question that asked respondents, “Are you familiar with meat bars?” and if they said yes, they were prompted to describe a meat bar. After analyzing the initial fifty-five responses of their descriptions of meat bars captured in the first soft launch, it was clear that
there was considerable confusion as to what constitutes a meat bar. While the majority (n=33 of 55, 60.0%) incorrectly described a meat bar, most often as a deli counter, the remaining twenty-two of fifty-five (40.0%) respondents used terms such as, “a preserved bar made of meat,” “a dehydrated cooked meat source in the shape of a bar,” and “an energy bar mainly made of meat products” when describing meat bars.

As a result, the question was revised to, “Are you familiar with meat bars? A meat bar is a hand-held food item containing meat, not a deli counter” in order to eliminate confusion. The survey was again launched, but there was still confusion surrounding what constitutes a meat bar. When prompted to define a meat bar in their own terms, with the revisions made to the screener question, some respondents again defined a meat bar as “jerky”, whereas other respondents referred to meat bars as “a place where you can eat all the meat you can eat”, “like a buffet or a spread of different kinds of meat”, or “a frozen food item on a stick”. This survey was, therefore, modified a third time so the screener question included a photo of meat bars to accompany the question “Are you familiar with meat bars? A meat bar is a hand-held food item containing meat, not a deli counter”. Note, even when provided with a definition and shown a picture of a meat bar, as detailed elsewhere herein, nearly 90% of the respondents agreed with our definition of a meat bar, but about one fourth of respondents also equated meat bars with jerky.

When the full survey was launched for a third time, a nationally-representative pool of 1,223 U.S. citizens participated in the survey. Six hundred and seventy-eight of those respondents were screened out because they stated they were not familiar with meat bars.

Screening is used because it helps the survey reach the target population and helps to ensure that respondents meet the target specifications (A guide to using screening…, n.d.). The remaining
five hundred and forty-five respondents who met the selection criteria of being familiar with meat bars completed the remainder of the survey.

**Sample Selection and Recruitment.** The respondents for Survey II were not necessarily the same as those who participated in Survey I; however, it is possible that some individuals may have completed both surveys. Participants were recruited in the same manner. Participants received a direct incentive from Qualtrics for participation in Survey II, which was $0.50 per respondent.

**Limitations.** Regarding potential limitations of Survey II, although potential participants were provided with both a definition and a photo of meat bars to lessen their confusion about what meat bars are and what meat bars are not, some respondents may have completed the survey under the impression that meat bars are the same thing as a deli counter and/or that meat bars are the same thing as jerky. As another potential limitation, some of the short answer responses within the section of the survey following the question, “Do you make your own meat bars?” were not legible. The answers deemed as not legible included random numbers and letters typed in the answer textbox; therefore, the responses did not answer the question as it was posed.

**RESULTS**

**Survey I.** Survey I assessed if consumers are familiar with meat bars. Regardless of the demographics, which are available in Table 4.1, of 1,050 randomly selected U.S. citizens, 29.2% (n=307) reported being familiar with meat bars, and 70.8% (n=743) stated they were not familiar with meat bars.

**Survey II.** Of 1,223 individuals who participated in survey II, nearly half, (n=545, 44.6%) respondents indicated that they were familiar with meat bars. The demographics of those that participated in Survey II can be found in Table 4.2. The finding that 29.2% of 1,050
respondents in Survey I answered yes, they were familiar with meat bars, whereas 44.6% of 1,223 respondents in Survey II answered yes, they were familiar with meat bars, can be justified by the further prompting with words and a photograph about meat bars provided in Survey II.

When asked to define a meat bar in their own words, 25.3% (n=138) of respondents described meat bars as “jerky”, indicating there remains confusion around terminology and definitions used for meat bars. Regardless, other respondents correctly and adequately described meat bars as “packaged dried meat”, “a bar of dehydrated meat”, “meat and spices formed into a bar”, “a protein bar with a beef jerky base”, “a compressed chunk of meat” and “similar to a granola bar, but made with meat”. Following, when presented with the statement, “meat bars are usually made from organic or grass-fed meat along with spices and dried fruit, and are savory, soft, and chewy with a hint of natural sweetness”, 87% (n=474) of respondents agreed and 13% (n=71) of respondents did not agree with this definition. Though, when asked to check all that apply for ingredients they would find in a meat bar, the top three ingredients included a meat source (n=529), spices (n=315), and preservatives (n=264). Over half of respondents (n=385) stated that the protein they prefer in a meat bar is beef, followed by chicken (n=293), pork (n=183), and turkey (n=179) when asked to check all that apply. The top three additional ingredients respondents preferred in meat bars are a BBQ flavor (n=287), jalapeño/peppers (n=179), and cranberries (n=173). Other popular choices as ingredients for meat bars included maple flavor (n=170), almonds (n=160), and sunflower seeds (n=158) when respondents were asked to check all that apply.

In general, those that consume meat bars do so because of personal preferences or by choice, at least once a week, as a snack, and have done so most recently at some point within the past year (Table 4.3). However, some participants stated their participation in specialty diets has
influenced their consumption of meat bars. While 62% (n=336) of respondents were familiar
with a paleo diet, only 22% (n=118) have practiced a paleo diet at some point in their life (Table
4.4). Of the total participants that purchased meat bars, they were typically purchased at grocery
stores and cost between $2.00 and $2.99 on average (Table 4.5). Survey respondents (n=390)
reported their typical level of exercise as “basic”, which included walking, jogging, short
distance running, yoga, basic weight lifting, and short distance cycling. Additionally, when asked
to check all that apply, the most popular hobbies among those who consume meat bars was
watching TV (n=433), followed by watching movies (n=378) and reading (n=327), all mostly
sedentary activities. Physical and outdoor hobbies were less popular, with hiking (n=212),
gardening (n=209), playing sports (n=203), and running (n=203) as the top selections.

When presented with the opportunity to check all that apply, 88% (n=507) of respondents
said they purchased meat bars and twenty-eight respondents reported that they both purchased
and made their own meat bars. However, when posed with the single question, do you make your
own meat bars, 17.8% (n=97) said they made their own meat bars, while 82.2% (n=448) did not.
Respondents who answered “no” to making their own meat bars were omitted from the following
questions.

The demographics of those who made their own meat bars revealed that 50% (n=49)
were between the ages of 25 and 44; 70% (n=68) were white, with an even representative
between genders. In addition, 39% (n=38) reported a total annual household income of $50,000
to $100,000, 35% (n=34) earned a college degree, 26% (n=25) completed some college or a 2-
year degree, 20% (n=19) completed less than a high school degree, high school degree, or GED,
and 20% (n=19) completed a post-graduate degree.
Of respondents who made their own meat bars (n=97), the majority (n=52) obtained their recipes online (Table 4.5). The top three appliances/methods used for dehydrating meat bars in the home included an oven (n=64), a home food dehydrator (n=40), and air-drying (n=12) presumably at room temperature; however, temperature and drying conditions were not specifically addressed in most instances (Table 4.5). At some point during dehydration, 69.1% (67 of 97) of respondents measured the internal temperature of meat bars. The remaining 30.9% (30 of 97) of respondents did not specifically measure temperature but followed the processing times and conditions stipulated by the recipe. Responses related to measuring the internal temperature of meat bars during cooking revealed that 18 of the 67 (26.9%) used terms that presumably had the same meaning as “thermometer”, such as “thermostat”, “themoter”, “temperature measure”, “temp gauge”, or “temperature cooking tool”, whereas only 10.3% (n=10) of respondents stated they actually use a “thermometer” to determine doneness.

Descriptors used by respondents for determining doneness included “tasting it”, “touch it”, “internal temperature”, “feeling it”, “texture and colour”, “how hot it is”, “by the outline of it”, and “when the inside is brown”.

After meat bars were determined to be “done” by whatever measurement, when asked to check all that apply, most participants, 29% (n=50), vacuum-sealed the finished product and refrigerated their product, 49% (n=65) (Table 4.6). Respondents stored their meat bars for lengths of time ranging from “1 year if vacuumed sealed, inside a plastic bag and then sealed in Tupperware” to “a couple days.” Other popular storage times included, “a week at most”, “up to a month”, and “six months”. Note, 55% (53 of 97) of respondents said that their meat bars did not spoil or suffer in quality over time, while 45% (44 of 97) of respondents said that their meat bars spoiled or suffered in quality over time (Table 4.6). Of those that said their meat bars
spoiled or suffered in quality over time, their descriptions included “mold growth”, changes in texture such as “hardening” or “getting soggy”, “foul odor”, “the color of the meat bar changes”, and “it dries out”.

**DISCUSSION**

This research provides vital baseline research on meat bar awareness and preparation in the home and raises concerns of food safety, suggesting food safety education and outreach methods are in great need for new and emerging food trends overall. These data also suggest that most U.S. citizens are not familiar with meat bars and that meat bars may have varying descriptions across the nation. Collectively, recipes should be updated to include proper handling and drying instructions coinciding with food safety research and consumers should be better educated on safe practices for preparing meat bars in the home, because, as the hypothesis suggests, most consumers are not practicing proper food safety behaviors when making meat bars in the home. Overall, this research contributes to future food safety research on new and emerging food trends and can be utilized by researchers to develop food safety campaigns specifically for new and emerging food trends.

There is a wide range in the methods being used to make meat bars in the home setting. Therefore, there is an evident need to use the demographic and characteristic data collected to develop food safety messages for the populations consuming and making meat bars on how to do so safely. Of utmost importance is ensuring consumers take the internal temperature of the meat bars that they make with a food thermometer to make sure they have reached a safe temperature to mitigate the risk of foodborne illness. With a new and emerging food trend there is very little guidance on what communication methods would be ideal to target such a group, therefore
additional research on consumer food safety behaviors in the home and food safety messaging campaigns is desirable.

