PARENTAL BELIEFS AND BEHAVIORS RELATED TO FOOD SAFETY IN ZAMBIA: EDUCATIONAL IMPLICATIONS

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Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Education

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February 10, 2025

Blacksburg, VA

Keywords: Food safety education, food education Zambia, Zambian parents

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ABSTRACT

Food safety has rarely been discussed in the literature on food education. In this study, Zambian parents of children in kindergarten, primary, and secondary were asked about their beliefs and other factors that influence their food safety behaviors and how these behaviors in turn impact their children. Qualitative interviews with 20 participants were recorded and coded. The analysis showed that parents were well informed on basic food safety practices, but several forces impacted how food safety was practiced and learned by school children in their homes and in school settings. The Innocenti Framework by Raza et al. (2020) was used to highlight areas in which parental experiences attempt to influence food choice in children. These forces were food allergies, experience with foodborne illnesses, access to information, cholera and COVID-19, social infrastructures, and curriculum structure. These forces impacted the decisions parents made in both their external and personal food environments as parents made decisions that were appropriate for their homes and based on what they could afford. This study provides a brief of what food safety looks like in the homes of Zambian parents in Lusaka. In the future, it would be beneficial for researchers to develop food safety educational interventions that are reflexive and appropriate to the local contexts within which they are intended to be applied.

Parental Beliefs and Behaviors Related to Food Safety in Zambia: Educational Implications

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GENERAL AUDIENCE ABSTRACT

Food safety education or food hygiene education is rarely written about in the literature. Food hygiene affects everyone since all people need to eat. Lack of proper food hygiene can result in sickness. This study was about the beliefs and behaviors related to food hygiene of Zambian parents who have children in kindergarten, primary, and secondary. The study specifically researched how these parents attempt to influence their children's food hygiene behaviors by asking parents about food behaviors in their homes and at restaurants. The results from the study showed that Zambian parents are well informed on how to practice food hygiene but do not always have the resources such as time, finances, information to practice it. Things such as curriculum, the government, information that is available to parents, cholera and COVID-19, all informed how well parents practice food hygiene and how they try to influence their children. Researchers in the future can develop food hygiene projects that are mindful of the things that prevent Zambians, and even parents from other contexts from practicing food hygiene.

DEDICATION

For my mothers, Glenda and Felistus. Words cannot describe how much you have helped me get to this point in my life ☺

JMJ

ACKNOWLEDGMENTS

Pope John Paul II says, “No one can sense more deeply than you artists, ingenious creators of beauty that you are, something of the pathos with which God at the dawn of creation looked upon the work of his hands” (Letter to artists, John Paul II). I have come to appreciate these words not just in the context of art but as a researcher. Nobody can sense more deeply than a researcher/scholar what is most important to them. Whether it is a literature gap, an intervention, or a policy recommendation, what is researched amounts to a creative “product” that will hopefully be used by others to continue the work.

Putting together this dissertation has been much like a work of art. I flatter myself by ascribing a level of importance to this dissertation because the final product has not been achieved by my own work alone, but by the help, support, and contribution of others.

To quote my father’s dissertation, no dissertation is ever perfect and so these pages, though not perfect, have been put together by many minds and hearts:

- The Director of the Institute of Scientific and National Research in Zambia, Dr. Alick Muvundika: thank you for helping me with the IRB process. I would not have been able to begin the data collection without your assistance.
- My Dad: thank you for inspiring my work ethic and the decision to pursue a PhD. It is beyond a blessing to have a father like you!
- The community and schools of St. Mary’s, Chilanga: none of this would have been possible without your participation and willingness to learn about my work!
- Participants: To all the participants who were willing to be a part of this study, I am grateful! Thank you for showing interest in this work!
- Mrs. Annibel: Thank for going above and beyond in helping me recruit participants for this study and for setting up a space for me to conduct the interviews.
- My awesome committee members: Drs. Amy Azano, Natalie Ferand, and Donna Westfall-Rudd. I cannot thank you enough for the support you gave me during this process. From suggesting classes to providing resources—all this has helped shape my work! I am grateful for your support.
- My advisor: words cannot begin to describe how wonderful Dr. Marcus Weaver-Hightower is. Such a supportive advisor who never refrained from challenging me and pushing me to do better! It was my biggest honor to have you as advisor and mentor.
- My Editor: thank you so very much for going above and beyond in helping me make this manuscript what it is!
- God: none of this would have been possible without the Lord’s hand in all of it! I am because He is!

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CHAPTER I: INTRODUCTION

Have you or someone you know ever experienced food poisoning? Food safety is a preventative approach used to minimize the risk of food poisoning and foodborne illnesses. According to the Food and Agriculture Organization (FAO), "Food safety is a science-based discipline, process or action that prevents food from containing substances that could harm a person's health" (FAO, 2024). The FAO definition of food safety recognized the varied ways of safe food. The United States Department of Agriculture (USDA) has defined food safety as containing four major constructs including cooking, cleaning, separating and chilling (USDA, 2024). According to the USDA, cooking includes using a food thermometer to ensure adhesion to proper temperatures. Cleaning includes washing hands and surfaces, while separating includes any measures taken to avoid cross-contamination and chilling includes proper storage of food in the refrigerator following preparation (USDA, 2024). The constructs have been used to create food safety curricula such as Fight BAC! (Partnership for Food Safety Education, 2024). Arguably, these constructs have helped in making food safety knowledge a measurable learning objective.

The World Health Organization (WHO), under the United Nations, recently launched a campaign to increase awareness and efforts towards food safety. One of the messages of the campaign was the following assertation: "If it is not safe, it is not food" (United Nations, n.d.). The WHO campaign demonstrated the necessity of safe food and how safe food corresponds to food security, as the lack of safe food was intrinsically linked to food insecurity. Food security, according to the FAO, existed when "all people, at all times, have physical, [social] and economic access to sufficient, *safe* [emphasis added] and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (Simon, 2012, p.4). The

definition by the FAO situated safe food as a topic that could only be discussed when food was available and met necessary nutritional and dietary needs.

The WHO estimated that 600 million people fell ill and 420,000 died every year from the consumption of contaminated food (United Nations, n.d.). The WHO further underscored that to derive nutritional benefits from food, it must be safe. Thus, the significance of food safety encompassed every individual, regardless of their geographical or social economic circumstances.

Unsafe food particularly adversely impacts immunocompromised individuals and small children worldwide (WHO, 2022). Still, any individual is likely to get sick from consuming contaminated food which can sometimes lead to long-term impacts on health and cause death. Individuals can also experience allergies which can be fatal without the use of allergy medications (Umasunthar et al., 2013). The negative impacts of foodborne illnesses should serve as an incentive to intensify educational efforts on how to prevent them, beginning with school-age youth in their homes, because food safety begins in the home (Byrd-BredBenner et al., 2013).

Educational Efforts on Food Safety

In the United States (U.S), very little was done to educate public school children on preventative measures to avoid foodborne illnesses, the Centers for Disease Control and Prevention (CDC), for example, reported that food education in schools was lacking (Food and Nutrition Service, 2023). Even more, majority of the food-related education offered was often in elective courses that not all students were enrolled in (see Virginia Standards of Learning Curriculum). A review of the literature showed that most studies on food education primarily focused on its nutritional aspects rather than safety (Willemson et al., 2022; Koch, 2016) and

even more, much of the existing research targeted older adults rather than students who were in kindergarten through grade 12 (Gizaw, 2019; Sivaramalingam et al., 2015; Milton and Mullan, 2010).

The lack of food education in the curriculum presents an opportunity to address various issues of interest to students, including food safety at school and home. Educating school-age children about safe handling practices could play a significant role in fostering lifelong behaviors during their formative years (Caskey & Anfara, 2007; Richards et al., 2008). Regardless of geographic location, parents and teachers play a significant role in helping school-age children foster food safety behaviors. Teachers, for example, need to be equipped with resources, time, and curriculum that addresses food safety, while parents could potentially influence their children's food safety related behaviors, since food safety begins in the home (Byrd-BredBenner et al., 2013).

Zambia and Food Safety Issues

Located in central sub-Saharan Africa, Zambia is a landlocked known as one of the most peaceful countries on the African continent (Taylor, 2006). The Republic of Zambia was colonized by Great Britain and retains governance policies similar to its colonizers, such as the presence of parliament and local monarchies, and even the schooling structures where prefects, headteachers, and other administrative roles are retained (Chileshe, 2023). The schooling system also resembles that of Great Britain with seven years of primary school and five of secondary (Thomas et al., 2020). The Republic of Zambia boasts of housing one of the seven natural wonders of the world, Victoria Falls (Taylor, 2006). While 73 languages are spoken in the country, English is considered the official language (Banda & Jimaima, 2018). Some of the most widely spoken languages are Nyanja, Tonga, and Bemba. Because of the diversity of languages

spoken in Zambia, it is not uncommon to find signage, especially for hygiene, written in any one of the main languages.

In Zambia, parents of school-age children have faced a variety of food-related issues that in turn affect learning environments, some of which the Ministry of Education outline (UNESCO, 2006). The Ministry reported that water supply and sanitation, diarrhea, worm infestations, and Vitamin A deficiency were some of the food-related issues that impacted school-aged children (UNESCO, 2006). Further, the Ministry recognized that the previously stated were preventable issues that resulted in school closures (especially regarding sanitation issues) (UNESCO, 2006). Consequently, the Ministry recognized hygiene education as a necessary means of educating teachers and teacher trainers on best practices to prevent illnesses (UNESCO, 2006). It has not been uncommon for Zambian households to practice hygiene, along with other food safety behaviors such as handwashing as most meals are consumed without utensils (Tembo, 2002). Hygiene practices within the home can be attributed to the role of the media in influencing behaviors and government efforts to raise awareness about hygiene in times of epidemics such as cholera, which has been food- and waterborne disease transmitted orally or through fecal matter (WHO, n.d. -a; Tamason et al., 2016). In many sub-Saharan countries, cholera outbreaks were attributed to a lack of clean water (Sasaki et al., 2009). The WHO (n.d.) reported that 12, 268 new cases and 467 deaths from cholera occurred in Zambia in February 2024 alone.

Zambia has four main seasons: cold, hot, dry and rainy seasons. These correspond to the Western winter, summer, fall, and spring, respectively. Unlike many Western countries, rainfall does not occur year-round but during the months of November to April. In recent years, however, climate conditions have dramatically impacted weather patterns (Kanno et al., 2015).

During the rainy season, cholera outbreaks are common due to a lack of proper drainage systems, creating stagnant water that is then used for various household purposes. The stagnant water also contaminates drinking water (Reid, 2023). Additionally, street vendors selling food do not have access to proper sanitation facilities (Sasaki et al., 2009; Mwape et al., 2020). The Zambian public has become increasingly sensitized and predisposed to prepare for cholera outbreaks during the rainy season (Mwape et al., 2020).

Even so, Zambian culture has historically informed practices related to hygiene in the prevention of cholera and any other foodborne illness. For example, participating in a meal without washing hands shows a lack of etiquette, so much so that using dirty hands to eat nshima, a traditional staple food, is almost taboo (Tembo, 2002). Oftentimes, meals that have consisted of nshima and some accompanying vegetables and protein, are consumed in communal settings and can sometimes be shared from the same serving bowl (Magogodi, 2022). Therefore, not washing hands would be inappropriate as hands are the "utensils" that are used. Tembo (2002) in his description of proper Zambian etiquette illustrates the awkwardness of not using clean hands when eating nshima:

> A young…. middle-class college American graduate from the Midwest, Joe Stevenson, was participating in a life-long dream: volunteer service abroad in a Third World Country. He was stationed in the Chipata rural provincial town in the Eastern Province of the Southern African country of Zambia. Mr. Banda asked Joe to wash his hands in the basin of water. Joe barely immersed the tips of his fingers in the water in a straight perpendicular fashion for a few seconds and pulled them out. This both surprised and appalled the host because it meant Joe was going to eat nshima with essentially dirty or less-than-clean hands. When Joe tried to get a small lump of nshima with his right hand,

> it was so hot he dropped it as he stood up and desperately licked his fingers swiftly. He tried again to get a lump of the nshima, it was so hot that he had to use both hands and dropped it again. This time, Joe quickly dipped both hands into the basin of cold water to cool them. Mr. Banda offered Joe a fork and knife. Joe refused insisting he wanted to try eating the Zambian traditional meal in a traditional way. Mr. Banda was flustered. There was a visible awkwardness between host and guest as they both tried to maintain some dignity. (p. 2)

Tembo's (2002) description of the interaction between Mr. Banda and Joe shows how washing hands before meals is a common practice in Zambian culture and illustrates the reasoning behind handwashing.

Zambian Economy and Impacts on Food Safety

Like other developing countries, Zambia has two complementary economic markets, formal and informal. While the literature does not offer a fixed definition of these two market systems, formal markets include spaces such as grocery stores (known as supermarkets in Zambia), restaurants, or any other commodity markets that are registered and licensed to operate and formally recognized-- hence the name “formal markets.” Informal markets include street vendors, mobile traders, small-scale traders, and any other businesses that are usually not registered and are run by individuals or families. In other words, informal venders usually operate outside legal protection and status (Giroux et al., 2021).

Formal and informal market systems create an interesting form of governance and enforcement of food-related policies. Foodborne illnesses more often occur in informal settings, as the standard of producing safe food is often overlooked or non-existent. Street vendors sell foods on roadsides or within designated selling areas but often do not follow safe food practices

due to a lack of resources (clean water, finances) to do so. Formal markets are well-structured and well-regulated, while informal markets (which comprise a larger portion of the economic landscape at more than 60%) are difficult to regulate as they are usually privately and individually owned (Mukuni, 2022). In many instances, "vendors are economically, socially, and spatially integrated in the urban food system and illustrates spatial aspects of both vendors' utilization of food suppliers and household food sourcing from vendors" (Giroux et al., 2021, p. 2). This means that the barriers to entry into food safety are almost non-existent for vendors, making it less challenging for them to operate their business and to be more readily available to consumers.