However, using what was gathered from the survey results it can be concluded that a food safety campaign targeted specifically towards consumers who make their own meat bars in the home would be effectively delivered online where the consumers are finding their recipes or by including food safety tips directly into the recipes. This would help to develop a societal norm surrounding the practice of food safety behaviors. If food safety steps are included in recipes then consumers will assume everyone is following those practices. Societal norms relate back to attitudes towards behaviors and perceived norms, which impact one’s intent to behave according to the RAA framework. Emotions including trust and reliability may also be induced if food safety messages are included directly into recipes. Evoking emotion is positive to changing behavior according to the EPPM framework. Additionally, meat bar specific food safety campaigns should provide insight into internal temperature, meat bar storage, meat bar spoilage, and other general tips and information surrounding the new food trend due to other interests and struggles those who made their own meat bars shared in the survey responses. Food safety needs to be the grounding factor in a meat bar specific food safety campaign with the utilization of teaching the consumers how they can specifically control the safety of their meat bars through the use of a food thermometer. This control measure will help consumers understand the specific actions they are able to take to increase the safety of their meat bars after their concern has been raised. This control measure will also influence both the consumer’s attitudes towards the behavior and their perceived behavioral control, which are two integral components of the RAA framework. Extension agents can also play a role in food safety messaging related to new and emerging food trends such as meat bars. Extension agents can hold programs that incorporate the
financial benefits of making new food trend item in the home instead of overpaying when purchasing them pre-made alongside food safety information. These community programs can also provide participants not only with the knowledge and skills to safely make the trending food items, but also the resources, such as a food thermometer and a reliable recipe to safely make the trending food item. Additionally, by holding needs assessments the extension agent can identify new and emerging food trends as they are developing and growing in popularity. Extension agents and other food safety advocates can also create and modify recipes for trending food items that incorporate food safety steps and final endpoint internal temperatures to release to the public. These methods of food safety messaging, because they are more intimate to the consumer, may influence response-efficacy and self-efficacy through emotional reactions and ties to the information and the way it is delivered. Evoking an emotional reaction is beneficial to health campaign messaging according to the EPPM framework. When information is delivered by a trusted individual it may create more of an emotional bond to the information. Overall, a food safety campaign targeting consumers who make meat bars in their own homes is of high importance and information regarding food safety campaigns specific to meat bars can be related to additional new and emerging food trends.
Table 4.1: Survey I, Familiarity with Meat Bars Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>Region of US Currently Residing In</td>
<td></td>
<td></td>
<td>Education Level</td>
<td></td>
<td></td>
<td>Familiarity with Meat Bars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>515</td>
<td>49.05%</td>
<td>Northeast</td>
<td>193</td>
<td>18.38%</td>
<td>Less than high school</td>
<td>32</td>
<td>3.05%</td>
<td>Yes, I am familiar with meat bars</td>
<td>307</td>
<td>29.24%</td>
</tr>
<tr>
<td>Female</td>
<td>535</td>
<td>50.95%</td>
<td>Midwest</td>
<td>224</td>
<td>21.33%</td>
<td>High School Graduate/GED</td>
<td>192</td>
<td>18.29%</td>
<td>No, I am not familiar with meat bars</td>
<td>743</td>
<td>70.76%</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>718</td>
<td>68.38%</td>
<td>West</td>
<td>244</td>
<td>23.24%</td>
<td>Some College</td>
<td>253</td>
<td>24.1%</td>
<td>Characteristic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td>128</td>
<td>12.19%</td>
<td>South</td>
<td>389</td>
<td>37.05%</td>
<td>Two Year Degree</td>
<td>123</td>
<td>11.71%</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>139</td>
<td>13.24%</td>
<td>Employment Status</td>
<td></td>
<td></td>
<td>Four Year Degree</td>
<td>269</td>
<td>25.62%</td>
<td>Minimum Age</td>
<td>18</td>
<td>28%</td>
</tr>
<tr>
<td>Asian</td>
<td>33</td>
<td>3.14%</td>
<td>Employed Full Time</td>
<td>505</td>
<td>48.1%</td>
<td>Master's Degree</td>
<td>143</td>
<td>13.62%</td>
<td>Maximum Age</td>
<td>85</td>
<td>100%</td>
</tr>
<tr>
<td>Other</td>
<td>32</td>
<td>3.05%</td>
<td>Employed Part Time</td>
<td>140</td>
<td>13.33%</td>
<td>Doctorate</td>
<td>17</td>
<td>1.62%</td>
<td>Mean Age</td>
<td>44.07</td>
<td>100%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td>Unemployed</td>
<td>345</td>
<td>32.86%</td>
<td>Household Income Before Taxes</td>
<td>189</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>352</td>
<td>32.37%</td>
<td>Number of Children Under 18 in Household</td>
<td></td>
<td></td>
<td>Under $23,000</td>
<td>189</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>26</td>
<td>2.48%</td>
<td>None</td>
<td>598</td>
<td>56.95%</td>
<td>$25,000 - $49,999</td>
<td>231</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>77</td>
<td>7.33%</td>
<td>One</td>
<td>203</td>
<td>19.35%</td>
<td>$50,000 - $74,999</td>
<td>199</td>
<td>18.93%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>21</td>
<td>2%</td>
<td>Two</td>
<td>164</td>
<td>15.62%</td>
<td>$75,000 - $99,999</td>
<td>147</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohabiting/Living with a partner</td>
<td>109</td>
<td>10.38%</td>
<td>Three</td>
<td>57</td>
<td>5.43%</td>
<td>Over $100,000</td>
<td>284</td>
<td>27.05%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Married</td>
<td>265</td>
<td>25.24%</td>
<td>Four or More</td>
<td>28</td>
<td>2.76%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
Table 4.2: Survey II, In Depth Meat Bar Familiarity Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
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<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
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<tr>
<td>Age</td>
<td></td>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 18</td>
<td>6</td>
<td>1.1%</td>
<td>Male</td>
<td>209</td>
<td>38.35%</td>
</tr>
<tr>
<td>18 – 24</td>
<td>101</td>
<td>18.53%</td>
<td>Female</td>
<td>330</td>
<td>60.55%</td>
</tr>
<tr>
<td>25 – 44</td>
<td>314</td>
<td>57.61%</td>
<td>Other</td>
<td>6</td>
<td>1.1%</td>
</tr>
<tr>
<td>45 – 64</td>
<td>101</td>
<td>18.53%</td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65 and older</td>
<td>23</td>
<td>4.22%</td>
<td>Less than high school/ high</td>
<td>115</td>
<td>21.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>school graduate/ GED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race (check all that apply)</td>
<td></td>
<td></td>
<td>Some college or 2-year degree</td>
<td>180</td>
<td>33.03%</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>18</td>
<td>N/A</td>
<td>College degree</td>
<td>181</td>
<td>33.21%</td>
</tr>
<tr>
<td>Asian</td>
<td>43</td>
<td>N/A</td>
<td>Post-graduate degree</td>
<td>69</td>
<td>12.66%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>66</td>
<td>N/A</td>
<td>Household Income Before Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>5</td>
<td>N/A</td>
<td>Less than $25,000</td>
<td>95</td>
<td>17.43%</td>
</tr>
<tr>
<td>White</td>
<td>417</td>
<td>N/A</td>
<td>$25,000 to $50,000</td>
<td>169</td>
<td>31.01%</td>
</tr>
<tr>
<td>Other</td>
<td>19</td>
<td>N/A</td>
<td>$50,000 to $100,000</td>
<td>185</td>
<td>33.94%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td></td>
<td></td>
<td>$100,000 to $150,000</td>
<td>75</td>
<td>13.76%</td>
</tr>
<tr>
<td>Yes</td>
<td>74</td>
<td>13.58%</td>
<td>$150,000 or more</td>
<td>21</td>
<td>3.85%</td>
</tr>
<tr>
<td>No</td>
<td>471</td>
<td>86.42%</td>
<td></td>
<td></td>
<td></td>
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</table>
Table 4.3: Paleo Diet Familiarity and Participation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you familiar with the paleo diet?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>336</td>
<td>61.65%</td>
</tr>
<tr>
<td>No</td>
<td>209</td>
<td>38.35%</td>
</tr>
<tr>
<td>Have you ever participated in the paleo diet?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>118</td>
<td>21.65%</td>
</tr>
<tr>
<td>No</td>
<td>427</td>
<td>78.35%</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Count</td>
<td>% of Total</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>About how long ago did you start eating meat bars?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within the past week</td>
<td>74</td>
<td>13.58%</td>
</tr>
<tr>
<td>Within the past month</td>
<td>70</td>
<td>12.84%</td>
</tr>
<tr>
<td>Within the past year</td>
<td>170</td>
<td>31.19%</td>
</tr>
<tr>
<td>Within the past 5 years</td>
<td>74</td>
<td>13.58%</td>
</tr>
<tr>
<td>Over 5 years ago</td>
<td>157</td>
<td>28.81%</td>
</tr>
<tr>
<td><strong>Why do you consume meat bars? (check all that apply)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paleo diet</td>
<td>92</td>
<td>N/A</td>
</tr>
<tr>
<td>Pemmican diet</td>
<td>43</td>
<td>N/A</td>
</tr>
<tr>
<td>Other specialty diet: gluten free, high protein, low carbohydrate, etc.</td>
<td>89</td>
<td>N/A</td>
</tr>
<tr>
<td>Medical reasons</td>
<td>39</td>
<td>N/A</td>
</tr>
<tr>
<td>Personal preferences/by choice</td>
<td>314</td>
<td>N/A</td>
</tr>
<tr>
<td>Lifestyle/sports and hobbies</td>
<td>163</td>
<td>N/A</td>
</tr>
<tr>
<td>Other</td>
<td>48</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Table 4.5: Meat Bar Purchasing Behaviors and Preferences

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where do you typically purchase meat bars? (check all that apply)</strong></td>
<td></td>
<td></td>
<td><strong>How much do you pay per meat bar on average?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grocery stores (Whole Foods, Kroger, Harris Teeter, Walmart, etc.)</td>
<td>447</td>
<td>N/A</td>
<td>Less than $1.00 per meat bar</td>
<td>39</td>
<td>7.16%</td>
</tr>
<tr>
<td>Outdoors stores (Cabela’s, Bass Pro Shop, Gander Mountain, Dick’s Sporting Goods, etc.)</td>
<td>120</td>
<td>N/A</td>
<td>$1.00 to $1.99 per meat bar</td>
<td>159</td>
<td>29.17%</td>
</tr>
<tr>
<td>Online orders (Amazon, Jet, Thrive, etc.)</td>
<td>130</td>
<td>N/A</td>
<td>$2.00 to $2.99 per meat bar</td>
<td>197</td>
<td>36.15%</td>
</tr>
<tr>
<td>Gyms and exercise stores</td>
<td>61</td>
<td>N/A</td>
<td>$3.00 to $3.99 per meat bar</td>
<td>93</td>
<td>17.06%</td>
</tr>
<tr>
<td>Airports</td>
<td>20</td>
<td>N/A</td>
<td>$4.00 or more per meat bar</td>
<td>57</td>
<td>10.46%</td>
</tr>
<tr>
<td>Road-side service areas</td>
<td>56</td>
<td>N/A</td>
<td><strong>How much would you be willing to pay per meat bar on average?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Have you ever seen a meat bar in a grocery store, convenience store, airport, road-side service area, etc.?</strong></td>
<td></td>
<td></td>
<td>Less than $1.00 per meat bar</td>
<td>32</td>
<td>5.87%</td>
</tr>
<tr>
<td>Yes</td>
<td>456</td>
<td>83.67%</td>
<td>$1.00 to $1.99 per meat bar</td>
<td>150</td>
<td>27.52%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$2.00 to $2.99 per meat bar</td>
<td>180</td>
<td>33.03%</td>
</tr>
<tr>
<td>No</td>
<td>89</td>
<td>16.33%</td>
<td>$3.00 to $3.99 per meat bar</td>
<td>120</td>
<td>22.02%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$4.00 or more per meat bar</td>
<td>63</td>
<td>11.56%</td>
</tr>
</tbody>
</table>
### Table 4.6: Home-made Meat Bar Processes and Characteristics

<table>
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<tr>
<th>Characteristic</th>
<th>Count</th>
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<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
<th>Characteristic</th>
<th>Count</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you make your own meat bars?</td>
<td></td>
<td></td>
<td>What appliance do you use to dehydrate/cook your meat bars?</td>
<td></td>
<td></td>
<td>How do you most often store the meat bars after dehydration/cooking?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>97</td>
<td>17.8%</td>
<td>Oven</td>
<td>64</td>
<td>N/A</td>
<td>Refrigerator</td>
<td>65</td>
<td>N/A</td>
</tr>
<tr>
<td>No</td>
<td>448</td>
<td>82.2%</td>
<td>Home food dehydrator</td>
<td>40</td>
<td>N/A</td>
<td>Freezer</td>
<td>41</td>
<td>N/A</td>
</tr>
<tr>
<td>How often do you make meat bars?</td>
<td></td>
<td></td>
<td>Industrial kitchen dehydrator</td>
<td>11</td>
<td>N/A</td>
<td>Room temperature</td>
<td>27</td>
<td>N/A</td>
</tr>
<tr>
<td>Multiple times a week</td>
<td>36</td>
<td>37.11%</td>
<td>Air dried (ambient temperature)</td>
<td>12</td>
<td>N/A</td>
<td>Who do you make meat bars for? (check all that apply)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once a week</td>
<td>25</td>
<td>25.77%</td>
<td>Other</td>
<td>4</td>
<td>N/A</td>
<td>Personal consumption</td>
<td>81</td>
<td>N/A</td>
</tr>
<tr>
<td>At least once a month</td>
<td>25</td>
<td>25.77%</td>
<td>How do you most often package the meat bars after dehydration/cooking?</td>
<td></td>
<td></td>
<td>To share with friends</td>
<td>39</td>
<td>N/A</td>
</tr>
<tr>
<td>At least once a year</td>
<td>11</td>
<td>11.34%</td>
<td>Vacuum-sealed</td>
<td>50</td>
<td>N/A</td>
<td>To offer for sale</td>
<td>9</td>
<td>N/A</td>
</tr>
<tr>
<td>Where did you get your meat bar recipe(s)? (check all that apply)</td>
<td></td>
<td></td>
<td>Plastic bag (Ziploc)</td>
<td>47</td>
<td>N/A</td>
<td>Do your meat bars ever spoil or suffer in quality over time?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online</td>
<td>52</td>
<td>53.61%</td>
<td>Sealed plastic wrap</td>
<td>20</td>
<td>N/A</td>
<td>Yes</td>
<td>53</td>
<td>54.64%</td>
</tr>
<tr>
<td>Specialized blog</td>
<td>9</td>
<td>9.28%</td>
<td>Plastic wrap</td>
<td>23</td>
<td>N/A</td>
<td>No</td>
<td>44</td>
<td>45.36%</td>
</tr>
<tr>
<td>TV show</td>
<td>12</td>
<td>12.37%</td>
<td>Parchment paper</td>
<td>10</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food magazine</td>
<td>6</td>
<td>6.19%</td>
<td>Plastic container (Tupperware)</td>
<td>17</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend</td>
<td>13</td>
<td>13.4%</td>
<td>Glass container (Pyrex)</td>
<td>6</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>5.15%</td>
<td></td>
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REFERENCES


CHAPTER 5
Perceptions and Self-Reported Behaviors Related to Handwashing

INTRODUCTION

Handwashing is an integral step to the cleaning element of preventing foodborne illness. Handwashing in the kitchen directly pertains to the spread of possible foodborne diseases as it relates to food preparation.

Restroom use. A study using multilevel modeling for handwashing prevalence and meta-regression for risk estimates conducted by Freeman and colleagues (2014) shows that handwashing after coming in contact with excreta, such as using the restroom or changing a child’s diaper, is poorly practiced globally with only 19% of the world’s population washing their hands after these instances. Washing hands after using the restroom in one’s own home also varies drastically depending on how clean individuals feel their bathroom is, what they touched, and what they did in the bathroom (Borchgrevink, Cha, & Kim, 2013). So, it is important to understand what motivates people to wash their hands after they use the restroom, especially in their own home, and then to educate them on why they should practice good hand hygiene everywhere.

Hand sanitizer. Hand hygiene and the perception of clean hands are also closely related to the use of instant, waterless hand sanitizers. Hand sanitizers are typically used either alone, in place of handwashing, or in conjunction with, after handwashing has occurred. Research shows that the reduction of contamination of diseases and infections on hands can easily be improved by implementing proper handwashing procedures, either alone or in combination with hand sanitizers, to maximize the log reduction of these bacteria and viruses on the hands. A study that implemented a mixed-methods approach of risk modeling and intervention studies based on
microbiological data found that microbes could be controlled or killed by the use of a disinfectant or hand sanitizer, therefore concluding that hand sanitizer does have an impact on improving hand hygiene whether used alone or in conjunction with handwashing (Bloomfield et al., 2007). A separate study using a systematic review of the literature regarding hand sanitizer, found water and soap to be more effective than hand sanitizer products when used alone in the removal of bacteria and viruses from hands (Foddai, Grant, & Dean, 2016). This study analyzed twenty-eight scientific publications to find these conclusions that hand sanitizers do rapidly inactivate bacteria under certain circumstances and they are less effective against viruses (Foddai et al., 2016). This is because if hands are not washed before the use of hand sanitizers the presence of food debris affects the inactivation rate of hand sanitizers (Foddai et al., 2016). So, while hand sanitizers are effective in rapidly inactivating some bacteria and viruses, the implementation of handwashing is still more recommended. Therefore, it is important to understand the general consumers’ habits and behaviors of using hand sanitizers, including why they use them, when they use them, if they use them in place of handwashing or if they wash their hands and then use them.

**Training.** While there is an abundance of research on handwashing behaviors and the effects of hand hygiene, there is minimal research on the perceptions of and motivations driving handwashing, especially within the field of food safety. An observational study held on a college campus illustrated a link between general knowledge of science and handwashing behaviors. Fifty science majors and fifty non-science majors were observed washing their hands using water, or soap and water, upon emerging from a stall in one of the ten most commonly used public bathrooms on the campus. They found that forty-three science majors washed their hands while only twenty-seven non-science majors washed their hands (Taylor, Basco, Zaied, & Ward,
This implies the link between knowledge of bacteria, viruses, and pathogens gathered from science courses to actual behaviors indicating that those with more knowledge on pathogens have a higher likeliness of washing their hands. The problem addressed in this study is related to whether or not there is an adequate amount of education on the spread of pathogens and handwashing.

**Theoretical framework.** This study design will be rooted in the RAA framework (Fishbein & Ajzen, 2010). The RAA framework provides the theoretical framework for this study because the goal of the study is to provide insight into and link the general populations’ perceptions and beliefs to their self-reported habits and behaviors surrounding handwashing. This theoretical framework is vital to the current qualitative study because it will impact how the researchers gather the insights into perceptions, and actual behaviors related to those perceptions. With the understanding of what influences behaviors in relation to the spread of bacteria, viruses, and diseases due to handwashing, or lack thereof, educational materials can then be developed in a way that directly influences the beliefs and perceptions of the general public.

**Problem statement.** Handwashing is an important aspect of reducing the spread of bacteria, viruses, and disease (Show Me the Science: Why Wash Your Hands?, 2015). It has been found that contaminated hands spread a large percentage of foodborne disease outbreaks. Researchers in London estimate that if everyone routinely washed their hands, a million deaths a year could be prevented (Water, Sanitation & Environmentally-related Hygiene, 2013). There is a gap in the research surrounding the general populations’ practices of handwashing within and outside of the home. Further, the general populations’ opinions and perceptions of handwashing are not widely known.
**Purpose statement.** With that knowledge and the understanding that proper hand hygiene is the number one way to prevent the spread of infection (Hand hygiene, n.d.) the current study was conducted to gather further data on the general populations’ perceptions, habits, and self-reported behaviors related to handwashing in regards to food safety. With these data researchers will then be able to better deduce the best ways to educate the general population on why, when, and how they should wash their hands.

**Research objectives.** The research objectives for the current research on the perceptions and self-reported behaviors of handwashing are to determine what food safety practices consumers exhibit in the home as it relates to hand hygiene and determine what methods of education will best engage consumers so they change their behaviors and practice better hand hygiene. The hypothesis for the research states that if consumers have taken a college-level general microbiology course, then they are more likely to self-report practice better hand hygiene. Overall goals that will be addressed within the research include: gathering insights on handwashing in community settings such as public restrooms; collecting perceptions and attitudes of handwashing practices of food workers within the food service industry; collecting perceptions and behaviors in relation to the use of instant, waterless hand sanitizers; understanding perceptions of handwashing and handwashing behaviors when in the home; and gathering information on the specific handwashing practices implemented while washing hands.

Through in-depth interviews these research goals will be able to evolve and emerge as the study unfolds. The discussion between the interviewer and interviewee will be able to be personalized and expand on the various aspects of the study as correlations and common themes developed between interviews.
METHODS

**Qualitative justification.** This qualitative research study was conducted using twenty interviews on self-reported behaviors and perceptions regarding handwashing in relation to food safety. These interviews were chosen so that information on personal opinions, perceptions, experiences, habits, and behaviors related to handwashing could be gathered. In-person interviews promote open discourse, yield authentic descriptions of phenomena, and yield better quality data versus phone interviews (Knox & Burkard, 2009). While observation is also a viable option to gather experiences, habits, and behaviors the observer effect could have impacted the results. The low cost of interviews, the minimal time commitment, the capture of verbal and non-verbal ques, and the ability to guide the discussion are all additional benefits to utilizing qualitative in-person interviews. Research has found that when people know they are being observed they change their behaviors; therefore, relying on self-reported behaviors eliminates that discrepancy. This phenomenon that occurs due to the awareness that one is being observed is called the observer effect (Noland, E., 1959). Thus, the current research implements interviews and is rooted in interpretive and constructivist epistemological perspectives in order to provide description, understanding, and interpretation of the phenomena of handwashing that derive from the four primary epistemological perspectives that are identified in research (Merriam & Tisdell, 2016).

**IRB approval.** A research study was developed at North Carolina State University with an interview protocol in the spring of 2018 to mine perceptions and self-reported behaviors related to handwashing. The following methods for this interview research were reviewed and accepted by North Carolina State University Institutional Review Board Protocol #12698.
Sample selection and recruitment. The sample consisted of twenty individuals in the Food, Bioprocessing and Nutrition Science department at North Carolina State University who voluntarily participated in the interviews. The sample was contacted by email sent to the NC State University Food, Bioprocessing and Nutrition Sciences and Food Science Club’s ListServ database. This ListServ consists of approximately one hundred undergraduate and graduate students in Food Science, Nutrition Science, or related majors.