There are laws in place to govern food safety such as the Public Health Act and the Food and Drugs Act.

> The Public Health Act as well as the Food and Drugs Act govern when and where local authorities can seize foods that are deemed unsafe and unfit for consumption, and can fine traders accordingly (Skinner and Haysom, 2016). Vendors who work within markets—known as marketeers—are legally allowed under the 2007 Markets and Bus Stations Act; however, due to either ignorance of regulations or poverty, some may not have obtained the proper business licenses and food safety permits, or do not comply with the council fee structure established for selling from a stall or table. (Giroux et al., 2021, p. 2)

Due to the many vendors who do not comply with regulations, a snowball effect occurs where parents of school children and the children themselves buy foods from these vendors because they are cheaper than retail sellers, increasing the occurrence of foodborne illnesses. The most

prominent of these foodborne illnesses is cholera, which usually occurs during the rainy season (Sasaki et al., 2009).

Problem Statement

The U.S.'s Centers for Disease Control and Prevention (CDC; n.d.) estimates that 48 million people become sick, 128,000 are hospitalized, and 3,000 die from foodborne illnesses in a year. The current literature on educating school-age youth on food safety (see Chapter Two), both inside and outside the classroom, has done little to discuss the parental forces that influence school-age youth's knowledge of food safety in the US. Even more, the food safety literature is majorly lacking in the Zambian context. With food safety being a science that is applied in homes (Byrd-Bredbenner et al., 2013), it is necessary to investigate the parental forces related to food safety in Zambia.

Rationale for Study

Food safety begins in the home (Langiano et al., 2012; Byrd-BredBenner et al., 2013). Very little has been studied about what parents know about food safety and how this influences their children's food safety-related behaviors and knowledge. This study takes deliberate aim at understanding these forces. The term "forces" in this context describe the economic, social, and other drivers of actions related to food safety. According to the WHO, food safety describes any methods that are used to arrive at safe food and include proper food storage, cooking food at the right temperatures, washing hands, or any other behaviors to keep food safe (Safety, 2006). Food safety knowledge on the other hand refers to the educational cognizance of these behaviors.

What makes food safety unique is that many individuals may participate in behaviors to keep food safe yet may not necessarily recognize it as "food safety" and includes behaviors such as storing food in the refrigerator or washing hands before eating or preparing food. In Zambia,

the reoccurring cases of cholera (Phiri et al, 2015; Nanazaluka et al., 2020; Sasaki et al., 2009) and other foodborne illnesses underline a need to investigate the factors that contribute to the lack of preventative measures. Additionally, investigating the forces that drive food safety knowledge in parents of Zambian youth makes for a unique study as it provides the literature with insight into food safety education and how it is impacted by parental behaviors.

Research Questions

One primary question and three sub-questions guided this investigation:

1. What forces drove parental behaviors related to food safety in parents of kindergarten, primary, and secondary school children in Zambia?
    a. What did parents know about food safety? What forces impacted this knowledge (or lack of it)?
    b. What did the personal and external food environments of parents look like regarding food safety?
    c. In what ways did parents attempt to influence their children's food safety behavior(s) or knowledge?

Delimitations

This study was limited to Zambian parents and guardians who presently had children in kindergarten, primary, and secondary school. The study was also limited to Zambian parents in Lusaka to reduce travel expenses for the researcher and the participants. Limiting the participants to Lusaka also helped reduce language barriers that were likely to occur in other geographic locations in Zambia. The interview questions were limited to food safety and not food insecurity and other food system issues.

Chapter Summary

The purpose of this chapter was to provide a brief introduction to the study, the research problem, and questions, along with the background of the country in question. The study investigated food safety practices of Zambian parents with children in kindergarten, primary, and secondary, along with the various forces that influenced their children's behaviors in relation to food safety. The objective of the study was to determine what parents knew about food safety and how this knowledge in turn attempted to influence their children. With the limited literature on Zambia's food safety, this study provided a brief of what food safety looks like in the homes and schools of parents with school-aged children. The following chapters will focus on (i) review of literature relevant to the study, (ii) the research methodology used, (iii) the findings and data, and (iv) conclusions, implications, and recommendations.

CHAPTER II: LITERATURE REVIEW

This study focused on the parental forces that influenced kindergarten, primary, and secondary students' knowledge of food safety in Zambia. The literature review provides a comprehensive review of food safety within the K-12 population, food safety interventions, parental involvement in food choices, and food preparation. It includes studies from the US, Zambia, and other countries.

Food Safety Knowledge of School-age Students

Several studies have investigated what school-age students know about food safety (Trexler & Roeder, 2003; Whited & Bruhn, 2019; Feng et al., 2019; Endres et al., 2001). Byrd-Bredbenner et al. (2010), for example, found that middle school students are interested in learning food safety. The study also found that middle school students did not think that they were susceptible to foodborne illnesses. While many of these students were involved in food preparation (Byrd-Bredbenner et al, 2010; Haapala & Probart, 2004), some were unfamiliar with food safety. Middle school-aged students were at a critical stage in their development, emphasizing the need to introduce concepts about food safety during this stage (Caskey & Anfara, 2007; Richards et al., 2008).

Haapala and Probart (2004) also examined the level of knowledge and self-reported behaviors of middle school students and found that there was a disparity between male and female students when it came to self-efficacy in food safety. This left room to investigate the kinds of forces, whether parental or not, that influenced male and female behavior when it came to food safety. Haapala and Probart (2004) also found that students had difficulty with items relating to cooking in their questionnaires. The researchers assumed that this was because these

middle school students had not yet been involved in cooking in their homes but were more familiar with handling snacks.

Since the study by Haapala and Probart (2004) had to do with self-reported behaviors on food safety, participants assumed that they were conversant with proper handling of food, even though this may not be true. The researchers reasoned that consumers in general assumed knowledge on how to handle food safely, regardless of age and grade level. This study investigated self-reported behaviors related to food safety and therefore was cognizant of the fact that food safety may be viewed as a behavior that is familiar to its participants.

Trexler and Roeder (2006) investigated what elementary students knew about food spoilage using qualitative interviewing. The researchers found that only a few elementary students understood food spoilage and could explain it. Trexler and Roeder's (2006) study notably showed the benefits of using qualitative inquiry to investigate food safety knowledge as qualitative inquiry helps unearth conceptual understandings of a topic like food safety. This conceptual understanding may otherwise be overlooked when other methodological approaches are used.

Food Safety Curriculum and Interventions

One of the most popular food safety curricula was Fight BAC! by the U.S. Food and Drug Administration (FDA). Its popularity stems from the fact that the curriculum was developed by the FDA, a well-known governing organization, and is accessible at no cost to users. Several scholars have also investigated developing new food safety curricula or the effectiveness of predeveloped curricula at school levels. Beavers et al. (2013) examined the food safety curriculum to determine how effective it was at developing self-efficacy, especially when

gaining knowledge. The study found that there was a strong relationship between self-efficacy in food safety and behavior change.

Beavers et al. (2015) also investigated the extent to which existing food safety curricula influenced self-efficacy. The results showed that the curriculum, *Hands-on,* was effective in influencing self-efficacy in students and influencing behaviors practiced at home or school, especially regarding food preparation and consumption. With the *Hands-on* curriculum, students were predisposed to observe the connections between what was learned in the classroom and what was practiced outside of it. Food safety is particularly a relevant topic for making connections between the classroom and the real world as it is a practical topic (Mukuni & Mukuni, 2023).

Investigating knowledge gain is a common approach to curriculum development in food safety. Richards et al. (2008) for example, sought to validate resources for teaching food safety in middle school science classes. Pre- and post-tests along with follow-up assessments found that there was a 21% knowledge gain, meaning that students showed acquisition of new food safety knowledge to an observable degree. Developing a curriculum related to food safety is especially beneficial to students as they may practice food safety-related behaviors in their homes and prevent unnecessary foodborne illnesses.

Another goal of the Richards et al. (2008) study was to ensure that food safety fits with state learning standards. This was of concern for teachers in science and other classrooms as teachers are required to teach topics that align with state standards. Therefore, aligning food safety with state standards would especially benefit teachers as it wouldn’t be an add-on they may not have time for. Richards et al. (2008) reasoned that food safety can be enriching to students' everyday lives especially when taught as a part of core curriculum courses such as

Language Arts, Math, Social Studies, and Science which in turn provided students with interactive, hands-on projects and connections to useful in everyday life (Richards et al., 2008).

Lynch et al. (2008) developed a multimedia resource for teaching food safety. Pre- and post-tests found significant knowledge gains. Like many other food safety curricula, these knowledge gains were a significant step in preventing foodborne illnesses and facilitating understanding of scientific topics (Mukuni & Mukuni, 2023). By utilizing a multimedia approach to teaching food safety, Lynch et al. (2008) were able to cater to the various learning needs of their participants. The use of games, for example, was appealing to middle schoolers and their learning preferences (Lynch et al, 2008).

Lynch et al (2008) conducted this study within the context of contributing to the national standards in family consumer science, science, and technology. Food safety lends itself to a topic that can be applied in the contexts of science, technology, and other courses, which helps in addressing learning standards whilst reducing foodborne illnesses (Mukuni & Mukuni, 2023). Additionally, using games and other digital means increasingly became an appropriate method of educating the youth on science topics (Hsiao et al., 2020).

Interventions were some of the other most common ways that the literature investigated the knowledge of school-age students on food safety. Quick et al. (2012) sought to cater to the informational needs of middle school youth. The authors used focus groups, not just for middle school youth but also for their parents, along with food safety experts. The study showed that middle school youth had some knowledge about food safety and showed parental emphasis on wanting their middle school children to learn about it.

Some scholars have argued that middle school and high school were appropriate levels to educate the youth on food safety as they were more likely to participate in food preparation and

could understand scientific concepts related to the safety of food (Diplock et al., 2017, 2018; Haapala & Probart, 2004; Lynch et al., 2008; Hsiao et al., 2020). High school students were especially likely to work in the food industry (Barret & Feng 2020) therefore providing an incentive to train them in food safety. Another demographic that participated in the food industry were students with disabilities (SWD). According to Carbone et al. (2012), data collected by the federal government showed that the food service industry was a major employer of students with disabilities and "since food service is among the most viable employment options for SWD, [students with disabilities] handling food safely is a critical pre-employment skill. Demonstration of knowledge as a preventive strategy for reducing foodborne illness risk is also fundamental to the FDA Food Code" (pp. 7-8). The employment of students with disabilities situated food safety education as catering to more than one demographic.

Parental Involvement and Food Preparation

While parents and guardians are involved in the preparation of food, not all parents were cognizant of appropriate food safety practices. Almansour et al. (2011) investigated the temperatures at which packed lunches were kept for pre-school children. The study found that over 90 % of the packed lunches with perishable items were not kept at safe temperatures. The data from Almansour et al. (2011) showed how parents or caretakers may not have been aware of how temperature impacted the safety of food items.

Vlasin-Marty et al. (2013) assessed the food safety knowledge of Native American parents of small children. The study concluded that parents were aware of the severity of foodborne illnesses even though they scored lower on some components of food safety. These parents also scored lower on items that related to foods that were more likely to cause a foodborne illness. By focusing on Native American communities, the results from this study

provided insight into how various communities practiced food safety to protect their families and small children.

Trepka et al. (2010) found that parents—particularly women in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)—improved their food safety knowledge following the survey which was based on four constructs of food safety, "cook," "clean," "separate," and "chill," from Fight BAC! Of these four constructs, cooking and chilling were the most difficult for participants. Similarly, Stenger et al. (2013) developed a series of newsletters for parents in the WIC program, aimed at improving their food safety knowledge. Both studies sought to reach families of young children regarding food safety issues and showed the effectiveness of using digital means to reach these families.

Allergies, more commonly observed in children than adults (Umasunthar et al., 2013; Lee, 2017), posed a significant food safety challenge for parents of young children. Ramos et al. (2021) implemented a mentorship intervention program aimed at training parents of children newly diagnosed with food allergies. The study revealed that prior to the intervention, many parents lacked confidence in managing their child's allergic reactions. Moreover, external factors beyond parental control, such as the COVID-19 pandemic, which disrupted the food supply chain (Russell et al., 2020), could have also influenced parental self-efficacy.

External forces, such as disruptions to the supply chain, created novel approaches to food consumption and therefore required new ways of dealing with allergies. Even so, some parents desired to acquire knowledge about how to deal with allergies as new events and milestones occurred in their child's life, such as during the initial diagnosis (Hu et al., 2007). The lack of knowledge by parents revealed the informational needs, as not all parents were aware of how to prevent food allergies in their children.

While avoiding foods that contain allergens is a common method of preventing allergic reactions, avoidance is not always a factor that could be controlled by either a parent or a child. For example, Zimmerman et al. (2021) used a remote hands-on activity to assay peanut residue of commercial food products and found some residue of food allergens on products. Since the activity was remote, parents picked up pre-assembled kits for their junior high students. Some of the food items (those that were processed in a facility that processes nuts) contained nut residue. The students observed how products that are labeled as not containing common allergens could still have residues of allergens.

Helping students understand their allergies is very important. Feldman et al. (2022) found that some students relied heavily on their parents and school caretakers to identify allergens in foods. On the one hand, the Feldman et al. (2022) study showed the significance of parental influence on allergen knowledge whilst also showing the lack of knowledge among students themselves. Sherman and Muehlhoff (2007) argued that for nutrition education to be effective,

> Nutrition education should be part of a "whole-school" approach, where classroom learning is linked with practical action, backed up by improvements in the school environment and family and community participation. It should have a considerable focus on behavior and an active, learner-centered methodology. (p. 336)

The authors emphasized a need to involve both parents and students in learning food safety. For Sherman and Muehlhoff (2007), nutrition and health education encompassed some food safety activities such as handwashing and prevention of food-related diseases by storing food properly, cooking at right temperatures, and using clean utensils—an approach that was common to Zambian researchers.