By utilizing a purposeful volunteer sample of individuals, the discussions exhibit the perceptions, habits, and behaviors of the sample population (Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K., 2015). Purposeful volunteer sampling allows the researcher to identify key aspects of a phenomenon of the sample population as they emerge within the interview process (Cohen & Crabtree, 2006). Volunteer sampling simply involves individuals who agree to participate in research (Jupp, 2006). The purposeful volunteer sample of participants relates to the phenomenon of interest and is emergent in its results, which reiterates why this sampling technique was implemented for qualitative research.

The purpose of the study was to represent the sample population and then deduct if there were any ties between perceptions and behaviors to social and or cultural norms, as well as educational background in regards to college-level general microbiology courses. Therefore, critical concepts and characteristics were explored in relation to the emergent findings to minimize concern with over-looking any themes (Glaser & Strauss, 1967; Strauss & Corbin, 1994, 2007). The results of the population were split into two groups based on whether or not the participant had completed a college-level general microbiology course. Then the results were compared within cases to determine if microbiology courses impact the knowledge and behaviors of the population as they relate to hand hygiene.
**Data collection.** The interview began with a brief introduction of the participant and then covered topics such as the influence of washing hands in public settings, the perceptions of handwashing in food establishments, behaviors related to the use of hand sanitizers, and handwashing habits within the personal residency of the participant. The interview moderator guide is available in Appendix C. The interview was semi-structured and the atmosphere was extremely informal to promote conversation and openness in the discourse. Additionally, semi-structured interviews are recommended when there is one single chance or opportunity to interview someone (Bernard, 1988). The semi-structured interview was guided by a protocol consisting of fourteen open-ended questions. This interview protocol serves as a way to develop rich and relevant communication (Given, 2008).

Each participant received a ten-dollar Target gift card as compensation for his or her time. The participant was compensated according to the time commitment they made. Therefore, with the average hourly wage in the United States at $22.40 the participants were compensated with nearly half that amount of money for the half an hour time commitment they made (United States Average Hourly Wages, 2018).

**Data analysis.** After all of the interviews were conducted the recordings were exported from the iPod touch to the researcher’s computer for transcription. Once completed, the data were coded to determine common themes using constant comparison analysis. The data were divided into units determined by participant quotations, attached a code, the codes were grouped into categories, and themes were developed that express each of the categories. This emergent-systematic focus group data analysis design promotes exploratory and verified analysis of data sets when multiple focus groups are being analyzed (Strauss & Corbin, 1998). Additionally, the primary researcher kept a reflexive diary throughout the data analysis process to document the
coding, theme, pattern, and cluster decisions being made A reflexive research diary is beneficial because it acknowledges the problem of bias in qualitative research that is stated in the positionality statement (Ortlipp, 2009).

**Limitations.** There was no verification that the students had or had not in fact completed or not completed a general microbiology course at the time of their interview; therefore, this information has the possibility of being incorrect. Additionally, when dealing with self-reported behaviors and perceptions, the participant had the opportunity to lie to the interviewer and make up responses that are untrue. There is no way to determine what responses were true or untrue; therefore, all responses were coded and analyzed as if they were true. The time limit of thirty minutes had to be kept in order to keep later interviews on time; therefore, some questions might not have been addressed to guarantee the interview would finish on time.

**RESULTS**

**Influence of General Microbiology Course.** To tie all of this information together in relation to the influence of participants having completed a general microbiology course, there were no significant distinctions between the responses of those who have or haven’t taken microbiology. The single minor difference between the two groups was that those who have taken microbiology used more technical terms such as bacteria, virus, pathogens, and microbe when responding versus those who had not taking microbiology typically used the term germs. However, the behaviors and perceptions of those who had taken microbiology were comparable to those who hadn’t taken microbiology, suggesting that the completion of a microbiology course does not significantly impact perceptions and behaviors regarding handwashing.

**Handwashing Motivators.** The first common theme that emerged surrounded the removal of pathogens from hands to stop the spread of such germs and the overall importance
of handwashing. When addressing motives participants stated that they wash their hands to:
“keep germs off of your hands in order to stay healthy, to avoid getting sick, and spreading it to other people,” “to stay clean and not spread germs,” “so you don’t distribute the germs on your hands,” “to disinfect your hands from all the germs you encounter,” and “to kill any bacteria that might be in contact with your hands.” Then, in relation to participants’ overall views of handwashing at the conclusion of the interview they stated: “it’s very important, especially to avoid any illnesses or diseases,” “I think it’s important especially in like food industry and I think it could be emphasized more,” “I think it’s important definitely that people do and I hope that other people do it,” “I love handwashing, I think it’s important and it helps to keep you healthy, away from germs, and get sick less,” and “it’s a very important and very positive experience, after talking about it I’m going to be more conscious of if for a period of time.”
Considering the understanding of why people should wash their hands and also the general importance of handwashing, many themes emerged surrounding the research questions (Table 5.1).

**Handwashing in Public.** When addressing the topic of whether or not being in a public setting is more or less of a motivator to wash hands, a common theme that many participants shared was that societal beliefs, peer pressure, and the dirtiness of the bathroom would motivate them to wash their hands more often in public. In relation to the influence of society and peers, these feelings were depicted through statements such as: “If you don’t do it people think that you’re gross, it’s ingrained in our heads, society,” “when it involves other people I’m more motivated to keep my hands clean,” “I feel like people would judge you like if you walk out of the stall and don’t even wash you hands because I feel like I would do that,” “if I see someone walk out without washing their hands it’s kind of like shame, you don’t say anything but if you
see it you’re like, oh,” “I would feel like peer pressure and I would judge someone for not washing their hands in a public bathroom,” “if you didn’t wash your hands and if someone sees, and most people are like me, then they think it’s gross if you don’t wash your hands in a public setting,” “I think more of a motivator to wash your hands when you’re in public because there’s other people in the same restroom and if you don’t wash your hands they’ll be like why isn’t she washing her hands, it’s the negative thinking from other people and I don’t want that of course I always wash my hands whenever I’m in the bathroom because I don’t want anyone to think I’m disgusting.” “I do feel like for some people it does play a factor but then some people just don’t care, like people in the guy’s bathroom will just walk out I’m like are you serious there are other people watching you and just judged you for that but okay,” and “If people are watching to make sure you wash your hands; it’s definitely frowned upon to do your thing and then leave.”

Additionally, statements that depicted the belief that the dirtiness of the public restroom impact the motivation to wash hands include: “I feel like there are more germs around so you’ve got to try to get clean somehow and washing your hands is the best option,” “when there are tons of people are around, there is more likeliness of things spreading around,” “it’s more of a motivator to wash my hands in public, because there are many people constantly entering and exiting and you don’t know how many people been there,” “when you’re that setting it just feels not clean so it’s just that feeling that makes you want to wash your hands,” “it’s more of a motivator to wash hands because of the volume of people that go through public bathrooms and there’s more of a chance that someone who has something just came through and you have no way of knowing,” and “there’s more people in there and it’s an environment I’m not familiar with and I don’t know who has been in there, so it feels dirtier, like I feel more inclined to wash my hands in public.” So, while there are many influences of why people wash their hands in
public, it was a common theme that other peoples’ presence and judgment as well as the dirtiness of the location all influence people to feel more motivated to wash their hands when in public restrooms.

**Perceptions of Food Workers’ Handwashing Practices.** Participants were provided two case study scenarios related to food worker’s handwashing practices at food establishments and we discussed their reactions, how the situation might make them feel, if they would notice the occurrence, how they might act, and if they might say something to either the employee or the manager in response to those situations. The first situation depicted that a food worker at a fast food restaurant collected the customer’s money and then proceeded to handle their food without washing their hands or putting on gloves and the second situation proposed that a restaurant customer noticed a food worker of the restaurant leave the restroom before washing their hands. The common theme was that when food handlers do not wash their hands after going to the bathroom, it is much worse than when food handlers do not wash their hands after touching money. It was also found that many participants are not confrontational and would be too nervous to speak up about either situation.

Statements that supported this theme include: “it probably wouldn’t bother me if the employee touched my money and then my food because I handled the money as well, but if they didn’t wash their hands after the restroom and then they handled my food that would gross,” “it’s gross because in my mind I associate the money versus the bathroom as a really big difference in my mind where the money is acceptable and you’re used to passing bills back and forth and getting that bacteria on your hands and it’s more normal and common, but if someone uses the bathroom you don’t know what they’ve got on their hands,” “I guess it’s not any more nasty than handling money because money is all over everybody’s hands and who knows but I think it’s the
stigma of a bathroom situation, it’s just no, your hands are in places in a bathroom,” and “I think that it’s more important that they wash their hands after the bathroom [than washing after touching money] because they’re touching your food or plate and it’s easy to transmit germs and bacteria that way.” Comments in general surrounding the stigma of food workers not washing their hands after using the restroom include: “that would be super gross and I would definitely make sure that they get in trouble or something because that’s pretty gross if you’re contaminating someone’s food by not washing your hands after using the bathroom,” “you can get all the real nasty pathogens from transferring from bathroom to restaurant,” “with that situation I would be more likely to tell the manager, I’d be like, wait that’s not okay. So yeah if they’re wearing their uniform that they’re working in I’d recognize and tell the manager, but I probably wouldn’t stop them in the moment but it grosses me out,” “fecal and urine contamination, everything about that is just not good,” and “employee at a restaurant or not you need to wash your hands after you use the restroom it doesn’t matter what you touched, what you didn’t touch, if you’re sitting, if you didn’t use the restroom at all you’re still touching knobs and handles that plenty of other people had to touch.” While some people brought up the topic of employee handwashing signs in restaurant restrooms, there was a divide on whether or not they were effective reminders for employees. However, many stated that they don’t think the signs make that big of a difference. For example, one participant stated that they, “probably don’t think the employee handwashing signs make a difference, but I think it’s more reassuring for customers even if they don’t know that employees are or aren’t doing it, I think it’s just like an oh okay they have that sign so they have to do that to make you feel better kind of thing.” Overall there is just less concern over the bacteria and viruses that could be on money compared to those that could be found in the bathroom as reiterated by statements including: “I wouldn’t
notice if a server touched my money and then my food, it’s not something I pay attention to because usually after I order I go sit down and get my drink or something, I don’t pay attention to what they do” and “I see the money situation happen more like when there are people on the street selling food, then I’ve seen that situation happen there, so yeah I’ve seen it happen but I didn’t say anything” What the population has become accustomed to believe plays a large role in what is found acceptable and unacceptable for the actions food workers perform.

Perceptions of Hand Sanitizers. A common theme among participants was that they are relatively aware that hand sanitizers are useful in killing microbes however dead microbes are not removed from the hands; therefore, they understood that handwashing is a more effective way to clean hands, as research supports. Participants were asked whether they think hand sanitizers are effective for killing the germs on hands and their perceptions regarding hand sanitizer included statements of the scientific killing versus removal of microbes including: “for killing the germs maybe but not for getting them off your hands, you’re going to have dead germs on there, but I think that for my purposes as a young adult in college it definitely better that I do something if like opposed to not handwashing,” “it doesn’t get rid of germs; I’ve been doings some research on it and it doesn’t get rid of any germs,” “hand sanitizer is not perfectly effective and it doesn’t necessarily remove filth, it will just sanitize the surface of the bacteria but the inside matter will still have potential contaminants,” “the germs are still on your hands, so sometimes I think using hand sanitizer is not as clean [as washing],” and “I know it kills them but I don’t know that it rinses them off because there’s not water to rinse it away.”