Hewett et al. (2020) conducted a study focusing on adolescent females who were parents in various provinces of Zambia, examining their ability to retain nutrition knowledge following an intervention. The participants received weekly mentorship on health, nutrition, finances, and life skills. Additionally, evaluations and surveys were conducted to assess their dietary intake based on self-reported behaviors. The study concluded that the interventions did not lead to significant behavior changes, primarily due to a lack of resources necessary to implement new practices. Hewett et al. (2020) further noted the following:

> Coupling an education-based approach with a family or household-based intervention that addresses access to and control over economic and food resources may be more constructive for improving nutritional outcomes for adolescents and their children. Additionally, nutrition-related education interventions moving forward should consider more extensive formative work and human-centered design approaches for developing complementary interventions to educational approaches. (p. 12)

These human-centered designs recognized the unique backgrounds and contexts within which study participants came from and how these contexts could be honored by researchers. Human-centered approaches became necessary when it came to the application of "standard knowledge" or knowledge that researchers may have deemed accessible to a wide audience. For example, food safety practices may be standard around the world, but contexts reinvent how these standards were applied. Therefore, human-centered approaches brought to the forefront how these contexts expanded food safety knowledge or practices.

As seen in the studies noted above, food safety interventions in some geographic contexts aided in behavior changes. However, resource availability and control proved to be one factor

that limited positive behavior change. An excerpt from the grade 4 nutrition curriculum and teacher's guide in Zambia provided the following example:

> The school's responsibility goes beyond the classroom lessons. Good hygiene should be part of the school's culture and policy. For example, lessons on washing hands are not likely to have an impact on learners' behavior if the school has no clear expectations about handwashing – or indeed if it has no soap or running water. (Songiso et al, 2007, p. 64)

This example further pointed out how resource availability impacts learning, and how parents or the community at large also played a role in the education of school children. This study sought to identify the various factors that influenced food safety behaviors in parents of students in primary, secondary, and even kindergarten.

Discussion

The preliminary data showed that there were considerable issues that influenced parents' knowledge of food and nutritional behaviors. The literature focuses on the types of studies that have involved parents and students in K-12 settings regarding food safety, particularly in the US. While the literature on Zambia's food safety is lacking, food safety is composed of standard scientific practices that could be informed by varying contexts. Washing of hands for example could be influenced by the availability of water and other social infrastructural forces (Bulled et al., 2017).

The literature points out the informational needs of both parents and students when it came to food safety. The Quick et al. (2012) study, for example, showed how parents perceived the importance of educating youth on food safety. Parents and guardians were some of the important influences on their children's academic and social behavior (Draxten et al., 2014).

This was because "environment and family background play a significant role in a child's academic achievement; therefore, if we blame the schools/school systems for the poor performance of the students, we fail to recognize that parental involvement is just as important" (Roy & Giraldo-García, p. 33). This was no different when it came to students learning about food safety in kindergarten, primary, and secondary school settings. Reinforcing behaviors that promoted safe food handling could best be implemented in home settings through habitual practice and modeling and then reemphasized in the classroom.

The literature also discussed learning standards about food safety. Lynch et al. (2015) highlighted the flexibility of food safety information in that it could be incorporated into subject areas related to science and technology. Even so, food safety could be incorporated into other subjects (including humanities) as it is a broad topic. In history courses, for example, students could discuss the history of food safety. Books such as *The Jungle* and *Fear of Food* discussed the historical background and implications of food safety systems. In *Fear of Food*, the historian Harvey Levenstein outlined why food safety increasingly became a major concern in the United States following the history of unsafe food and how consumers became more aware of the dangers of unsafe food.

Further, food safety had political and social connotations. This is especially true following the terrorist attacks of September 11, 2001, after which the US became increasingly concerned about terrorist threats, even within the country's food systems (Nestle, 2010), including bioterrorism. In this manner, the burden of teaching food safety did not fall solely on science courses but on other courses, as well as within homes. Still, learning food safety from a humanities perspective brought to the fore issues of consumption and social factors that influence food safety knowledge. For example, one cannot discuss food allergies without

discussing the types of foods that were consumed in one's home along with the social or economic factors related to those consumption patterns (Bulled et al., 2017). Therefore, investigating parental (and guardian) forces that influence food safety is important as parents are major decision-makers in homes, especially when it comes to food (Fleary & Ettienne, 2019).

What the literature did not do explicitly is show were some of the factors and influences that informed food safety knowledge and behaviors of parents in Zambia, and how this, in turn, impacted their children. In Zambia, preventable foodborne illnesses such as cholera, have claimed the lives of many citizens. In 2024, the World Health Organization (WHO) reported that 12,268 new cases and 467 deaths from cholera occurred in Zambia in February alone (World Health Organization, n.d.) The reoccurring cases of cholera in Zambia were devasting as they occurred year after year. Since cholera is both a water- and foodborne disease that most often is transmitted through contaminated water in developing countries (Sasaki et al., 2008), it is imperative to investigate forces or factors that have aided in the lack of preventative measures that could have been taken amongst consumers in their homes regarding safe water and food. This study brought to the forefront these factors as they were important indicators in mitigating foodborne illnesses, particularly within the Zambian context.

Conceptual Framework

Raza et al. (2020) created a conceptual framework for the various forces in the food system that influenced the diets of children and adolescent consumers. The authors identified external and personal food environments, along with behaviors of adults and caretakers, as determinants in the food supply chain. While food safety was not the focus of this framework, it did offer concepts related to food safety that influenced the behavior of both children and adults.

Raza et al. (2020) described the framework as comprising four main components: determinants, drivers, influences, and interactions. Known as the Innocenti framework, it identified drivers as the structural factors shaping the functionality of the food system. These drivers played a critical role in ensuring the safety, affordability, nutrition, and sustainability of the system. Determinants, on the other hand, referred to processes spanning production to consumption that aimed at enhancing the diets of children and adolescents. The framework further categorized these determinants into three areas: food supply chains, food environments (both external and personal), and the behaviors of caregivers, children, and adolescents (Raza et al., 2020).

The Innocenti framework presented a foundational understanding of the possible parental factors and influences that could play a role in food safety knowledge and behaviors. For example, determinants such as personal food environments offered insights into what influenced the behaviors of parents when it came to food choice and how this in turn affected their children's choice of food. The framework provided an understanding of how these various factors informed the food system. Of particular significance to this study were the drivers, determinants, food environments, and influencers. The framework broke down the food environment as follows:

> **External food environments** are the retail and commercial markets, schools, and informal vendors where consumers interface with food, and reflect aspects of availability, food price, marketing, and advertising, and vendor and product properties (e.g., vendor hours, food offered, etc.)
>
> **Personal food environments** are the individual and household-level factors that consumers bring to the food environment, such as purchasing power, access,

convenience, and desirability, and inform why people choose to procure the foods that they do. (Raza et al., 2020, p. 3)

As briefly mentioned in the literature review, external food environments played a significant role in understanding influences on food safety behaviors. Russell et al. (2020) found that the COVID-19 pandemic caused major disruptions to the food supply chain, which in turn affected parents of children with allergies. New food environments created new challenges for navigating the safety of food, such as availability of food. Personal food environments, on the other hand, were indicators of the social and or cultural influences of consumption patterns. These personal environments could also show some aspects of safety as they were factors at the household level. As the study by Hsiao et al. (2020) showed that food poisoning cases occurred more often in homes than in commercial spaces. From a food safety standpoint, the home being a major site of food poisoning indicated a need to investigate personal food environments and the kinds of influences and forces that drove food safety behaviors. It also identified homes as the site for major food safety issues.

The Innocenti framework guided this study in understanding the various factors and influences on food safety behaviors of parents of school-aged children in Zambia. This study specifically focused on the external and personal environments as they related to food safety more closely. The Innocenti framework also provided input into the causes of factors that influenced parental behaviors.

Chapter Summary

This chapter discussed the literature and provided the conceptual framework for the study. The review of the literature showed a lack of extensive studies on parental influence regarding food safety on their school-age children. The review also showed the impact of food

safety education on school-aged children in the US and Zambia. The Conceptual framework identified the components in the food system that influenced food safety the most, along with the forces that influenced food safety behaviors in parents and adolescents. The next chapter discusses the methods used in the study.

CHAPTER III: METHODS

This chapter outlines the methods employed in this investigation, including a reflexivity statement, data collection procedures, participant information, data preparation, validation, and trustworthiness measures. This study utilized qualitative interviews with parents of children from kindergarten through grade 12 in Zambia. This approach aimed to gain a deep understanding of participants' experiences, thoughts, and emotions (Check & Schutt, 2013). Check and Schutt (2013) emphasized that "intensive interviewers must be sensitive to the broader social context of their interaction with the interviewee and to the implications of their relationship for the way they ask questions and interpret answers" (p. 204). Consequently, this study was designed to explore participants' experiences regarding food safety and the diverse factors that shaped them. Attention was given to the contexts in which these influences occurred and the roles they played in shaping participants' experiences.

Research Questions

The literature in the previous chapter focused on what parents and students tend to know about food safety, but with little emphasis on what influenced this knowledge. Accordingly, this study took a deliberate approach to investigating the various forces and parental influences on food safety knowledge and how this had, in turn, influenced their children's food safety behaviors in Zambia. To do so, I developed one primary question and three sub-questions to guide this investigation:

1. What forces drove parental behaviors related to food safety in parents of kindergarten, primary, and secondary school children in Zambia?
    a. What did parents know about food safety? What forces impacted this knowledge (or lack of it)?

b. What did the personal and external food environments of parents look like regarding food safety?
c. In what ways did parents attempt to influence their children's food safety behavior(s) or knowledge?

Reflexivity Statement

This reflexivity section describes if and how my subjectivity influenced the research process and interpretation of findings. I sought to disclose how my interactions with participants, my background, and the proceeding data interacted with my subjectivity. As Olmos-Vega et al. (2022) disclosed, it is nearly impossible to rid oneself of some degree of subjectivity. Hence, I was aware of how my subjectivity interacted with my data findings.

I was born and raised in Zambia and moved to the US as a teenager. The Zambian culture was and still is a part of me, despite spending my adult years in a new country. I had the opportunity to go to high school in both the US and Zambia, and I firmly believe this helped shape my perspective on the school culture in both countries (and many other things). Spending most of my adult years in the US could have impacted my ability to understand some of the cultural norms in the Zambian context as I interviewed participants. My Zambian background also informed how I phrased the interview questions, as I was aware of meanings and interpretations from the Zambian point of view. My Zambian background also informed why qualitative interviews was a suitable approach to understand participants experiences.

Even though I have a background in food science, I tried not to let this be the sole lens through which I interpreted and or commented on my interviewee's experiences. For example, one of my interviewees shared a storied experience that would technically classify as a food poisoning case and not a food allergy. While it was very difficult for me to not interrupt this

participant and share the technical name of the experience, I only commented later to the participant. The experience of participants using technical terms incorrectly during the interview process became rather commonplace throughout the interviews. For example, one participant used the term “food security” instead of “food safety.” I later realized that it was a norm to use this type of language yet still maintain effective communication.

Separate from the use of technical terms, several participants used “Pidgin” English or shortcut English to express themselves during the interviews; Pidgin English is a mixture of English and local languages that enable inhabitants who may not share a common language to communicate (Siegel, 2008; Haruyama, 2023). In Zambian Pidgin, it is not uncommon to hear expressions such as “ka” before a noun to describe something or someone that is small or to ask a question. In short, “ka” is a context-dependent expression. Two of my participants used this expression during the interview. As such, I did not try to alter participant sentence structures in my findings section but added explanations in parenthesis to terms or expressions that would be unfamiliar to a wider audience. Even more, some participants did not use complete sentences to share their experiences. During the coding process, it was important for me to use the same one-word expressions and responses to capture participant meanings.

It was crucial for me to remain mindful of the socioeconomic backgrounds and contexts of my participants throughout the study. The language I used during interviews was particularly important, as my participants came from diverse educational backgrounds. To ensure effective communication, I adapted my language to be more accessible and understandable. Some participants felt comfortable pointing out when they didn’t understand certain terms. For instance, one participant was unfamiliar with the concept of allergies and asked me to explain it. Additionally, I substituted the term “food safety” with “hygiene,” as this was more easily

understood by most participants. These adjustments helped foster clearer communication and a more inclusive research process.

My background in food science was one of the lenses through which I coded the interview transcripts. For example, when participants shared their experience with eating food when it was still hot, I coded these experiences as temperature-control measures in food safety, since temperature plays a significant role in the safety of food (see Koutsomanis & Gougouli, 2015; Webb & Morancie, 2015; Ricci et al., 2020). Moreover, during the data collection process I sometimes felt a tension between viewing myself as an outsider (etic) vs an insider (emic). Specifically, I felt I was an insider by virtue of being a Zambian; in contrast, not being a parent afforded the perspective of being an outsider. Some participants invited me into their experience as "parent" by comments such as "as a parent . . . you know."

Because of the nature of the research topic, I took on a pragmatist approach during, before and after the data collection process. Pragmatism as an approach to qualitative inquiry encourages actionable knowledge, the relationship between experience, knowing, and acting, and finally, inquiry as a process that is experiential. Pragmatism as an epistemological approach seeks to offer an approach to inquiry that is practical and not just metaphysical or even abstract (Kelly and Cordeiro, 2020). During the interview process, for example, I sought to ask questions that were useful and appeared to solve problems that parents experienced regarding hygienic practices in their homes. In other words, it was my hope that participants found usefulness in the questions that they were asked during the interview and in the final writeup. Several participants reached out after the interview to express gratitude for the types of questions they were asked and how useful to their everyday life the interview was. Since food safety and food consumption

are everyday experiences for parents, using a pragmatist approach was equally relevant to me as a researcher.

I participated in peer debriefing (though with family members) by discussing how interviewees were sharing their experiences. This included conversations about how comfortable participants were in sharing their experiences, and whether they participated in hygienic practices or encouraged their children to do so. The peer debriefing exercises also consisted of conversations on what I could have done to improve participant level of comfort in sharing their experiences. Because my relatives were more conversant with Zambian culture (due to spending their adult years in Zambia), I inquired of them of cultural idioms I did not understand and even clarification on terms that were used during the interview process.

Since one of the important goals of this research project was to ascertain parental experiences with food safety, it was relevant to highlight experiences using process coding as most interview questions focused on processes that parents engaged in their homes. It was also relevant to explore emergent participant experiences (Saldaña & Omasta, 2022). Overall, the coding process attempted to capture participant meanings and maintain them by using the same words in some of the codes. Therefore, codes appeared as short phrases rather than singular words.

Qualitative Inquiry

While several methods of qualitative inquiry can be used to gather participant data. It was relevant to use qualitative interviews in this study as the main approach to qualitative inquiry since qualitative interviews attempt to understand the world from subjects' perspectives to derive meaning from their lived experiences (Creswell and Poth, 2018). Semi-structured interviews were used as the main method of data collection and included a prepared list of questions.

Participants were asked to describe in detail their experience with food safety, using open-ended questions (Alsaawi, 2014). It was therefore important to use interviews to gather data on participant experiences and to understand the world from their shared experiences. Participants told stories of their upbringings and common practices in their childhood. Participants also shared bad experiences they had had with food and invited me into these experiences. Since part of my research aim was to understand parental experiences, entering participants' storied experiences was the best approach to achieving research goals.

The research process comprised of purposeful sampling to obtain information about parents of students in kindergarten, primary and secondary, by specifically targeting parents who fit this category. Prior to beginning the study, Virginia Tech's Institutional Review Board (IRB) provided guidance on ethical and institutional standards along with suitable procedures. Once approval from the IRB was obtained, the National Institute of Scientific and Industrial Research was contacted in Zambia to obtain local approval for the study. The National Institute of Scientific and Industrial Research was the closest to an IRB in Zambia. Within three weeks, a letter of approval was signed by the Assistant Director and a copy was sent to Virginia Tech's IRB. Data collection could then be started. Flyers were then posted to Instagram and Facebook to recruit Zambian parents in Lusaka. Three schools were also visited to discuss the study and the possibility of the schools participating in the study or in the recruitment of participants. Of the three schools, one of them arranged for parents to be interviewed during drop-off times. Some of the parents who were interviewed were employees of the same school. A few parents responded to the flyers posted on social media by sending emails to show their interest while a few others called the phone number listed on the flyer. Interested parents were then asked to choose a suitable time for their interviews. Interviews took place on school grounds, at shopping malls,

and at a local church. I met one participant in their home. The recorded portion of the interviews took anywhere from 8 to 20 minutes depending on what participants shared. Participants were asked about whether they had had experienced foodborne illness or sickness, how these experiences shaped their food safety or hygiene practices, the types of classes their children were enrolled in, whether their children's schools had food safety related coursework, how parents learned food safety, their current food safety habits, and finally demographic questions about themselves and their children. Interview items are listed here below and in Appendix A:

The following questions are about you and your child or children who are in school (Kindergarten to 12th grade). Please provide as much detail in your responses.

1. Have you or your child ever gotten sick from consuming food? If so, describe your experience and how you delt with the illness. (symptoms, hospital visits, etc)
2. What influence do you have over the classes and type of classes that your child is taking? Do they choose classes, or do you suggest them?
3. What other things influence your school-age children's decision making when it comes to food and food related course work?
4. What other things influence your decision making when it comes to food? (price, allergy information, distance to grocery store, etc.)

These next questions will focus on your eating habits and food preparation techniques. Please respond to them to the best of your knowledge and with a lot of detail.

5. How often do you eat in a restaurant? Describe any steps you take before eating your meal
6. How often do you eat homecooked meals? Describe any safety steps you take before and during meal preparation and consumption
7. Describe any food safety related steps you take when packing a meal or snacks for your children (packing food with icepack, handwashing, reading food labels for allergies, etc)
8. Are you the primary food preparer (cooking or storing of food) in your home? If so, do you involve your child in preparing food? Why or why not?

9. How often do you think about food safety when you prepare food (storing food properly, washing hands, cleaning utensils, cooking at proper temperatures, allergies, packing snacks, etc.)
10. Do any of your school-age children have allergies? If so, how has this influenced your food relationship/precautions you take in your home?

These next questions require you to think about the factors that have influenced your knowledge regarding food safety

11. Describe any experiences you have had that have helped you learn about food safety (your own parents involving you in food prep, any experience with allergies, getting food poisoning, etc)
12. Describe any experiences you have had that have prevented you from learning about food safety

Demographic questions

1. Relationship to child
2. Grade level of your child
3. Gender of child (or children)
4. Level of school completed.
   - Some high school
   - Highschool
   - Some college
   - College
   - Some graduate or professional school
   - graduate or professional school
   - other
5. Employment status

Thank you for taking the interview. If you would like to be entered in the drawing for $100 visa card or Airtel money, please provide your phone number or email.

The participants were parents of children in kindergarten, primary, and secondary school. There was no prior relationship to these participants before data collection began. These parents were representative of diverse social economic groups in Zambia. Table 1 outlines the demographic information of these parents. Data collection consisted of semi-structured interviews. The interviews were recorded using the Glean app which also provided transcription. The target number of participants was 20 or more respondents, and all yielded 20 interviewees. The data collection took two months to complete while data analysis took two and half months. Data was collected in the months of May-June of 2024.

Participants

Participants for this study were parents of children in kindergarten or baby class, primary (grades 1-7), and secondary schools (grades 8-12) in Zambia. A total of 20 parents participated in the study. The study aimed to recruit 20 or more participants to provide a diverse range of experiences or until saturation of participant experience was reached (Vasileiou et al., 2018). The children of the recruited parents were representative of students in private, basic, and government schools, which are the main types of schools in Zambia. These participants were recruited via word of mouth at a local church group, through friends, and colleagues who were parents and through social media. Some of these parents helped in the recruitment process by sharing about the study, and others responded to the recruitment flyers from Instagram and Facebook. Most of these parents were employed and had children in primary and kindergarten.

The parents were also representative of the diverse educational backgrounds of people in Zambia. According to the World Bank, in 2018 the adult literacy rate of females aged 15 and above was 83% while that of males in the same age range was 91%. The World Bank also

reported that as of 2019, the unemployment rate was at 11% (The World Bank, n.d.). The literacy rate is especially significant in that it shows how much of the Zambian population can read and write effectively, a factor that is significant when it comes to studies that require participants to be able to read and sign consent documents. As such, this study screened participants to ensure they could understand English by communicating in English.

According to the Zambia Statistics Agency (n.d.), 56.4% of the employed population in 2021 had completed secondary school, 30.8% primary, and only .7% had a master's degree or higher. When it came to employment rates many Zambians tended to be entrepreneurs who participated in the informal market sector with 73.2 % having informal businesses that range from selling cooked foods to providing hardware services, while only 26.8% were formally employed (Zambia Statistics Agency, n.d.). Very few parents in the study had children in secondary school, most likely due to the fact that majority of parents who were interviewed worked at the primary school were most of the interviews were taking place and these parents had children at that school. Some parents were also guardians to children in their household. Table 1 provides a snapshot of the participants.

Table 1.

Demographic Information of Participants

Relationship to child	Grade level of child(ren)	Gender of child(ren)	Level of school completed	Employment status
mother	kindergarten	male	college	employed
mother	kindergarten	male	college	self-employed
father	1 & 10	male (2)	college	employed
mother	11	female	college	employed
mother	4,5 &7	female (2), male	master's	employed
mother	6	male	diploma	employed
mother	kindergarten	male	secondary	not employed
mother	primary	male	grade 9	not employed
mother	kindergarten	male	secondary	not employed
father	kindergarten, 9 & 11	-	some secondary	employed
guardian	kindergarten (3), 3,7, & 9(2)	-	college	employed
guardian	kindergarten, 3 &8 12 ,3 & 5	-	college	employed
guardian	6	female (2)	diploma	employed
mother	6	male, female	diploma	employed
mother	kindergarten (2),	female	grade 7	employed
guardian	4,7 &11	-	some secondary	employed
mother/guardian	1, 2, & 8	female (2), male (3)	diploma	employed
mother		Female (4), male	college	employed

Note. Diplomas are similar to certificates in specific fields, especially in vocational education.

Data Collection

Data collection involved conducting semi-structured qualitative interviews. These interviews were recorded using the Glean app, which also facilitated transcription. The target sample size for the study was set at twenty or more participants, and a total of twenty interviews were successfully completed. The interview questions are detailed in Appendix A. Purposeful sampling was employed to identify and recruit participants, specifically targeting parents of students in kindergarten through grade 12 who fit the study criteria. This approach ensured the collection of relevant and focused data aligned with the research objectives.

Qualitative Interview Protocol

The interview questions were developed based on food safety literature in K-12 settings (see appendix C) and were adapted from the Innocenti framework proposed by Raza et al. (2020). A comprehensive list of interview items is provided in Appendix A. Each section of the interview was designed to explore a specific aspect of food safety knowledge and behaviors (see Appendix C). Key dimensions of food safety, such as food storage and preparation, were emphasized as these practices are commonly carried out in the home. Consequently, most of the interview questions focused on these areas.

As a qualitative interview, participants were encouraged to provide detailed descriptions of their experiences, allowing for a richer understanding of their perspectives. The structured interview process was outlined as follows.

Recruitment of Interview Participants

Three schools in Lusaka were selected. Headteachers were informed about the study and asked to distribute flyers and recruitment emails or WhatsApp messages. Two of the three schools agreed to distribute recruitment information. Only one school was able to plan for

parents to be interviewed. Recruitment information was also posted on social media (Facebook and Instagram). Some parents also helped recruit participants.

Setting up Interview Times with Parents

Parents interested in participating in the study were provided with a copy of the consent form along with screening questions. The screening questions aimed to determine participants' eligibility by confirming whether they were fluent in English and currently parents of school-age children. Parents were also asked to indicate their availability to meet at restaurants or other public locations for the interview. On the day of the interview, the consent form was reviewed with the participants, along with a summary of the study's purpose and procedures. Once all questions were addressed, informed consent was obtained before proceeding with the interview.

Recording of Interviews

Interviews were then recorded using the Glean App. The recorded portion of the interviews lasted anywhere from 8 to 20 minutes. Before recording, participants were made aware which parts of the interview were to be recorded. Recording only began after the discussion of the consent form and the explanation of what the study was about.

Debriefing

The researcher participated in debriefing with family members on how participants were sharing their experiences. Family members also helped explain unfamiliar terms that participants used. Following the interviews, participants were also debriefed and told what to expect with compensation and accessing the final report.

Compensation

Participants were entered to win a $100 Visa gift card or $100 Airtel cash (a mobile money service). The drawing was conducted at the end of the data collection process. All

participant names were entered into a digital spinning wheel set to randomly select a winner. The winner of the drawing was then contacted on how they preferred to receive their compensation. The winner was then contacted via phone call to confirm receipt of their Airtel money cash prize.

Data Preparation

The interview transcripts were coded using process coding and organized by themes. During the transcription process, the audio recordings were carefully matched to the corresponding transcripts for each participant. This initial phase involved identifying potential themes within the data, even before the transcription was finalized, resulting in 17 units of analysis. Once transcription was complete, the formal coding process began. Process coding was applied to analyze the data. Process coding was particularly useful as participants described the specific steps they took in practicing food safety (see Saldaña and Omasta, 2022). This approach allowed for a deeper understanding of participants' experiences and behaviors.

Full transcripts were prepared as a combined Microsoft Word document, and codes were recorded initially as comments before being copied to a separate document. The codes in the new document were then read to derive broader themes from the coded participant experiences. Themes were subsequently drawn from these codes and a comparison was made between the themes from the initial transcription process to the themes after coding. These themes consisted of patterns of experiences that participants shared. For example, three or more participants reported experiencing foodborne sickness and this experience was identified as a theme. Over 50 codes were derived from the data. Overall, six themes and nine categories were identified as patterns. The themes were named according to a relative term from the literature. The themes are described in detail in Chapter four. Most of the themes were directly related to the research questions whilst others were based on general observations from the data. For example, the

theme gender as a factor in food handling was not directly related to the research questions but was apparent in the analysis process. Table 2 provides a detailed look at how codes were categorized to form themes. Appendix E also provides a summary of the major categories from the data.

Table 2.

Sample Code Book Including Themes, Codes, and Quotes from Transcript.

Themes from data	Sample codes and code description	Sample participant quotes from the transcript
Lack of food safety information	Lack of information has prevented learning food safety (Information)	"One is lack of information. We don't know a lot about the same precautions to take if a child has a challenge" Participant 4
Lack of food safety knowledge	Believes that there is not enough information about food safety especially since some communities do not practice hygiene Vendors do not practice food safety (Knowledge)	"I think there must be people to sensitize people on that because food hygiene is the most important thing in our lives. Because we find people, they are selling food already made on the street, in some buckets which are not well washed, maybe there's dust there. So if there was that sensation, people would avoid. So even those who are selling would take precautions for their food to be bought." Participant 13
Fear of cholera and COVID	Does not tend to eat out because of fear of cholera Buys drinks Because they are safer than food (COVID/Cholera)	"…I usually only get a something to drink because I fear getting cholera" Participant 17
Experience with foodborne illnesses	Has experienced foodborne sickness	"I ate something and then I went to the clinic." Participant 16
Rigid food-related curriculum	School chose coursework for child (Curriculum)	"So, he's in a different class, not the choice that we made, or he made" Participant 16

Gender as a factor in food handling	Gender of child may impact choice of food related course work (Gender)	"He's a boy I know he might want to take courses like cooking, and I know he may not like it" Participant 1

Note. Codes may not represent the full quote from the transcript. Codes are presented as single words in parenthesis. Appendix contains full codebook with definitions.