Additionally, those who did not know the scientific reasoning were still under the impression that handwashing is better for cleaning hands than using hand sanitizer. Participants stated: “I’ve heard that washing your hands is better so I think it’s good in like crunch situations
where you don’t want to or can’t go to the bathroom but I think washing your hands is better,”
“realistically if you touch something and don’t have access to a sink it’s better than not using but
washing hands is still the better option,” “I don’t think it’s an exact substitute but it’s better than
doing nothing, so I at least try to do that if I don’t have access to a bathroom or am too lazy to
get up to go wash my hands, I’ve heard it like kills the bacteria on your hands but doesn’t wash
them off,” and doing something is better than nothing.” Some even grasped the scientific concept
without articulating it in scientific terms: “I don’t feel like I’m cleaning my hands when I use
hand sanitizer. I feel like I’m just moving it around and it stays on my hands.”

Then when asked how they think the majority of the population feels about hand sanitizer
they believe others put more of an emphasis on hand sanitizer and believe it is just as effective as
handwashing if not better. However, there were comments that this could be a societal influence
as well: “I feel like a lot of people especially in the US use it a lot and think it’s pretty effective, I
think it’s different in other countries. Like I’m originally from Uzbekistan and I didn’t even
know about hand sanitizer until I moved here.”

**Handwashing in the Home.** A common theme among participants was that they don’t
wash their hands as often as recommended or when it is recommended to, especially when in the
home, to prevent cross contamination and the spread of germs. The main three focuses were on
after restroom use, after touching raw meat, poultry, or eggs, and when arriving home after
having been out of the house. General statements surrounding handwashing in the home
included: “I should wash my hands more at home but I don’t think I have time for that,” “I think
I wash quicker at home unless I’m cooking,” “I definitely don’t wash my hands every day, but I
usually shower every day so they’re clean from that. I’d say I wash them like four times a week
honestly,” “handwashing at home is not a habit for me, I don’t think about it,” “I do think I take
less time to wash my hands if I’m at my house, because I feel like it’s cleaner since it’s like my house,” “I guess like at home I have the soap that I like and I like the smell so I’ll want to wash my hands longer and then I really like the soft towel at my house so it’s just really nice,” and “I don’t wash my hands after using the restroom when I’m at home no, but when I’m out I do almost all the time.”

Along those lines, when sharing their handwashing habits they practice in the home after using the restroom, many participants stated that they are much more relaxed about their practices in their own home. Comments included: “sometimes I probably forget to wash my hands,” “at home I definitely don’t wash for as long as I should and after I use the bathroom I don’t wash them in the middle of the night, but during the day time and if I’m not super sleepy then I do wash them all the time after the restroom,” and “sometimes I forget to wash my hands after I use the bathroom at home but I always do after I use the bathroom in public.”

In relation to handwashing surrounding the handling of food, participants depicted that they understood the importance of washing their hands before touching ready-to-eat foods and after touching raw foods, however, they don’t always perform these actions when they should. For instance statements included: I will say I won’t wash my hands every time I touch meat, because if I am cooking something and I know I’m going to go back to touch raw poultry I won’t wash my hands between that,” “when handling food I wash my hands prior but not when simply entering the kitchen; not really before I eat, maybe sometimes, maybe if I touch my cat then I’ll wash my hands but before eating probably not,” “I try to do it before I eat but sometimes I forget,” “if I’m prepping dinner for multiple people I will wash my hands, but if it’s just for me I won’t,” “sometimes if I know I’m going to get my hands in food I’ll wash them, but if I’m just microwaving something I won’t wash my hands. After I eat I know I should wash them,” “I try
to wash my hands after I touch meat or eggs but I contradict myself because I use cold water and don’t use soap every time,” “with cracking eggs I only wash my hands if it touches me,” “I guess I just put more emphasis on keeping the food safe in situations not necessarily the environment perspective and like I generally don’t wash hands after cracking eggs because there’s the shell there, so certain things I just worry about more than others,” “after I handle meat I don’t use soap, I just use the water and rinse them, and after I crack an egg I just use water too because that’s what my mother told me,” and “with eggs I kind of just rinse my hands, like I don’t thoroughly wash them or use soap.”

Participants were also generally unaware of the contaminants they could be bringing into their homes from outside or not concerned about these factors. Statements that reiterate this point include: “when I get home from being out I don’t wash my hands every time, I guess it depends on where I’ve been,” “every once in a while I’m just like, I did so much today I have gross hands so sometimes I’ll get home and wash my hands, but I’d say probably like half the time at most,” “if I’m running errands and come home I won’t wash my hands,” “I’m realizing I really don’t wash my hands when I get home, when I was living in the city I would but my hands would just feel grimy,” and “I don’t wash my hands when I get home unless I go to the bathroom.” There is a stigma surrounding homes that they are a generally cleaner and more sanitary place compared to public locations; therefore, it was evidenced that people are less concerned about their behaviors related the spread of microbes and the importance of handwashing when in the home.

**Handwashing Procedures and Beliefs.** When describing the process participants use to wash their hands the common theme was that there were many false perceptions surrounding water temperature, soap type, and scrub time. As mentioned previously, research shows water temperature does not matter; however, many participants were under the impression that it does,
therefore they had many statements to share on the water temperature they believe they should be using to wash their hands or the justification of the water temperature they are using: “I think warm water is better,” “I prefer more on the hot side because I feel like it releases the germs more,” “I think hot water might work better because I know you’re supposed to wash dishes with hot water,” “if I want my hands more clean I use hot water,” “I prefer warm water but I’ve heard hot water is better to clean them, so I usually use it over cold,” “I use warm water because I think it helps get them cleaner,” “I use hot water maybe psychological but I think it gets them cleaner, like hot is supposed to kill anything and maybe it’s not hot enough to kill anything but it makes me feel better about it,” “from a science point of view definitely warmer water helps get hands cleaner,” “I mean I know the warmer water will help stuff get off better,” “I like to use the water as hot as I can tolerate just for personal preference and I also do think they get cleaner with hot water,” “I usually use warm but I’ve learned that it doesn’t matter what temperature water, they always tell you that it’s warm but just recently people are like it doesn’t matter so I’ll go with it even if I don’t believe it,” “I’m sure there is some physiological benefit of warmer water but I don’t really know,” and “I like to use warm water, in middle school we did a handwashing thing where we had someone go wash their hands with cold water, someone go wash their hands with warm water, and then we did the same thing with like using soap and not using soap, and then we had a no handwashing and it just showed us what was on our hands after so we learned that like warmer water but not like hot gets it off better.” While there is no harm in using warm or hot water to wash hands, there is an evident misconception that these temperatures of water aid in getting hands cleaner.

Research has also shown that the type of soap does not correlate with the efficacy of handwashing. However, some participants prefer antibacterial soap or were under the impression
that it gets their hands cleaner: “antibacterial would be preferred,” “I mostly like using antibacterial soap,” “I don’t mind but if it’s antibacterial I guess it’s better,” “I prefer antibacterial as long as it doesn’t smell too strong, but in public I’ll use whatever is available,” and “I usually try to use antibacterial soap if possible.” There is a large debate surrounding antibacterial soap and some participants commented on creating bacteria resistance and the creation of superbugs. There was a variety of opinions surrounding the type of soap that is preferred when washing hands.

Then, while scrub time is a large factor of the efficiency of getting hands clean when handwashing, the consensus among participants was that they do not wash their hands long enough or at least not as long as they think is recommended. Scrub time, when the participant has soap on their hands and is rubbing them together, was far less than recommended by both the CDC and the FDA Food Code. Times for scrubbing included: “maybe three seconds but that’s it, just a quick wash,” “I scrub for like 5 to 10 seconds, definitely below 10 unless I’m like forced to wash longer,” “it depends if I’m in a rush or if I can take the time. Before I go to bed or early in the morning when I have time to myself I’ll focus more, but otherwise it’s a quick wash,” “I’ll wash anywhere from 10 to 20 seconds… maybe 5 seconds sometimes,” “I try to clean them [my hands] as fast as I can in a short amount of time before I have to go,” “I’ll scrub for like 10 seconds approximately I guess,” “4 or 5 seconds, but I don’t know if it’s really considered scrubbing because I don’t usually use soap,” “I’ll scrub for 10 to 15 seconds, probably a little faster,” “maybe just five or six seconds, I don’t pay attention,” and “safe would be scrubbing for longer than I do, probably scrub all of the hand instead of just the palm.” Many participants indicated that they don’t pay much attention to the length of time they wash their hands and
don’t take any measures, such as singing a song, to keep track of this time. They additionally did not portray much concern regarding the amount of time they spend scrubbing their hands.

**DISCUSSION**

From these findings it can be concluded that there are many misconceptions and a lack of general knowledge surrounding handwashing, including in public, in the home, food workers’ handwashing in food establishments, and the procedures being implemented when washing hands. There is a knowledge gap between the understanding of the purpose and importance of handwashing and the understanding of when and how to wash hands. While many participants understood that handwashing should be practiced in order to stop the spread of microbes that can cause illnesses, they stated that they were not always washing their hands after using the restroom, before entering the kitchen, before handling food, after touching raw meat, poultry, or eggs, or upon arriving home after running errands or being out. Each of which are common ways to spread illness-causing microbes. So, while participants may understand it is important to wash your hands, they are unaware of specific instances when it is most important to implement this practice.

Overall, there is not enough knowledge and understanding surrounding handwashing; therefore, it can be concluded that there are not enough educational materials being provided to the general population on handwashing. Drawing from these findings and conclusions, there is an obvious need to create more awareness and understanding surrounding all aspects of handwashing. Children and adults need to be provided with continuous education on the importance of handwashing and the possible implications that can result from not washing hands and the spread of microbes. Additionally, there needs to be more common teaching of the proper methods and procedures of handwashing to all. There is a lack of understanding on why
handwashing is important and also how to do it; so, with this information it is evident there is a need to reinforce the proper handwashing procedures. From these conclusions, it can also be presumed that there is a higher need to not only enforce handwashing in food establishments, but to also teach people to recognize improper hygiene in restaurants and what to do to address those issues when in those situations.

These conclusions also speak to the fact that college-level general microbiology courses are not placing emphasis on the spread of microbes and how that spread can be reduced through proper hand hygiene techniques. Overall there needs to be more informal and formal educational materials and learning opportunities that educate people of all ages on all aspects of hand hygiene. It can also be inferred that consumers do not connect the practices they follow in their home with their knowledge of pathogen spread. Therefore, when educating consumers on handwashing it is important to make ties to specific instances when they should practice proper hand hygiene. This will help proper handwashing to become a societal norm, which will influence consumer’s perceived norms and influence their intent to behave, according to the RAA framework.

Food safety campaigns emphasizing hand washing need to become more prevalent. The more consumers feel comfortable talking about handwashing and the more reminders about handwashing in society, then the more likely it will be for handwashing to become a societal norm. Also, a food safety campaign focused on hand hygiene should likely target a specific population, because the way children need to be educated about handwashing is different than adults need to be educated about handwashing. A handwashing campaign targeted towards children should be taught in schools and reinforced at home with most emphasis on proper handwashing time and the importance of doing so before meals to prevent sickness. While an
Adult handwashing campaign should aim to evoke a high emotional reaction to promote response-efﬁcacy as it relates to the EPPM framework. The campaign should then educate on the importance of proper handwashing techniques before food preparation and provide simple, easy to follow steps as a method of self-efﬁcacy. Additional handwashing campaigns can be targeted towards those who eat at restaurants by encouraging them to speak up and providing guidance on what to say when they see food handlers not practicing proper hand hygiene techniques. As always, it is important to meet the target population where they are, so advertise food safety campaigns in the locations that the population is most commonly found.

There are many methods of hand hygiene communication and messaging that can be implemented to the community to raise awareness of the importance of handwashing in order to influence attitudes towards handwashing and inﬂuence perceived behavior control over reducing the spread of bacteria. Speciﬁcally, extension agents can incorporate handwashing into as many programs as possible in an age appropriate manner. For example, when teaching programs on canning or cooking, or even when educating about livestock, the reiteration that handwashing is necessary when moving from task to task to reduce the spread of pathogens is important. Extension agents can also create and advertise handwashing infographics to be released within the community as a method of making hand hygiene communication more common in society. Holding handwashing ‘myth busters’ programs to demystify some of the false perceptions consumers hold surrounding handwashing, washing foods, hand sanitizers and general pathogen spread would be beneﬁcial to educate consumers about true handwashing beneﬁts and practices. Also, educators and 4-H extension agents could utilize the use of Glo Germ™ when teaching children about the spread of pathogens because it visually represents the effectiveness of handwashing for reducing the number of pathogens on hands. These methods of communicating
the importance of handwashing and best handwashing practices will likely influence consumer’s intentions to behave by targeting the main components of the RAA framework.

This research contributes to other research in the field of food safety by determining what knowledge the general public is lacking in regards to hand hygiene with an insight on how to accurately provide this population with such information in a way that they will grasp and realize the significance in. With these conclusions in place that depict the need for additional education on hand hygiene behaviors to prevent the spread of illness, teachers, researchers, extension agents, and food establishment managers alike can all use this information to develop educational materials, lessons, courses, and techniques to educate and promote proper hand hygiene. Additionally, teachers and professors of college-level general microbiology course can use this research to determine ways in which they can improve their courses by expanding on the spread of microbes in relation to hand hygiene practices. This would be an effective way to aid in the teaching of microbiology because the majority of the population is familiar with the concept of handwashing and it is something they have been told to do since a young age, therefore, by incorporating scientific information surrounding microbiology into such a trivial task might not only influence the perceptions and behaviors of students as they relate to handwashing, but it might also provide further context and connection with the course content.
<table>
<thead>
<tr>
<th>Handwashing Theme</th>
<th>Core Statements</th>
<th>Food Safety Campaign Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handwashing in Public</td>
<td>There is felt societal pressure to wash hands</td>
<td>Create handwashing campaigns that guilt consumers into washing their hands when in public</td>
</tr>
<tr>
<td></td>
<td>Public restrooms are perceived to be dirtier than home bathrooms</td>
<td>Use fear to evoke the felt need to wash hands in public because of the number of bacteria and viruses in the environment</td>
</tr>
<tr>
<td>Perceptions of Food Workers’ Handwashing Practices</td>
<td>Pay attention to food worker’s hand hygiene because they are touching the food you are about to consume</td>
<td>Educate consumers to speak up and what to say if they see food handlers not practicing proper hand hygiene, most likely through posters in the restaurant bathroom</td>
</tr>
<tr>
<td>Perceptions of Hand Sanitizers</td>
<td>Using hand sanitizer is not completely effective in cleaning hands, but is better than not doing anything</td>
<td>Target specific populations who rely on hand sanitizer such as parents of children and teachers that handwashing is more effective than handwashing and that hands should be thoroughly washed before touching food</td>
</tr>
<tr>
<td>Handwashing in the Home</td>
<td>Washing hands in the home before handling and preparing food is vital in order to prevent the spread of foodborne illness</td>
<td>Consumers need to understand the illness risk they are taking when they don’t wash their hands when handing food so it is important to evoke fear and also find a way to bring the messaging into the home whether through food packaging labels, cooking shows, television commercials, or stated handwashing recommendation times in recipes</td>
</tr>
<tr>
<td>Handwashing Procedures and Beliefs</td>
<td>Water temperature, soap type, and scrub time matter when washing hands but not all aspects are abided by</td>
<td>Debunk the myth that water temperature matters when washing hands and then emphasize the importance of scrub time through the use of fear inducing visuals</td>
</tr>
<tr>
<td>Influence of General Microbiology Course</td>
<td>Handwashing and the spread of bacteria and viruses by the hands is not emphasized in general microbiology</td>
<td>Hand hygiene needs more of an emphasis throughout school curriculum from kindergarten to Family and Consumer Sciences classes, all the way to microbiology courses at the college level</td>
</tr>
</tbody>
</table>
REFERENCES


CONCLUSION

The current literature base on consumer food safety in the home is outdated; however, research in the past has shown that consumers are not practicing safe food handling techniques in home kitchens to prevent the spread of foodborne illness. Additionally, there is very little research available on the efficacy of food safety campaigns aimed at changing consumer behaviors in the home. Not only is there little research on these campaigns, there are simply few campaigns whose objectives are to teach consumers about the importance of food safety and change their behaviors. With such minimal understanding of what consumer’s perceptions of food safety are or how consumers are handling and preparing food in their own homes, there is a gap in understanding what consumers need to be educated on regarding the food safety elements of clean, separate, cook, and chill. Furthermore, food safety campaigns of various sorts need to be developed and utilized to aid in educating consumers on proper food safety measures to take when preparing food in the home.

The research studies outlined in this thesis work together to provide insight into consumer food safety behaviors in the home and into the development of effective food safety campaigns aimed at changing consumers’ behaviors. These studies showed that consumers are not practicing proper food safety handling and preparation techniques in the home, especially regarding food thermometer and cleaning and sanitization methods. The results from these studies suggest proper and effective food safety campaigns need to be developed. From the research, it can be concluded that the most effective food safety campaigns would include both visual and auditory components that are shared with a captive audience in a captivating and fear-invoking manner while offering plausible solutions to reduce the fear. Additionally, food safety campaigns targeted towards specific audiences or campaigns that are focused on specific topics
or situations may enable greater behavior change, especially when combined with reiterated visual components. This is connected to the societal norm aspect of the RAA framework.

Food safety campaigns need to reach consumers from a variety of sources including government and industry through food safety packaging and labels, social through promoting food safety on cooking shows, in cooking magazines, and on social media, grocery stores through in-store food safety advertising monitors and signs, and local through extension outreach and education programs. Additionally, a great way to reach parents is through their children. So, if children are given a food thermometer and they bring it home asking their parents to use it, the parents will likely listen to their child if it is rooted in their safety and wellbeing. It has been found that the more personalized the food safety campaign is to the target audience, the more they will pay attention to it and they will have more investment in changing their behavior. Extension agents need to recognize their role as food safety advocates by enabling food safety behavior change in their communities. This can be done by providing community members with the knowledge, skills, and resources needed to implement safe food handling with the help of an effective food safety campaign. Extension agents can disperse as many of the components of the campaign as possible in ways supported by RAA and EPPM frameworks and also help to gather feedback and data from the effectiveness of the campaign with community members. Extension agents can also serve as a liaison to government, industry, social, and local agencies by providing them with food safety information and materials from food safety campaigns that they can disperse. They can then gather information to see if the information and materials are enabling consumers to change their behaviors. Extension agents are a valuable resource to utilize when attempting to disperse information into the community to create a societal norm and change behavior.
Overall, a food safety campaign should educate and inform consumers on why food safety is necessary while providing direct and simple solutions to practice proper food safety methods in the home. An ideal food safety campaign would be captivating, prevalent in the target population’s environment, evoke emotion, provide ample food safety solutions to the emotion, and change the consumers’ behaviors so that they feel the need to practice safe food handling techniques when preparing food in the home. A captivating and prevalent food safety campaign would help to create positive attitudes towards food safety and make food safety communication more of a norm in society. These two elements are vital factors in the successful implementation of the RAA framework when delivering messaging. Evoking emotion and then providing guidance on how to handle that emotion or the consequential behavior have ties to the EPPM and RAA frameworks. The EPPM framework depicts that it is useful to evoke emotion because an output of the emotional stimuli is to control the emotion by changing a behavior. Additionally, the RAA framework states that perceived behavioral control may have an impact on determining people's intentions. By utilizing components of each of these frameworks a food safety campaign will likely be effective in changing consumer’s food safety behaviors to be safer when preparing food in the home.

The overall goal of this thesis was to investigate what food safety behaviors consumers are lacking when handling and preparing in the home and then to determine effective food safety campaign strategies to help educate consumers on how to handle and prepare food safely in their homes. Research on consumer food safety behaviors in the home and food safety campaign efficacy should continue to explore and improve food safety behaviors as a way to reduce the number of foodborne illnesses world-wide.
INTRODUCTION

Good morning/afternoon/evening, my name is ___ with WRA Research. I’m not selling anything. We are conducting a brief survey on behalf of NC State University as part of a USDA funded project about food preparation, and would like to include your opinions.

(IF NECESSARY, SAY:) It should only take about __ minutes, depending on your answers.

(IF NECESSARY, SAY:) Your responses are confidential and will never be identified with you.

(INSERT STANDARD INTRO SCREEN DISPOS)

This call may be recorded for quality control purposes only.

SQ1. Are you one of the primary meal preparers in your household?
(OPEN-ENDED)
(IF NECESSARY, SAY:) Either for yourself or others.

1 Yes
2 No (IF LANDLINE, ASK TO SPEAK TO THE PRIMARY MEAL PREPARER AND REPEAT INTRO AND SQ1. IF NOT AVAILABLE, OBTAIN NAME AND SET CALLBACK FOR BEST TIME TO REACH)

SQ2. To ensure that we include all age groups in our sample, please tell me which category includes your age?
(READ RESPONSES)

1 18 to 24
2 25 to 34
3 35 to 44
4 45 to 54
5 55 to 64
6 Or, 65 or above
7 (REFUSED)
8 (UNDER 18) (THANK & TERMINATE)

(IF SQ1=1, CONTINUE WITH SQ3. OTHERWISE, THANK & TERM)

SQ3. Can I please have your zip code?
(OPEN-ENDED)
SQ4. And for classification purposes only, are you of Hispanic, Latino, or Spanish origin? (OPEN-ENDED)

1  Yes
2  No
3  (REFUSED)

SQ5. Gender
(RECORD ONLY – DO NOT ASK)

1  Male
2  Female

SQ6. On average, about how often do you or others in your household cook ground beef hamburger patties? Would you say
(READ RESPONSES)
(IF NOT SURE/VARIES, SAY:) Your best guess is fine, even if it varies, just need an approximation.