Trustworthiness

To ensure trustworthiness, this study incorporated a reflexivity statement and maintained audit trails by documenting participant data. The reflexivity statement served to demonstrate the researcher's engagement with the data throughout both the data collection and analysis process.

Other scholars have described trustworthiness in qualitative inquiry as consisting of narratives and even "thick descriptions." Stahl and King (2020) further defined thick descriptions as the provision of texts rich in detail to demonstrate the palpability of an event or object of study. This study provides detail on how it was conducted, how the researcher collected data and interacted with it. With Stahl and King's (2020) definition of thick descriptions, the reflexivity statement along with the data descriptions function as elements of trustworthiness—they show how plausible the data collection and preparation process were. They also provide opportunities for trustworthiness of the researcher. Guba's (1986) list of constructs of trustworthiness namely credibility, transferability, dependability and confirmability are outlined below, based on how they were used in this study.

Credibility

Lincoln and Guba (1985) emphasized that credibility is a cornerstone of establishing trustworthiness in research. Credibility assesses the alignment between study findings and reality (Shenton, 2004). In this study, the findings were supported by existing literature with similar

conclusions. For instance, Hapaala and Probert (2004) examined participants' self-reported behaviors, highlighting a tendency for individuals in food safety studies to overestimate their knowledge of the subject matter. Similarly, participants in this study reported being aware of food safety practices such as handwashing and properly cooking food before consumption. These behaviors align with commonly reported food safety practices among consumers (Redmond & Griffith, 2003).

Another form of establishing credibility was through the use of well-established qualitative methods of inquiry (Shenton, 2004). For example, a researcher can use qualitative approaches such as interviews, observational case studies, and any other methodological approaches that are common to qualitative inquiry. In this research study, qualitative interviews were used. Participants were asked to provide detailed explanations of their experiences and to review the study's findings. Lincoln and Guba (1985) suggest that establishing credibility involves ensuring that the findings of a study are validated by the constructors of the multiple realities being examined. To achieve this, participants whose contact information was available were invited to review the findings and confirm whether they accurately represented their experiences.

The interview questions were designed to encourage participants to share their personal experiences with keeping food safe. Since this research investigation sought to understand the food safety experiences of parents in Zambia, it was important to use a method of inquiry that best captured these experiences, namely, qualitative interviewing. Even more, using participants' own language in the coding process was important in understanding their experiences. Each interview lasted approximately 8-20 minutes and was recorded using the audio recording and transcription app, Glean. The transcription process consisted of verbatim transcription and

included pauses and grammatical errors. The coding method that was used for the data was process coding which was emergent from the data (see Appendix B for a full list of codes).

Another key element of establishing credibility is developing familiarity with the culture of the participants prior to collection. Shenton (2004) suggests this may involve preliminary visits to the organization in question or consulting relevant documents beforehand. Similarly, Lincoln and Guba (1985) advocate for prolonged engagement with the culture of interest to gain a deeper understanding of its context, rather than isolating a single cultural component for study. In this research, credibility was enhanced through the researcher's intrinsic familiarity with the participants' culture. As a Zambian who has lived and experienced Zambian culture, the researcher possessed firsthand knowledge of the cultural context and the schooling experiences relevant to this study. While these experiences are not the same as prolonged engagement, they helped the researcher understand the context within which participants shared their experiences. Additionally, coding was also used to identify themes and patterns in participant experiences. These combined methods helped ensure the findings were in line with participant experiences.

Transferability

Transferability refers to the extent to which research findings can be applied to other contexts (Shenton, 2004). Although this study was conducted within a particular context, it was crucial to clearly define the boundaries of the research and explore how the findings and study design might be relevant to other settings. By detailing the study parameters, the research design serves as a framework to support transferability. Chapter four outlines in detail how this study may apply to broader contexts. The following ethics section provides the rationale for the decision not to disclose certain details regarding participant experiences in this report.

Ethics

Before the study began, the IRB provided guidelines for ethics of the study design. The researcher contacted the IRB prior to making travel arrangements to Zambia. The IRB approved the study but requested additional permissions from a Zambian research institution. Since there was not IRB in Zambia, a research institution was reached out to, to function as an authority to check the ethics of the study. Once permission was granted from Zambia, a letter authorizing the study was sent to the IRB in the US. The IRB approved the start of the study. It was important to maintain confidentiality of participants and their experiences, especially storing their data, contact information, biometric data, and names. During the peer debriefing sessions, the researcher prioritized the confidentiality of participant data by focusing on the participants' approach to sharing experiences and not on the content of those experiences. For example, some participants did not elaborate on negative experiences with food and so the researcher did not probe those participants when signs of discomfort were apparent, and the researcher discussed the possible discomfort participants showed.

Data was stored in a password protected laptop, along with contact information. Extra steps were taken to add passwords to other devices that stored participant data such as the researcher’s cellphone. Since the notes app was used to store participant contact information, a passcode was created to further protect participant data. Given that the interviews probed parental experiences with their children, the appendices do not contain full transcripts of the interviews as participants shared information about the schools, names, ages, addresses and other identifying information. To maintain participant confidentiality, the researcher has abstained from publishing full interview transcripts.

Confirmability

Confirmability describes the ways in which the results are true to the experiences of the participants and do not reflect the preferences of the researcher (Shenton, 2004). The appendices of this study contain full codes with descriptions, detailing what participants shared in the interviews. Additionally, the findings and data chapter provided excerpts of participant experiences along with other studies that supplement participant experiences. Member-checking was also used as a form of confirmability by asking selected participants to review the findings of the study. In total, five participants were asked to review the findings and comment on whether they felt the results were representative of their experiences. Again, this number was limited by the fact that the majority of participants did not have email addresses and could only be reached through word of mouth or a local Zambian phone number.

McKim (2023) introduced a novel approach for conducting meaningful member checking by enabling participants to review the findings section of a study. This process ensures accurate representation of participant experiences and provides an opportunity for feedback. McKim (2023) highlighted the importance of this approach, as it allows participants to review the findings and request the removal of any information prior to publication.

In line with this method, participants in this study were invited to review Chapter Four, particularly the vignettes, and provide feedback. This process ensured that participants could request the removal of any content they did not wish to have published. McKim's (2023) approach aligns well with qualitative interviews, as it emphasizes the importance of participants validating the representation of their lived experiences and ensuring that the meanings of their stories remain intact throughout the research process.

Chapter Summary

This chapter outlined the methods that were used for this study. The chapter specifically introduced the methods that was used in the study, the reflexivity statement, the interview protocol, data collection, the participants, and the trustworthiness of the study results. The chapter described the qualitative interview process and process coding and why the researcher chose these modes of data analysis. The next chapter discusses the data findings.

CHAPTER IV: DATA AND FINDINGS

This chapter presents the data and discusses the findings from the study. The chapter includes a restatement of the research questions, a description of data, presentation of findings, interpretation of findings, major themes from the data, and a summary of the chapter. The goal of this chapter is to answer the research questions. One primary research question and three sub-questions guided this investigation:

What forces drove parental behaviors related to food safety in parents of kindergarten, primary, and secondary school children in Zambia?

a. What did parents know about food safety? What forces impacted this knowledge (or lack of it)?
b. What did the personal and external food environments of parents look like regarding food safety?
c. In what ways did parents attempt to influence their children's food safety behavior(s) or knowledge?

Data and Findings

RQ 1: What forces drove parental behaviors related to food safety in parents of children in kindergarten, primary, and secondary school in Zambia?

As the overarching question of this research project, the emerging data confirm that several parental forces drove parental behaviors related to food safety in parents of school going children in Zambia. For example, parents were driven by economic choices and resource availability.

> It's whatever [resources to buy food] is available. At times you may not have resources to buy the food well in advance. So, you find that even in lunchtime comes, you just now have to think, what can I cook for these people? (Participant 4)
>
> Some of the [food safety] concerns I normally do have are, for example, I said myself I do warm my food before I eat, but like the boy who goes to school here [son], he always carries the packed lunch, but we know [as parents] that there are no facilities to warm the food. (Participant 3)

Participants 3 and 4 demonstrated a clear awareness of the importance of practicing food safety. However, the availability of resources emerged as a significant barrier to effectively implementing these practices. For instance, Participant 4 described the challenges involved in preparing meals, particularly lunch, due to their child's severe food intolerances. This requires the parent to make accommodations based on what is readily available, complicating the process of ensuring proper nutrition and food safety.

Food safety is not merely about preventing food poisoning or foodborne illnesses; it also involves steps that can be taken to choose foods that are not harmful. This includes preventing allergies, avoiding food sensitivities, and minimizing food intolerances. Food sensitivities differ from allergies and intolerances in that they are less severe but can cause symptoms such as stomach pain, rashes, and brain fog (Campos, 2020). Very often, individuals with food intolerances can tolerate small doses of the problem food, while individuals with allergies cannot (Taylor & Baumert, 2020). Food intolerances can include lactose intolerance and any other intolerances to foods. For Participant 4, whose child was diagnosed with food intolerance, this meant that their child was only able to tolerate a small amount of the offending food, while larger amounts could cause issues such as severe stomach pain.

Parents also shared that cholera and COVID-19 were some of the major driving forces that resulted in food safety-related behaviors in the home:

> So, mainly the main thing that has influenced me is because recently moved from Kitwe to Lusaka, so there was a cholera outbreak. So, I was scared maybe he [son] might catch the cholera from school I really don't want him to play outside. So just that thing, knowing there's cholera and all that, that's the thing that influenced me to be more cautious when it comes to preparation of food. (Participant 1)

> Yes, we have, and we have learned a lot [from hearing the news about cholera]. Even where I stay near, there's a ka-compound [a small township]. The children were getting sick of cholera so I always warn my child not to eat the food from the vendors who sell on the street and wash fruits before eating even if it's a guava he plucks from the tree I tell him he should wash it. (Participant 6)

> Okay, I don't like... Okay, I love eating food like... Like packed food. Not like... I say like chapati. I don't... Because of this outbreak of cholera. That makes me fear because I may not know if that is completely clean (Participant 7)

Participants 1, 6, and 7 described how their experiences with cholera made them more cautious about food safety and motivated them to encourage their children to adopt similar precautions. Participant 6, for instance, advised their child to avoid consuming food from street vendors due to concerns about the safety of its preparation. Street vendors typically sell items such as vitumbuwa (a deep-fried snack made from flour), sausages, fruits, and other foods. However, since these foods are prepared and sold on the streets, the water used for cooking and washing utensils is often of uncertain quality. Moreover, many street vendors lack access to clean public sanitation facilities, such as toilets. Given that cholera is a bacterial disease transmitted through

the fecal-oral route (Sasaki et al., 2009), access to proper sanitation facilities is critical to preventing its spread.

Participant 7 emphasized the importance of food presentation when choosing places to eat in order to avoid cholera. They noted that some street vendors sell food in visibly dirty containers, which deters certain consumers from purchasing. Usually, these vendors sell foods at cheaper prices (Giroux et al., 2020), which can appeal to young people and children. Participant 7 also pointed out various foods that are likely to be vehicles for cholera, such as packaged food. This risk increases when the food preparation process and the source of the water used are unknown. Through these insights, participants highlighted the strong influence cholera has in shaping food choices, especially in external food environments.

Parents also identified the availability of information as a factor that influenced their behaviors in the home and even within the community (personal and external food environments). When asked about information availability on food safety, including information about cholera, Participant 19 said:

> How do I say it's 50-50. Because sometimes with information for it to reach everyone it's very difficult because usually it's only on the TV and the channels and it's not everyone who have them [access to a full selection of channels] so it's 50-50 those that are able to access it, those that have TV yes, maybe even at school they teach the children.

Participant 20 addressed the amount of information and its efficacy:

> Yes, it is enough [information about cholera]. I think it is enough because even the message is quite catchy. You can be singing along; you can be reciting, and I think it gets the message through. I think it's enough.

These two participants shared differing opinions on information availability on cholera. Participant 19 highlighted that some people lacked access to crucial information about cholera. This lack of information can significantly hinder the adoption of proper food safety practices, acting as a barrier in both external and personal food environments. It influences how and when individuals engage in safe food practices, particularly during active cholera outbreaks. For instance, when people are unaware of boil water advisories or the contamination of water sources, this lack of information can adversely impact food safety practices.

Some parents spoke about the experiences that molded their food safety behaviors. When asked about how their experience with a food allergy in their child or in themselves impacted their knowledge of food safety, some parents responded:

> Yes, it [experiencing foodborne illnesses and allergies] made me change. Because I was thinking all foods are the same. When you eat, you are just okay. But after taking that food, we both [parent and child] developed diarrhea. So, it made me think that some foods you need to be very careful as you are preparing the food, and you have to make sure that the food you are preparing is worthy to be eaten. (Participant 14)
>
> I usually do think about it [food safety or hygiene] because like my mom she works from [*name of Hospital redacted*] where the hygiene thing is usually observed so she usually encourages me to observe the hygiene rules. (Participant 7)

Other participants also shared how food safety behaviors were passed on to them from their parents and how their own experiences with foodborne illnesses and allergies also shaped their behaviors. For Participant 7, for example, their mother's work at a hospital has influenced hygiene practices in their own home. Participant 14 shared how first-hand experience with food poisoning shaped how they perceive the safety of food. Participant 14's experience was common

amongst parents, as more than half of the parents expressed a change in perception of food safety following an experience of allergies, food poisoning, and foodborne illness in their home.

Major Themes from Research Question One. A number of significant themes were identified that influence parents' food safety decisions, including the lack of information, limited resources, the impact of COVID-19 and cholera, and general experiences with foodborne illnesses. Regarding information availability, while some parents felt adequately informed about food safety, others indicated that they were unable to access the necessary information. This disparity highlights differences in parental beliefs regarding access to food safety information. The limitations to resource availability shared by parents reflect both economic constraints and a lack of informational access. For example, some parents expressed uncertainty in identifying food allergies in their children or knowing how to respond when a child experiences food intolerance (see participants 1 and 6 above). Still, parents' experiences with foodborne illnesses significantly shaped their knowledge about food safety. A common theme shared by parents was their experiences with cholera, whether it was through their communities, their children's schools, or media coverage. Table 3 illustrates the frequency of these major themes in correspondence to categories.