1  Daily (every day)
2  More than once a week
3  About once a week
4  2 to 3 times a month
5  Once a month
6  Less than once a month
7  Or, never  (THANK & TERMINATE)

1. When cooking ground beef hamburger patties, how do you TYPICALLY determine when the burgers are done?
(OPEN-ENDED & PROBE FOR SPECIFICS) (RECORD VERBATIM)

2. Do you ALWAYS, OFTEN, SOMETIMES, RARELY, or NEVER use the following techniques to determine if hamburger patties are done?
(ROTATE A-E) (REPEAT SCALE AS NEEDED)
(IF DON’T KNOW, SAY:) Your best guess is fine, even if not sure.
A. Measure the internal temperature with a food thermometer  
B. Look at the outside and/or inside color of the burger  
C. Go by the texture or firmness of the burger  
D. Look for the juices to run clear  
E. The amount of time it has been cooking

1. Always  
2. Often  
3. Sometimes  
4. Rarely  
5. Never

(IF Q2A=5, SKIP TO Q4. OTHERWISE ASK:)
3. When you are using a food thermometer on ground beef hamburger patties, what is the MINIMUM temperature you typically cook them to?
(OPEN-ENDED AND RECORD VERBATIM – DO NOT Probe)

(IF Q2A=1, SKIP TO Q5. OTHERWISE ASK:)
4. Why do you NOT use a food thermometer (IF Q2A=2-4, SAY:) more often when you are cooking hamburgers? (IF Q2A=5, SAY:) when you are cooking hamburgers?
(OPEN-ENDED & PROBE FOR SPECIFICS)

5. Are you aware of the cooked internal temperature at which ground beef is considered safe to eat?
(OPEN-ENDED)

1. Yes  
2. No/Don’t know (SKIP TO Q6)

5B. What temperature?
(OPEN-ENDED AND RECORD VERBATIM – DO NOT PROBE)

(IF Q2A=5, SKIP TO Q7. OTHERWISE ASK:)
6. When using a food thermometer on ground beef hamburger patties, how often would you say you cook them to 160 degrees or higher?
(READ RESPONSES)  
(IF DON’T KNOW, SAY:) Your best guess if fine, even if not sure.

1. Always  
2. Often  
3. Sometimes  
4. Rarely  
5. Never
7. Using a 0 to 10 scale, where “0” equals NOT AT ALL CONCERNED, and “10” equals EXTREMELY CONCERNED, how would you rate your overall level of concern with the SAFETY of the ground beef you eat? 
(REPEAT SCALE AS NEEDED)

0  Not at all concerned  (SKIP TO Q8)
1  (SKIP TO Q6)
2  (SKIP TO Q6)
3  (SKIP TO Q6)
4
5
6
7
8
9
10  Extremely concerned
11  (DON’T KNOW)

7A. What is it in ground beef that concerns you in terms of its safety, what worries you specifically? 
(OPEN-ENDED AND PROBE FOR SPECIFICS)

8. Using the same scale, where “0” is NOT AT ALL CONCERNED and “10” is EXTREMELY CONCERNED, how would you rate your level of concern with each of the following? Please use the full range of the scale to show differences; the higher the number, the more concerned you are. 
(ROTATE A-F)  (REPEAT SCALE AS NEEDED)

A  GMOs
B  pesticides
C  antibiotics
D  Bacteria
E  Hormones
F  Transfats

0  Not at all concerned
1
2
3
4
5
6
7
8
9
10  Extremely concerned
12 (DON’T KNOW)

9. When cooking ground beef hamburger patties yourself, how much control do you feel you have over how safe it is to eat? Would you say

(READ RESPONSES)

1  A great deal of control
2  A moderate amount of control
3  Some control
4  Very little control
5  Or, no control

10. For each of the following statements, please tell me whether you STRONGLY AGREE, MILDLY AGREE, NEITHER AGREE NOR DISAGREE, MILDLY DISAGREE, or STRONGLY DISAGREE with that statement.

(ROTATE A-E) (REPEAT SCALE AS NEEDED)

A  Using a food thermometer to measure the internal temperature is the only way to be sure that a burger is done and safe to eat
B  Color is a reliable indicator that a burger is done and safe to eat
C  Texture and firmness are reliable indicators that a burger is done and safe to eat
D  As long as the juices from the burger run clear, it is safe to eat
E  The amount of time the burger has been cooking is a reliable method for determining if a burger is done and safe to eat

1  Strongly agree
2  Mildly agree
3  Neither agree nor disagree
3  Mildly disagree
4  Strongly disagree

11. Do you ALWAYS, OFTEN, SOMETIMES, RARELY, or NEVER use a food thermometer when cooking any of the following other types of foods for safety?

(ROTATE A-E) (REPEAT SCALE AS NEEDED)

(IF DON'T KNOW, SAY:) Your best guess if fine, even if not sure.

A  Steak
B  Fish
Shell fish
C  Chicken
D Turkey
E Vegetable dishes
Eggs
1  Always
2  Often
3  Sometimes
4  Rarely
5  Never

(ASK Q12 IF Q2A=5 AND ALL Q11A-E=5. OTHERWISE SKIP TO Q12A)

12. Do you have a food thermometer in your home?
(OPEN-ENDED)

1  Yes
2  No (SKIP TO Q13)
3  (NOT SURE) (SKIP TO Q13)

12A. What type of food thermometer do you use most often?
(READ RESPONSES)

1  A digital thermometer
2  Or one with a dial
3  (BOTH)
4  (NOT SURE)
5  (NEITHER / NEVER USE)

12B. How long have you owned a food thermometer?
(READ RESPONSES)

1  Less than 3 months
2  3 to 6 months
3  6 months to a year (SKIP TO Q11)
4  More than one year (SKIP TO Q11)
5  (NOT SURE) (SKIP TO Q11)

12C. Did you purchase your food thermometer or did someone else buy it or give it to you?
(OPEN-ENDED)

1  Yes – respondent purchased
2  No – someone else bought it (SKIP TO Q13)
3  (NOT SURE) (SKIP TO Q13)

12D. Why did you purchase it?
(OPEN-ENDED & PROBE FOR SPECIFICS)

13. Now I have just a few questions about advertising you may have noticed. First, in the past 6 months or so, have you read, seen, or heard any advertising related to FOOD safety issues?
(OPEN-ENDED)
13A. What was the main message of this advertising? What do you recall, specifically? 
(OPEN-ENDED & PROBE FOR SPECIFICS) 
Anything else? 
(OPEN-ENDED & PROBE FOR SPECIFICS)

13B. Can you tell me who sponsored this advertising? 
(OPEN-ENDED & RECORD VERBATIM) 
(ACCEPT MULTIPLE REPLIES)

13C. Where did you see or hear this advertising? 
(OPEN-ENDED – DO NOT READ) (ACCEPT ALL REPLIES)

1 TV
2 Radio
3 Online (the Internet)
4 In movie theater
5 Newspaper
6 Billboard (outdoor)
96 (OTHER – SPECIFY:)
98 (NO OTHERS)
99 (DON’T RECALL)

14. During the past 6 months or so, have you read, seen, or heard any advertising specifically related to BEEF safety? 
(OPEN-ENDED)

1 Yes
2 No (SKIP TO Q15)
3 (NOT SURE) (SKIP TO Q15)

14A. What was the main message of this advertising? What do you recall, specifically? 
(OPEN-ENDED & PROBE FOR SPECIFICS) 
Anything else? 
(OPEN-ENDED & PROBE FOR SPECIFICS)

14B. Can you tell me who sponsored this advertising? 
(OPEN-ENDED & RECORD VERBATIM) 
(ACCEPT MULTIPLE REPLIES)

14C. Where did you see or hear this advertising? 
(OPEN-ENDED – DO NOT READ) (ACCEPT ALL REPLIES)
1 TV
2 Radio
3 Online (the Internet)
4 In movie theater
5 Newspaper
6 Billboard (outdoor)
96 (OTHER – SPECIFY:)
98 (NO OTHERS)
99 (DON’T RECALL)

QUESTIONS REGARDING AIDED RECALL OF CAMPAIGN WILL BE ADDED HERE IN THE POST-TEST.

Finally, I just have a few last questions for classification purposes only.

15. What is your marital status? (READ RESPONSES)

1 Single, never married
2 Married or domestic partner
3 Widowed, divorced, or separated
4 (REFUSED)

16. Do you have any children under the age of 18 in your household? (OPEN-ENDED)

1 Yes
2 No
3 (REFUSED)

16A. Including yourself, how many people live in your household? (OPEN-ENDED) (IF REFUSED, ENTER “97”)

(RECORD NUMBER:)

17. Are you currently (READ RESPONSES)

1 Employed outside the home
2 Self-employed
3 Not employed but looking for work
4 Homemaker
5 Student
6 Military
7 Retired
8 Unable to work (Disabled)
9 (REFUSED)
18. What is the highest level of education you have had the opportunity to complete?
(READ RESPONSES)

1  Less than high school graduate
2  High school diploma or GED
3  Some college credit, no degree
4  Trade/technical or vocational training
5  Associates degree (2-year)
6  Bachelors degree (4-year)
7  Post-graduate degree (Masters, Professional, Doctorate)
8  (REFUSED)

19. Which of the following BEST describes your race?
You can choose all that apply.
(READ RESPONSES)

1  White or Caucasian
2  Black or African-American
3  American Indian or Alaska Native
4  Asian
5  Mixed race
6  Some other race (SPECIFY:)
7  (REFUSED)

20. Considering all wage earners for your household, would your total household income, before taxes, be under or over $40,000 per year?
(OPEN-ENDED)

(IF UNDER, ASK:)  Is it over or under $25,000?
(IF OVER, ASK:)  Is it over or under $60,000?
(IF STILL OVER, ASK:)  Is it over or under $100,000?

1  Under $25,000
2  $25,000 - $39,999
3  $40,000 - $59,999
4  $60,000 - $100,000
5  Over $100,000
6  (REFUSED)

That concludes the interview. I just need to verify that I reached you at (INSERT PHONE NUMBER)
(If not correct, record number: __________________________)

And in case my supervisor wants to verify I completed this survey,
can I please have your first name?

**(RECORD NAME)**

Thank you so much for your time and opinions – have a good
day/evening!

**RECORD ONLY – DO NOT ASK**

21. Study Wave

1 Pre-test
2 Post-test
APPENDIX B

160 is Good Focus Group Moderator Guide Protocol

Pre-Arrival
Moderator:
Hello everyone. Thanks for coming today! Please some sign-in with me and then take a seat where there is a packet.
If you have any questions or need help with anything, let me know and in the meantime please write your name on the nametag sticker in your packet and put it on. Also help yourself to any refreshments while we wait.
[Begin when everyone has arrived, is situated, and is seated.]

Opening
Moderator:
Hello everyone! Thank you for coming in today for this focus group. I will be your moderator for the day and I am the one who has been in contact with you regarding this study. I am a first year Master’s student in Agriculture and Extension Education at NC State University focusing on food safety and this study will be part of my thesis.
Firstly, this focus group will take one hour; if anyone unable to stay for the whole time please let me know now.
We will begin with a review of the consent forms that you have in front of you. Please look over the consent form as I read over the document; if you have any questions or concerns, please do not hesitate to ask. When I am done reviewing the consent form you will sign it and I will collect it. The second copy is for you to keep. [Review consent forms.]
Thank you. Please remember, you may withdraw from this study at any time. As mentioned, we will be audio recording this session, today on the two iPod touches you see on the table.
I’ll be asking questions and simply guiding the discussion. There are no right or wrong answers. It is okay to disagree with other participants. We just want this to be a discussion. If we ask something, we’re not trying to lead you in a certain direction. We just want to hear any ideas or thoughts you have. We are conducting this research to understand if mass food safety messaging affects perceptions, food safety attitudes, and self-reported behavior changes. Our hope is to take the responses from our discussion today to create more effective food safety messages.
Let’s get started.

Introductions
- First off, I would like to scroll through the 160° Is Good website that I previously asked you to review. This is just to familiarize you with the campaign message that we will be discussing. As I scroll through the website please take it all in.
  - This video was played during the previews at the beginning of movies at movie theatres.
  - The audio clips were played on basic FM radio stations as well as the music app Pandora
  - The logo was shown as a banner ad along the top of websites
  - And website was linked to social media such as Facebook and Twitter
o Additionally, the quiz that is located on the website can be found in your packet for you to review as well.

Option A:
• As a way to introduce yourselves you can say your name and what you think the purpose of the advertisements was.
  o What were your first impressions of the advertisements?
  o Did you like the advertisements?
  o Did you dislike the advertisements?
  o What stood out to you?

Option B:
• Once again, I’d just like to get a head count of how many of you recognized this campaign previously.
  o So, as a way to introduce yourselves you can say your name and if you saw or heard any of these advertisements this past summer?
    ▪ If so, where did you see or hear it?
    ▪ Was there anything presented in the campaign that surprised you?
1. Now that we’ve reviewed the campaign I would like you to state what you think food safety means and the role it plays in your life.
   a. What do you think of when you hear the words food safety?
   b. Does this campaign match what you think of when you hear food safety?
   c. How could this campaign portray food safety effectively?
      i. Effective:
        1. How would you define successful in this scenario?
        2. In this regard, effective relates to hearing or seeing the messaging and it caused a change in thought or behavior in regards to thermometer use.
2. What do you feel would be effective about these advertisements in regards to convincing you to buy and use a food thermometer when cooking meat and why?
   a. What do you feel would be ineffective about these advertisements in regards to convincing you to buy and use food thermometer when cooking meat and why?
   b. What type of thermometer would you buy and why?
   c. What would you use it on and why?
      i. *Overall feedback on campaign messaging as a whole
3. In your opinion, what food safety messaging would be effective in convincing you to buy and use a food thermometer when cooking meat and why?
   a. In your opinion, what food safety messaging would be ineffective in convincing you to buy and use a food thermometer when cooking meat and why?
   b. What did you like or not like about the 160° Is Good food safety campaign?
      i. *Overall feedback about food safety messaging in general
4. If you own a food thermometer, what motivated you to get and use it? Why?
   a. If you do not own a food thermometer what are the reasons you don’t feel the need to purchase and use one and why?
   b. What is it that turns you away from using a food thermometer?

Now we have some questions regarding the results we gathered through a phone survey where advertisements were released:
• The results from the phone survey depicted that after seeing the advertisements, 23% of respondents said they started using a food thermometer or already use a food thermometer. Do you agree with this statement?  
  o Why do you think the other 77% did not or will not purchase a food thermometer?  
  o What do you believe could be done to convince them to purchase and use a food thermometer?
• The results from the phone survey depicted that 81% of respondents did not recall seeing, hearing, or reading any beef safety advertising.  
  o Why do you think that is?  
  o What do you think could be done to reach a larger audience?  
• The results from the phone survey depicted that 15% of respondents use a food thermometer to determine when a beef hamburger is done cooking.  
  o Why do you think that is?  
  o What other methods do you think people are using?  
  o Why would they use these methods?  
  o How could messages be designed to show the importance of using a food thermometer?

5. What are your thoughts on the ______________ advertisement? (voice, tone, colors)  
   a. Movie theatre pre-roll clip  
      i. Do you feel this advertisement method is successful?  
      ii. What methods do you believe would be more successful in reaching more people and why?  
   b. Audio clips (either radio or Pandora)  
      i. Do you feel this advertisement method is successful?  
      ii. What methods do you believe would be more successful in reaching more people and why?  
   c. Logo  
      i. Do you feel this advertisement method is successful?  
      ii. What methods do you believe would be more successful in reaching more people and why?  
   d. Website  
      i. Do you feel this advertisement method is successful?  
      ii. What methods do you believe would be more successful in reaching more people and why?  
   e. Quiz  
      i. Do you feel this advertisement method is successful?  
      ii. What methods do you believe would be more successful in reaching more people and why?  
   f. Successful:  
      i. How would you define successful in this scenario?  
      ii. In this regard, successful relates to hearing or seeing the messaging and it caused a change in thought or behavior in regards to thermometer use.

6. Which of your food safety behaviors do you feel would be most affected by the advertisements and why?  
   a. Which do you feel were least affected and why?
b. Were there food safety messages incorporated that you had not previously considered?

7. What methods could we use to convey the importance of purchasing and using a food thermometer beyond these?

8. How would you describe the overall impact of these food safety advertisements?
   a. On yourself?
   b. On others who may also be introduced to the campaign?

9. If we were to design a successful and effective food safety campaign together, right now, how would it look? You can use the paper and pen in front of you to create lists and designs as we share as a group.
   a. What would it include?
   b. What would it not include?
      i. Information wise
   c. How would it be advertised?

Probing questions:
- Would you explain further?
- Would you say more?
- Please describe what you mean.
- Is there anything else that you can add?
- Is there anyone else that agrees with that statement?
- Is there anyone that disagrees with that statement?
- What do you mean by successful? Flip the question back to the group
- Why is using a food thermometer important? How could the advertisement help you answer that questions?

Wrap-Up / Summary
- In light of everything that we’ve discussed regarding food safety messaging, is there anything that you want to add or comment on that we may have missed?

Moderator: Please feel free to ask me any questions at any time regarding this.

Thank you so much for your time and participation in this focus group. We really appreciate all that you’ve done to help us out! We are happy to provide you with further information regarding anything we’ve discussed today; please let us know.

Please receive your gift card on your way out.
APPENDIX C

Handwashing Interview Guide Protocol

Welcome! My name is Sarah Cope and I’ll be walking you through what you’ll be doing as part of our study today. As a quick introduction I am a first-year graduate student here at NC State University in the Agriculture and Extension Education department with a focus on food safety. The results of your interview and others will be transcribed; analyzed; and written-up for a qualitative research course I am taking this semester and then hopefully for publication. The results will be used to provide food safety researchers and educators with insight into the general populations’ perceptions and self-reported habits and behaviors of handwashing, so that they can develop accurate and relevant educational materials that will provide this audience with information on why, when, and how they should wash their hands in a way that is significant to them.

Before we start, I need you to read and sign this consent form. Please let me know if you have any questions or concerns while you review it. You will receive a copy of the form to take home.

Thank you for your consent, as stated within the consent form this interview will be audio recorded, the recording is simply used to verify accurate collection of your responses. Your identity will not be associated with your responses in any reports. Do you have any questions before we begin?

I will begin the recording now and we will get started with the interview.

1. Before we dive into handwashing, tell me about yourself.

2. What do you feel the purpose of washing hands is?
   a. What is your main motivator to wash your hands?
   b. Why do you feel that is your main motivator?

3. Do you believe being in a public setting, such as in a public restroom where other people are around, is more or less of a motivator to wash hands?
   a. Why do you think that?

4. Would you say that you have safe handwashing habits?
   a. Why would you say that?
   b. How would you describe your personal handwashing habits and practices?

5. Please describe the process you typically use to wash your hands.
   a. What temperature water?
   b. Do you use soap?
   c. What type of soap (typically)?
   d. How long do you wash?
   e. What do you dry your hands with?
      i. Single use, disposable paper towel
      ii. Reusable cloth towel
      iii. Air dryer
      iv. Wipe on clothes
   f. How does this differ between in public and at home?

6. How often do you think you wash your hands?
   a. Do you wash your hands after you use the restroom?
   b. Do you wash your hands before entering the kitchen/handling food?
c. Do you wash your hands after touching raw meat/poultry in the kitchen?
d. Do you wash your hands upon arriving home after running errands/being out?
7. Do you ever use hand sanitizer instead of washing your hands with soap and water?
   a. When/why?
8. Do you feel substituting hand sanitizer for handwashing is good for killing the germs on your hands?
   a. Why do you think that?
   b. How do you think the majority of the population feels about hand sanitizer?
9. Describe how handwashing is taught and emphasized in today’s society?
   a. Do you think handwashing is emphasized enough in today’s society? Why?
   b. How does handwashing education differ between adults as much and children?
10. Okay now I have two scenarios for you to imagine and tell me how you might act in that situation:
    a. For the first scenario: how would you act in the following situation where you arrive at a fast food restaurant; the server takes your order, collects your money, and then proceeds to handle your food without washing their hands first.
       i. Does this bother you? Why?
       ii. Would you say something? Why?
       iii. Do you feel this is a common occurrence? Why?
    b. For the second scenario: how would you handle the following situation where you are in the restroom at a restaurant and while you’re in there you notice an employee of the restaurant use the restroom and leave before washing their hands.
       i. Does this bother you? Why?
       ii. Would you say something to the employee? Why?
       iii. Would you say something to the manager? Why?
       iv. Do you feel this is a common occurrence? Why?
11. Are you more worried about the cleanliness of your hands when handling food at home or the cleanliness of food workers’ hands when out at restaurants?
    a. Why do you think that is?
12. Have you ever had a foodborne illness?
    a. Can you tell me about the experience?
    b. Was it contracted from home cooked food or food from a restaurant?
    c. What were your symptoms?
13. Now revisiting what we talked about earlier, what are your views of handwashing?
    a. Please tell me again your main motivators of washing your hands.
14. Do you have any other questions comments or concerns regarding handwashing perceptions and habits?

Thank you so much for your participation in this interview and your time. Here is your $10.00 Target gift card as your compensation for your time.