Table 3.

Correspondence of Themes with Categories and Frequency of Occurrence in Data

Theme(s)	Category	Frequency of codes in this category
Experience with foodborne illnesses	Enough information on food safety	6
Fear of cholera and COVID-19	Eating habits	14
Rigid food-related curriculum	Parental influence	24
Fear of cholera and COVID-19	Current food safety practices	37
Gender as a factor in food handling	Gender as impacting learning food safety	5
Rigid food-related curriculum	Curriculum and food safety	21
Fear of cholera and COVID-19	COVID-19 and cholera	12
Lack of food safety knowledge/ Lack of food safety information	Lack of information on food safety	10
Experience with foodborne illnesses/ Fear of cholera and COVID-19	Experiences with foodborne illness	29

Note. Some themes fall in more than one category and are denoted by "/"

How do parents attempt to influence their children's food safety behavior(s)?

Zambian parents attempted to influence their children's food safety behaviors in several ways. For example, parents taught their children to observe food safety practices such as handwashing:

> Yes. We normally [wash hands], it's just a daily routine because they [children] sometimes find that if they are fast, they will not do it. So, if a friend has seen that someone is not even, because even the vegetables, they have to wash the vegetables, they have to clean where they are cooking from as they are cooking. (Participant 11)
>
> I cook myself and my daughter. We exchange. When I'm not there, she cooks at lunch. At supper, I cook. We wash our utensils. And even if the vegetables before we cut, we wash, and before we cook also, we wash again. Yes, we wash our hands before cooking the food. (Participant 6)

The experience of cooking with a parent plays a key role in reinforcing the importance of food safety for children. As Larson et al. (2015) noted, modeling behaviors such as making food choices and establishing eating habits, or simply engaging in these activities with a child, helps the child internalize and adopt these practices into their own routines. In the case of Participant 6, the daughter who observed her parent washing vegetables and hands as part of food preparation is likely to continue this behavior in the future. Similarly, Participant 11 highlighted how handwashing has become a routine in their home, although their children were not always eager to practice it in certain situations. This underscores that food safety behaviors are not automatically passed from parent to child and may require ongoing reinforcement.

Parents also sought to influence their children's food safety behaviors through curriculum and coursework. Some parents emphasized the importance of enrolling their children in food-related classes:

> It's better [if the child learns about food safety] because I'm the one who suffers. When …. that one is sick, it's me to look for the medicine, even me to see that the child will be better. So, it's me, it's me who chooses for them. (Participant 18)

Like Participant 18, parents sought to influence their children's food safety behaviors by ensuring that the curriculum offered food safety coursework. Participant 18, for example, shared how not enrolling their child in a food safety-related class would impact the parent. This individual stated that not having coursework related to food safety would prevent their child from learning how to prevent foodborne illness in the future. In contrast, other parents would have wanted to enroll their children in food-related coursework, but the curriculum did not offer these options:

> So, with primary schools, if they take my child to a private school and they have all those options [food safety related coursework] I would enroll them into those classes, but now, I think with the education system in Zambia, I don't know if we have home economics, which starts at, is it grade 8? (Participant 2)

> For the one in grade 10, I think he didn't have much option because he was at the same school as at [*name of school redacted*] Seminary. So, at the same school for the junior secondary school, so there were only two streams [options for cognate coursework]. So, either you go into this one or go into the other stream so the administration that side decided to where the child goes but we were asked just to confirm whether those are the subjects we wanted the child to take. (Participant 3)

Similarly to Participants 2 and 3, other parents noted that the curriculum varied significantly depending on the school and was often limited. Participant 3 highlighted that in some schools, parents had little input in selecting coursework, further restricting access to food safety education. This lack of coursework related to food safety is especially problematic with the reoccurring number of cholera cases in the country (Sasaki et al., 2009). Since the curriculum is largely decided by the government via the Curriculum Development Center (CDC), with input from teachers and other stakeholders (Mulenga & Mwanza, 2019), it would be beneficial for students, parents, teachers, community members and even the government itself to accommodate best practices on how to prevent foodborne illnesses through the curriculum. While subjects like home economics do cover food safety topics, these classes are not consistently available in most schools.

Major Theme(s) from Research Question 1 a. The primary theme identified with this sub-research question was a rigid food safety curriculum. Parents expressed their attempts to influence their children's food safety behaviors by encouraging their children to enroll in food safety-related classes and by modeling appropriate behaviors at home. Many parents, however, faced challenges due to the rigidity of the curriculum in certain schools. For example, Participant 3 noted that their child attended a seminary school that did not offer any food-related content in the curriculum. Similarly, Participant 18 shared their preference for enrolling their child in a class focused on food and food safety but were unable to do so because of the constraints of the existing curriculum.

What do parents know about food safety? What forces have impacted this knowledge (or lack of it)?

When it came to what parents knew about food safety and the forces that impacted this knowledge, parents (and guardians) shared a range of experiences that have helped them become more cognizant of food safety. To begin, parents shared that they regularly washed their hands:

> We eat [outside the home] sometimes. Maybe you are in town, and you eat, but we choose the places to go because some places are… just looking at them they are dirty--maybe you can get sick. Yes. And then before eating, obviously you should wash your hands and after eating. (Participant 6)
>
> Yes, I wash my hands [before eating when outside home]…When I finish cooking, I usually put a lid on the food so that dirt, all kinds of dirt, don't go in the food. (Participant 8)
>
> I cook, no one helps me, and I wash my hands before cooking. (Participant 9)

Participants 6, 8 and 9 showed the diverse food safety practices of parents, from handwashing to choosing clean places to eat, which demonstrates that Zambian parents are knowledgeable about basic hygiene practices that can help in preventing food safety issues. The most common practice amongst parents was handwashing. According to Tembo (2002), handwashing is likely reinforced by cultural practices, since most Zambian foods are consumed without utensils. Participant 8 described a unique food safety practice of covering foods before consuming them. This practice helps prevent dirt and flies—known as vectors for disease (Blazar et al., 2011)—from contaminating the food. In Zambia, it is common for households to use outdoor kitchens and alternative energy sources, such as charcoal, for meal preparation (Ngoma et al., 2018).

Since charcoal stoves are usually used outdoors, the risk of flies and dirt contaminating food is higher, making this precaution particularly important.

Zambian parents also shared other food safety practices such as heating food before eating it. This showed that they were mindful of the impacts of temperature on the safety of food:

> Because at times… we do have running stomachs whereby you don't even understand what happened. So, you just think of the food--maybe we kept the food unsafe. So usually, you'd rather eat hot food. You'd rather cover your food just to protect it. Make sure that the food you eat is warm. Whenever you are home, the food you eat is hot. Whenever it's cold food, it's just a bit of food fear. So, maybe it's not safe. (Participant 12)

> I usually observe some parents, they pack the packed lunch for their children in the morning. So sometimes, a cold-packed lunch is good for them. At least the body needs warmth for them. Maybe for those who pack in the food warmer, it is better. Not those who pack in the lunch boxes. Because there the food will get cold. (Participant 13).

> Like the time of cholera, some of the parents they were not aware that when you keep recycling food, you recycle food they are supposed to warm it before they eat and they are supposed to keep the food covered so that it will avoid flies or any other germs which can make them sick. (Participant 14)

From a food safety standpoint, temperature is a factor that influences the safety of food. Foods left at room temperature for more than two hours are at a greater risk of causing foodborne illness. This is because certain spoilage organisms thrive within a temperature "danger zone," which ranges from 40–140°F (4–60°C) (Wong & Heacock, 2014). Additionally, factors like water activity play a significant role in food spoilage. Foods with high water activity (a_w) and

high moisture content are more prone to spoilage compared to dry foods or those with lower water activity, as microorganisms utilize the water in the food to grow and cause spoilage. However, it is known that water content in and of itself does not provide sufficient information to determine food safety or predict product shelf life. Instead, "The relationship between water content and water activity is complex and related to the relative humidity of the food and its water content. This relationship must be determined for each specific food item." (Safety, 2006, p. 1)

In Zambian contexts, it is more common to consume sun-dried foods in homes while foods with high water activity are packed as lunch for school-aged children. Some parents described the types of foods they packed for their children and how spoilage was prevented. When asked about the types of containers parents used for packed lunches for their children, parents shared the following:

> We just put them[food] in the lunch box. But if it's rice, normally if it's rice, I will separate the rice and the tomato. Because normally, tomatoes will go bad easily. So, I pack different, in different lunch boxes. We put the rice, and the tomato separate so that when eating we just mix them. (Participant 11)
>
> I put... I usually don't do the rices and the gravies. I don't do that. I usually go for dry food. So, I usually make some sandwich. Or just dry piece of chicken or sausage with some bread or with some chips and a fruit. So, I avoid the things that easily go bad. I don't put gravy; I don't put fresh tomato. Sometimes I put cucumber, though they're not fans of cucumber. I try to balance, to give them a balanced meal. (Participant 20)

Separating foods is a great way to prevent spoilage and cross-contamination. Some microorganisms such as *Staphylococcus aureus* (*S. aureus*), commonly found on the skin and

within the gut of most mammals, thrive at room temperature and when foods have high water activity.

> The growth of S. aureus and subsequent toxin production depends on several intrinsic factors of the food, such as pH-value, salt content, nutritional factors, water activity (aw-value), concurring microorganisms, and extrinsic factors, e.g., temperature and atmospheric conditions….Staphylococcal food poisoning is most often associated with processed red meats, poultry products (especially chicken salad), sauces, dairy products (especially cheeses), and custard- or cream-filled bakery products. Ham and associated products are involved in about 30% of outbreaks of staphylococcal food poisoning. (Ebert, 2018, p.217).

Zambian packed lunches can include rice and gravy (made with tomatoes and onions). The gravy can easily spoil due to storage or being stored at room temperature for extended times before being consumed. As Participant 11 shared, the type of container that is used for storage of packed lunches impacts food spoilage. Using a container such as "food warmer," which maintains the temperature of hot foods for a specific amount of time, can help keep hot foods out of the danger zone. Parents were asked if they used food warmers for their children's packed lunches and only a few parents indicated that they used one. This came as no surprise since food warmers are often used as serving dishes during communal meals in Zambian households.

Some parents have had to learn about food safety due to their own or their child's negative experience with food. One parent shared how a lack of temperature control caused foodborne sickness:

> Sometimes, like last time, I didn't know that my daughter didn't put her vegetable in the fridge. So, it was hot. Then I ate it, I got diarrhea. Then I just ate a bit. I tasted that it was not good, it's just gone bad, I threw it away but still I got sick. (Participant 6)

Refrigerating food is another aspect of food safety that is commonly practiced in homes. Curriculum like Fight BAC! (Rippberger, 2023), created to help students and parents in homes practice food safety, emphasizes the need to keep hot foods hot and cold foods cold. This means that foods that are consumed cold should be kept in the fridge until ready to be eaten. The same principle applies to hot food—these should be warmed before eating and not stored at room temperature for more than two hours before consumption (Rippberger, 2024).

Some foods pose a greater threat to the health and safety of an individual when left at room temperature. Foods like rice, for example, have been largely associated with *Bacillus cereus,* a dangerous microorganism that can cause food poisoning, diarrhea, and meningitis which can be fatal (Cronin & Wilkinson, 2009; Leong et al., 2023). *Bacillus* can produce endospores that are resistant to ultraviolet radiation, high temperatures, and extreme freezing temperatures. Even in extreme temperatures, the endospores can survive for hours (Leong et al., 2023). This means that once the spores have been formed, heating foods like rice before consumption will not have positive effects on the safety of the food. Proper storage after preparation or immediate consumption after preparation is the best way to reduce the risk of foodborne illness that can be caused by *Bacillus*. When it came to parental knowledge of food safety, Zambian parents generally showed little more than basic knowledge, even without formal knowledge of food safety principles.

Major Theme(s) from Research Question 1 b. The major theme associated with this research question was knowledge of food safety practices. Zambian parents showed slightly above basic

knowledge of food safety practices. For example, parents knew to separate foods to prevent spoilage and to warm foods before consumption. Some parents even mentioned postponing meal preparation, understanding that temperature control is crucial in food safety. Among these practices, handwashing was identified as the most common food safety practice. The knowledge of food safety practices was also informed by fear of contracting cholera or even COVID-19. One participant expressed concern about COVID-19, while the fear of cholera was more prevalent among the participants.

What do the personal and external food environments of parents look like regarding food safety?

According to Raza et al. (2020), external food environments encompass spaces such as commercial and retail markets, schools, and other locations where consumers engage with food. These external food environments are shaped by factors such as price, availability, advertising, and the characteristics of the food itself—whether it is hot or cold, the type of food, and other attributes that define both the food and its surroundings. On the other hand, personal food environments, as defined by Raza et al. (2020), refer to the household-level factors that influence individual consumers. These include factors such as preference, purchasing power, and any other factors that inform why a particular consumer may choose to buy a food product. According to this definition, allergies may inform why consumers may choose to purchase a particular kind of food. Participants shared the following about their personal and external food environments:

> Yes, yes, I do [eat outside the home] because if I make it and go to a restaurant and I go to a restaurant and make an order maybe for a pizza and all that, I have to ensure and find

out that maybe they have egg product. So it goes back to the point that I have become really picky with the food and all that. (Participant 1)

Yes, it has [impacted my food choices]. Because if I cook beans, she [daughter with intolerance to beans] will not take the beans. So, she has to look either for an egg or vegetables, or if there's nothing, she will just maybe have a cup of tea. (Participant 4)

Yeah, but you know as they grow [the children], you find that's their choice [on what they choose to eat]. For example, you know these things we call Vinkubala [in Zambia, you know those [edible] caterpillars. I react myself when I eat, like two minutes later, you find that I swell. Actually… I'm allergic to that, yeah. Even the father [to the children]. But for them, when they go to their grandmother's place, they eat and they like it, you know? So, we find that that's now they're eating. That we don't buy because of the same but I think we should be buying for them because nothing happens. (Participant 5)

Participants 4 and 5 expressed how complicated it can be to make food choices in a home where some family members have allergies. For Participant 4, the daughter who suffers from an intolerance to beans must find alternative meals when the beans are served in the home. Participant 5 described a similar food issue, except their parent was the one with the food allergy. Participant 1 emphasized the importance of reading the label at the restaurant, given that their child is severely allergic to eggs.

Allergies and intolerances were found to be common issues among participants, with four individuals reporting allergies either in themselves or their children. Additionally, foodborne illness was the most frequently reported issue, with seven parents sharing that such illnesses had occurred in their households. Parents who had dealt with allergies and intolerances highlighted how these factors influenced their purchasing decisions and the choices they made regarding

food both inside and outside their homes. Other parents, by describing how meals were prepared in their households, provided insight into the structure of their food environments.

Major Theme(s) from Research Question 1 c. Related to this research question, the theme "experience with foodborne illness" was the most observed, as parents shared what their personal and external food environments looked like. Related to this theme, parents shared how food allergies and intolerances informed their purchasing power and how they interacted with food at restaurants and in their homes. Other foodborne illnesses were also reported by participants. Participant 3 for example, shared how they had contracted typhoid from food.

In conclusion, the following food safety-related forces were highly influential in the behaviors of Zambian parents: food allergies, experience with foodborne illnesses, access to information, cholera and COVID-19, social infrastructures, and curriculum structures. These factors influenced the decisions parents made within both their external and personal food environments, guiding them to make choices that suited their households and aligned with their financial means. Despite these challenges, parents demonstrated a solid understanding of basic food safety principles, including handwashing (clean), separating foods to prevent cross-contamination (separate), proper refrigeration (chill), and thorough cooking (cook). Additionally, these forces aligned with major themes that were identified from the data. The theme gender impacts on learning food safety was identified even though this theme was not directly related to the research question(s). This theme is discussed in the proceeding section.

Discussion

Zambian parents were well informed on the benefits of practicing food safety. More than half of the participants shared the specific steps they follow to ensure the prevention of foodborne illness. This was largely informed by cultural norms (e.g., handwashing before meals)

and reoccurring outbreaks of cholera in the country. Handwashing stations are commonly found in Zambian restaurants and even at grocery stores, as many traditional Zambian meals are typically eaten without utensils (Tembo, 2002). Epidemics such as cholera have further emphasized the importance of washing hands before handling groceries or consuming meals.

The external and personal food environments of Zambian parents also showed that food safety is regularly practiced or is on the minds of most Zambian parents. For example, several parents shared cleaning and washing as part of their regular food safety practices, even when eating outside the home. One major factor that influenced these personal and external food environments was the availability of resources to practice food safety and the ability to purchase foods that were preferential in their homes or would not cause allergies in their children.

Overall, the main factors that influenced food safety behaviors in Zambian parents were the price and availability of food items, fear of outbreaks, lack of food safety information, cultural practices, and experience with foodborne illness. These factors, in turn, influenced some children's food safety knowledge and even informed whether parents pushed their children to enroll in food-related coursework. In this way, parents attempted to influence their children by enrolling them in coursework that parents deemed as relevant or important. One parent noted how the burden of not learning food safety would not just fall on the child but the parent too:

> It's better [for the child to be enrolled in a food-related course] because I'm the one who suffers. When… one [child] is sick, it's me to look for the medicine, even me to see that the child will be better. So, it's me, it's me who chooses [the classes] for them. (Participant 18)

In the Zambian context, academic environments are not uniform in the availability of food-related coursework (see UNESCO, 2010). While some parents may want their children to be

enrolled in food-related coursework, the curriculum is school dependent, especially when it comes to food-related coursework. Some parents reported how particular schools only offered pure sciences or that coursework was determined by the school and teachers:

> Only my firstborn has taken subjects to do with home economics and the rest. The one who's in the secondary right now is doing "pures" so there's nothing like that [food coursework] and then the primary level they do them because at primary it's compulsory—there's home economics. They teach them. (Participant 19)
>
> We just had to confirm what we wanted [what coursework parents wanted child to be enrolled in], but what we wanted was not there actually. They don't have pure science. Also, for the senior section, they removed agriculture science. So, they are just doing physical science and other subjects. (Participant 3)

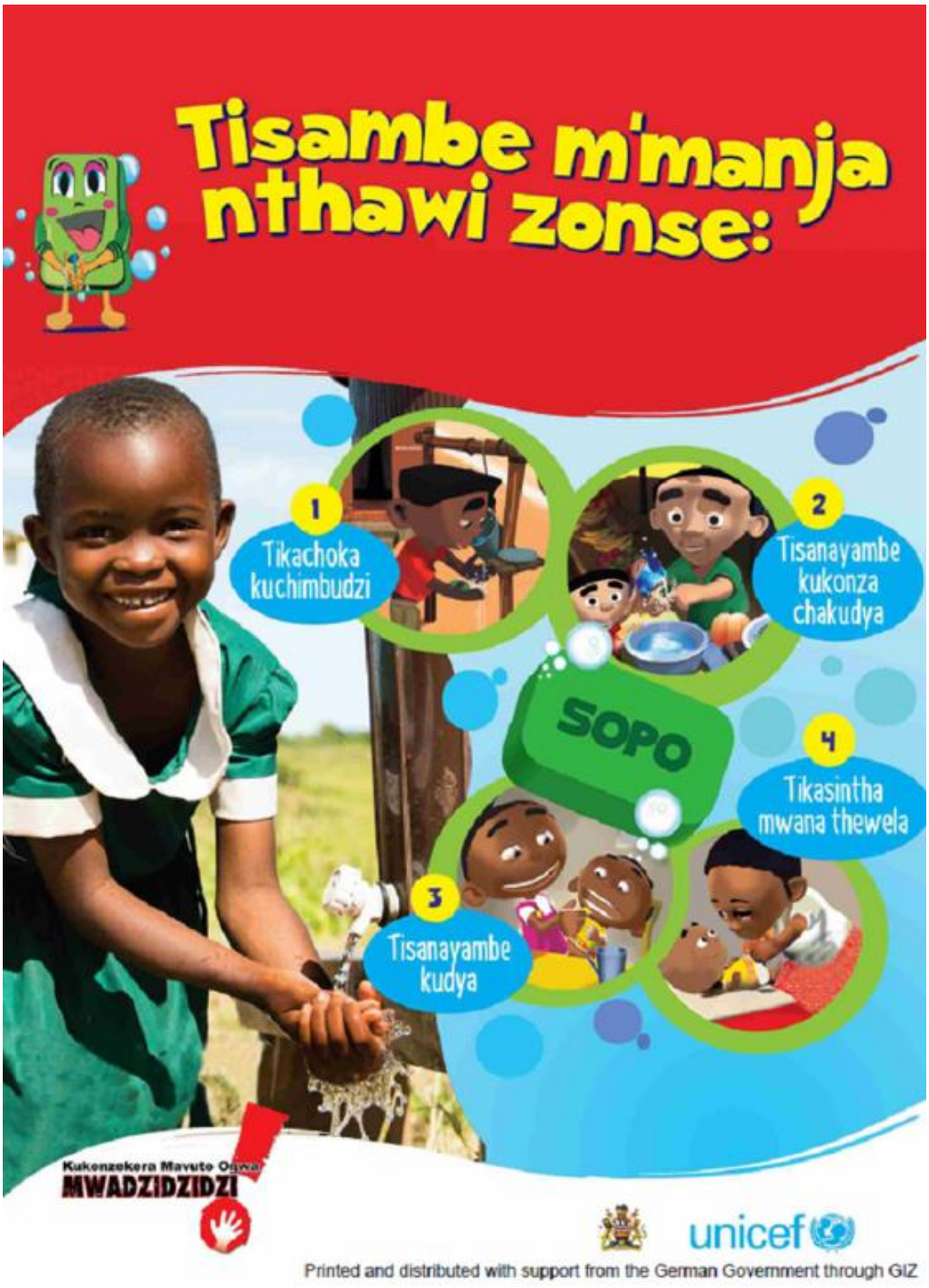
The curriculum in Zambia shows that courses such as home economics and nutrition are one of the two classes that discuss food safety. The home economics syllabus, for example, includes nine learning outcomes for students enrolled in the course. Of those nine learning outcomes, only three are related to food safety:

1. Adequately plan meals for various members of the family and the communities in different conditions.
2. Build in the learners the capacity to apply principles of nutrition, adequately manage the kitchen, and appropriately prepare, cook and present food in accordance with the principles of nutrition.
3. Appropriately use and store food, ingredients, materials, utensils and equipment used in food and nutrition (Mdundu, 1988, p.8).

Other science classes do discuss general food topics such as the food chain and the different types of food and their functions in the human body (Schnizel, 2022; UNESCO, 2006). Even so, school children still have opportunities outside the classroom to learn the significance of practicing food safety. For example, many schools have signage on proper handwashing techniques written in at least one local language and accompanied by images, demonstrating the proper handwashing techniques, as illustrated in Figure 1.

Figure 1.

Infographic Cholera Poster of Washing Hands by the United Nations International Children's Fund (UNICEF)



Source: *Cholera Poster - Resources • SUSANA*, n.d.

These types of images (Figure 1) are especially common during cholera outbreaks. Still, most schools have designated handwashing stations for the children to use before and after meals.

In any developing country, numerous factors shape the food safety knowledge of both parents and school children. While practices such as handwashing, hygiene, and proper food storage are widely recognized as essential to food safety (Byrd-Bredbenner et al., 2013), it is the underlying infrastructure and the contextual environment in which these practices occur that ultimately determine their effectiveness.

> We are familiar with some of the underlying conditions: unsafe water used for the cleaning and processing of food, poor food-production processes, inadequate storage, and food-handling practices including infected food workers and cross-contamination of food. These can be coupled with inadequate or poorly enforced regulatory standards and industry compliance. (Todd, 2020, p. 1)

Handwashing and washing of food items may be a common practice amongst people in developing countries, but the lack of access to clean water may cause more harm to those practicing food safety. Lack of access to clean water then becomes a force limiting the practices of food safety. One parent shared how they were well aware of the need to use clean water for the school children, such as the use of chlorinated water: “How do you know it is safe? Sometimes we do see the adding chlorine, sometimes you just feel the water as you are taking it, and feel it has chlorine in it. So, you feel you are safe” (Participant 12). Adding chlorine to drinking water is one of the most common ways that Zambian communities and the government disinfect contaminated water in their homes, schools, and other public spaces (Muleya et al., 2020).

Infrastructural deficits and foodborne illnesses significantly affect learning environments. For instance, the occurrence of cholera outbreaks has increasingly determined how long schools remain closed. In 2023 and 2024, the start of the school year was delayed due to cholera outbreaks (see *UNICEF, n.d.-b*). These disruptions underscore the urgent need to prevent foodborne illnesses like cholera and to improve the infrastructures that support communities during such outbreaks. Key infrastructural deficits include limited access to clean water, the absence of a food safety curriculum, inadequate access to safe and nutritious food for both parents and children, among other factors—many of which were highlighted by parents during the interviews. These infrastructural deficits can be seen as the broader contexts in which foodborne illnesses and food safety practices unfold. If these infrastructural challenges are not addressed, they can perpetuate a continuous cycle of cholera outbreaks.

Figure 2, developed based on the findings of this study, illustrates the various forces and factors that impact how school children learn about food safety. As shown in this figure, school children are central to learning food safety and this knowledge is impacted by the schools, the community, and most significantly by parents at home. On a larger scale, outbreaks such as COVID-19 and cholera, the curriculum, and the cultural norms are the backdrop in which school children are impacted. The curriculum, for example, informs what students learn in the classroom and may not always include food safety topics. The government, on the other hand, influences what students learn and determines when students can learn, especially during cholera outbreaks. The government determines when to keep schools open or closed during epidemics and pandemics. Figure 2 illustrates these and other forces that actively play a role in influencing food safety education in Zambian school-aged children.

Figure 2.

Various Contextual Forces that Influence Zambian School Children's Food Safety Knowledge

Note. Figure does not represent all forces that impact learning food safety.

The Zambian government has been attempting to provide safe water and other sanitation facilities to counter cholera, but acknowledges that it has been challenging:

> Provision of adequate safe water and improving sanitation facilities are long-term measures, which tend to be extremely expensive, require infrastructural change, skilled personnel for implementation, and management of the infrastructure. As a short-term measure, vaccination programs will be implemented to control the disease [cholera]. (Mwaba et al., 2020)

Nevertheless, the Zambian government attempts to counter cholera outbreaks by adding chlorine to the public water supply, which as noted earlier, is not uniformly available to all communities.

Instead, some communities use rainwater which is not always safe for use (Mwaba et al., 2020; Gama et al., 2017).

Infrastructural deficits create significant challenges for parents and schoolchildren in practicing food safety, as many of these issues are beyond their control. For instance, the availability of clean water in schools is often outside the influence of both parents and children. However, parents can still take proactive measures, such as teaching their children to avoid drinking school water or to use hand sanitizer before meals. One parent shared how their youngest child has learned to sanitize their hands before eating:

> That one [handwashing], it's a daily routine where they [children] know that even the ka small one [the youngest child] after visiting the toilet she wants to make sure that if there is no water near her, she will come and look for hand sanitizer. She has to rub the hands this girl baby. She will come and rub the hands. Participant 11

While sanitizing cannot replace handwashing as a form of food safety (Shahbaz et al., 2020), it is in these small ways that parents can attempt to influence their child's food safety behavior. If parents are aware of best practices when it comes to food safety, they can pass this knowledge on to their children. For example, behaviors such as smelling foods to determine whether a food is spoiled, cooking meats thoroughly, and storing perishable foods in refrigerators, are all part of food safety practices that can be inculcated in their children.

In Zambia, it is not uncommon for children to participate in food preparation. However, cooking is often viewed as a feminine activity:

> I think in Zambia boys tend *not* to be encouraged to take home-economic nutrition classes. They are more likely to take science and these other subjects for men. (Participant 3)

Viewing cooking and nutrition as subjects for girls and women can impact whether male students learn about food safety. Since food safety does impact everyone, regardless of gender, it is beneficial for everyone to learn about it. Gender was a common theme that impacted who learned food safety. Of the two male participants who were interviewed, they both shared how cooking and food preparation was mainly practiced by their wives. Gender, then, is a factor that informs when and with whom parents choose to teach food safety. For example, many parents and guardians shared how cooking was often done with their daughters or nieces, and not many cooked with their sons:

> Most of the times it's me but sometimes my daughter helps me under my instructions. (Participant 14)
>
> Truthfully, not really cooking. I don't remember when I last prepared a meal, but these others the, like, maybe, maybe some tea in evening for everyone. Yeah, so my wife and daughter prepare the meals. (Participant 3)
>
> I am the main person [who cooks] … with the help of the girls. My daughter, my niece. (Participant 4)

Even though cooking may be viewed as a gender-specific role, other food safety practices such as handwashing and allergies were less associated with gender. Haapala and Probart (2004), in their study on the self-efficacy of middle school students, found that there was a disparity between male and female-reported behaviors in food safety. Since the Haapala and Probart (2004) study was conducted in a western setting, it shows how food safety may be practiced by female participants in different cultural settings.

To reiterate, the central research question sought to identify the factors influencing food safety knowledge among Zambian parents. The data revealed that cholera, COVID-19, and the

availability of resources and information were key factors shaping parental behaviors. Examining both the personal and external food environments provided insight into additional factors at the household level, such as food allergies, food choices, and restaurant visits, that also impacted parental behaviors. These factors highlight the role of infrastructure in determining how effectively parents practice food safety within and outside their homes.

Chapter Summary

This Chapter discussed the study findings and data. This chapter was organized according to the research questions and showed the various contextual forces that impacted food safety behaviors and knowledge of Zambian parents. The proceeding chapter discusses the summary of the findings and data, the implications of the study, recommendations and conclusions.

CHAPTER V: CONCLUSION

Summary of Findings

The data from the study shows that parents in Zambia are well-informed on the significance of food safety. Many parents shared how food safety was practiced within their homes and how they had received information on how to prevent foodborne illnesses. Some parents and guardians showed concern for the lack of information within their communities. These concerns are justified as cholera outbreaks are eminent and recurrent in Zambian communities.

Various factors influenced how parents practiced food safety and, in turn, how they attempted to influence their children. In some cases, infrastructural barriers limited the ability of parents to influence their child's food safety behaviors. For example, some parents wished to enroll their children in food-related coursework but were not able to due to a lack of options. Other parents faced resource constraints that prevented them from purchasing preferred foods, especially in households where food allergies were present.

Gender was a major factor in influencing which children were learning about aspects of food safety such as cooking. Parents mainly included female children in food preparation, limiting the opportunity for their male children to learn food safety. Even still, children, regardless of gender, had opportunities to learn about food safety such as through signage posted outside of school classrooms and news regarding cholera outbreaks.

The most prominent themes that were derived from the data were lack of information and knowledge for parents and community members on how to prevent foodborne illnesses, fear of global and local outbreaks like cholera, experience with foodborne illnesses or allergies, rigid

food-related curricula in Zambian schools, and finally, gender as a factor in food handling. For example, the most common theme was experience with foodborne illness or allergies; some of the codes from this theme were “Son has experienced food poisoning,” “Children have no allergies but have experienced food poisoning,” and “Child has experienced food allergies.” These codes emerged from the first interview question which asked participants whether they had experienced allergies and foodborne illnesses. Identifying information was removed from the participants including the names of schools that children attend. Table 2 provided a sample of the themes along with sample codes and direct quotes from the transcript.

Implications

This study highlights the importance of educating, supporting, and reinforcing food safety practices among Zambian parents with school-aged children. While many Zambian parents recognize the importance of practicing food safety, they often lack the necessary resources to implement these practices effectively. Given the prevalence of cholera cases in Zambia, it is crucial for the government and relevant ministries to take proactive measures by providing accessible resources and support to parents and schools to prevent outbreaks.

The lack of resources may indicate a need to reconsider budget allocations to better address the health and educational needs of Zambia as a whole. The United Nations International Children’s Fund (UNICEF, n.d.) reports that in 2023 the Zambian government increased the allocation of funding for the health sector from K13.9 billion to K17.4 billion, equivalent to approximately $500-600 as of October 2024. This 15.2% increase could play a critical role in evaluating the effectiveness of such investments in combating cholera and other diseases that affect school-aged children. UNICEF recommends that the Zambian government further increase investments in the health sector to help combat public health issues and notes that 65,000

additional health personnel are needed to be able to cater to the health needs of the Zambian population (UNICEF, n.d.-a). It would be beneficial for the government to not only increase state allocation of health funds but also to incentivize employment and service in medical fields.

Statistically, children are among the most vulnerable to foodborne illnesses (Sharif et al., 2018), making it crucial to educate them on the importance of practicing food safety at school and at home. Zambian schoolchildren participate in food preparation and carry packed lunches for school. It is the shared interest of parents, school administrators, community members, and the government to promote and reinforce food safety behaviors. Equally important is ensuring that these stakeholders are well-informed about the various methods for implementing food safety practices within both household and external environments.

Food safety education can be effectively introduced through curriculum reform, thereby integrating food safety topics into core curriculum classes. Richards et al. (2008) examined how to best implement food safety as part of core curriculum classes. The researchers also found the best means of meeting state requirements was to align core curriculum courses with food safety principles. Since the Zambian government encourages the participation of various stakeholders in curriculum planning, parents can voice their desire for food safety and other food-related concepts within the curriculum. Since several parents expressed interest in enrolling their children in food-related coursework, participating in curriculum planning would be the best way to influence what their children learn.

The literature from scholars such as Sherman and Muehlhoff (2007), who studied nutrition and food safety in Zambia, argued for a whole-school approach where learning was supplemented by actions from parents and the community. This approach is in line with the findings of this study in that students would benefit from garnering support from their

communities and their parents. Cholera outbreaks demonstrate that the disease impacts not only learners but the broader community as well. To address this, Zambian parents can collaborate with communities to develop and implement strategies for preventing cholera, rather than placing much of the responsibility solely on the government. Given the limited resources allocated to helping individual communities fight cholera, it would be in the interest of these communities to take proactive steps in adopting and promoting preventative measures, such as the proper use of sanitation facilities and even keeping surroundings clean. Parents live in communities, and they can take the first step in encouraging clean surroundings.

The United States and several countries in Europe have been able to combat cholera cases and reduce them significantly. According to the Centers for Disease Control and Prevention (CDC), the US had prevalent cholera cases during the 1800s. In recent years, very rarely have US residents reported cholera cases due to modern sewage and water facilities (Centers for Disease Control and Prevention, n.d.). Additionally, these developed countries have implemented successful Water, Sanitation, and Hygiene (WASH) infrastructures. These infrastructures specifically encourage clean water and proper sanitation processes (Miggo et al., 2023). Although the US and Zambia differ in their economies and systems of governance, the US can serve as a model for effective systems to eradicate cholera. For example, the US demonstrates that proper sewage management and clean water are highly effective measures in preventing cholera outbreaks.

Zambia has implemented measures to eradicate cholera, including public education campaigns and initiatives to improve sanitation. However, these efforts have been hampered by a lack of critical resources, such as access to clean water. This resource gap has significantly limited the country's ability to fully implement the identified measures to reduce cholera

outbreaks, including those identified as essential, such as ensuring the availability of clean water (Sasaki et al., 2009). The organization, Medecins Sans Frontiers (MSF, Doctors Without Borders) also recognizes these infrastructure limitations that are not just present in Zambia, and states that

> Treatment and prevention of cholera come with considerable logistic challenges. Setting up cholera treatment centers requires a lot of supplies, and so do water and sanitation projects. In places that are unsafe or otherwise difficult to access, that is a huge constraint. The number of outbreaks this year makes it very challenging. There's already a shortage of cholera vaccines and the supply of other essential materials, like the fluid for intravenous rehydration, is also under pressure. (*MSF*, 2022, p. 2)

This highlights how standard scientific practices are influenced by external forces such as contextual influences, which can limit their effectiveness. Hewett et al. (2020) conducted a study with Zambian adolescent mothers to assess the success of interventions aimed at improving nutritional choices. While the interventions were effective in enhancing these parents' knowledge and decision-making, the participants were unable to implement what they learned in their own homes due to a lack of resources. This underscores the critical role of economic context in determining the success of interventions, often outweighing the efficacy of the interventions themselves.

Perhaps another cholera response strategy to consider, from a country neighboring Zambia, the Democratic Republic of Congo, can be adopted as a sustainable mitigation strategy:

> In a recent briefing with UNICEF USA, Grant Leaity, UNICEF's Representative in the Democratic Republic of Congo, said that when a suspected case comes to a health facility for treatment, a rapid response team is immediately dispatched to clean and sanitize the

person's home and surrounding area — even before lab results are in. (UNICEF, n.d.-a, p.1)

Deploying a response team in Zambia could effectively reduce the number of cholera cases in specific areas, as opposed to waiting for reported cases and lacking a follow-up strategy in the communities where cases originate. Given the similarities between Zambia and the Democratic Republic of Congo, there is great potential for applying transferable prevention and mitigation measures for cholera. Although Congo continues to report high cases of cholera (UNICEF, n.d.), implementing a proactive response team in Zambia remains a valuable approach worth implementing.

Another effort toward the prevention and mitigation of cholera advocated by UNICEF is a child-centered cholera prevention approach that also includes education as an effective response strategy. UNICEF specifically addresses the need to use vaccinations and life-saving supplies in efforts to reduce cholera while also promoting hygienic practices amongst community members (UNICEF, n.d.). This approach aligns with the whole-school model proposed by Sherman and Muehlhoff (2007), where the community works in conjunction with the school to enhance learning. This could involve students applying what they've learned in the classroom directly within the communities, reinforcing the connection between education and real-world practice.

This study shows the important role that parents play in the education of children, particularly where food safety is concerned. For example, parents in this study expressed how their own parents influenced their current food safety practices and how they, as parents, encourage food safety practices among their children. The study also shows how contexts expand

food safety knowledge and how it is practiced. Contexts also delimitate how food safety can be applied.

Recommendations

Zambian parents stressed the importance of available educational resources to learn how to prevent foodborne illnesses in their homes and communities. Going forward, Zambian parents would benefit from the following recommendations:

- Receiving educational information specifically related to keeping their school children safe before and during cholera outbreaks. Researchers can develop materials and training sessions for parents of school-aged children. These resources should highlight the contextual praxis within which food safety practices are taking place.
- Zambian parents can advocate for food safety programs at their children's schools. International organizations can step in and provide educational materials for both parents and children. The World Health Organization (WHO; 2022), for example, is working to improve food safety practices as part of the Sustainable Development Goals (SDGs) on the African continent and around the world. The WHO can be engaged to help reach the eradication of cholera that is specific to Zambia.
- Zambian parents can play a pivotal role in promoting hygienic practices within their communities. By doing so, they can help their children learn food safety and hygiene both at school and in their daily lives. Rather than relying solely on the government to enforce hygiene standards, parents can take the initiative in facilitating best practices, recognizing that cholera affects not only the government but the entire nation.
- Parents can support the education of both girls and boys on prevention strategies for cholera and other foodborne illnesses. Since cholera does not discriminate between males

and females, it is imperative to educate both girls and boys on how to prevent cholera and other foodborne illnesses, beginning in the home. At a basic level, this should start with parents involving both their male and female children in food preparation.

- A curriculum that incorporates food safety education is essential for curbing cholera outbreaks. While courses like home economics are currently optional, integrating food safety into the broader curriculum would benefit parents, school administrators, the government, and school-aged children. Additionally, parents can actively contribute to curriculum planning efforts, a practice encouraged by the Zambian government.
- The Zambian government can engage organizations such as UNICEF in health analysis of best practices to reduce foodborne illnesses and other public health issues. Considering how UNICEF and other organizations have made recommendations on how to better serve Zambian youth, it would be beneficial to investigate ways of implementing these recommendations.
- Parents can encourage children to avoid eating foods from street vendors, as it is often not safe.

Concluding Remarks

This study examined the various factors influencing the food safety knowledge of parents with children from kindergarten through grade 12 in Zambia. Through qualitative interviews with Zambian parents, the research found that while parents possess a fundamental understanding of basic food safety practices, the ability to effectively implement these practices is heavily shaped by contextual factors. This study revealed that local conditions, cultural norms, and socioeconomic circumstances are key determinants in how successfully parents and their children implement food safety measures. Looking ahead, future research would benefit from

exploring strategies to tailor food safety interventions to better fit the diverse contexts in which they are applied, ensuring that they are more effective and accessible to all communities

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REFERENCES

Ahmed, S. K. (2024). The pillars of trustworthiness in qualitative research. *Journal of Medicine, Surgery, and Public Health, 2*, 100051. https://doi.org/10.1016/j.glmedi.2024.100051

Almansour, F. D., Sweitzer, S. J., Magness, A. A., Calloway, E. E., McAllaster, M. R., Roberts-Gray, C. R., ... & Briley, M. E. (2011). Temperature of foods sent by parents of preschool-aged children. *Pediatrics, 128*(3), 519-523. https://doi.org/10.1542/peds.2010-2885

Alsaawi, A. (2014). A critical review of qualitative interviews. *European Journal of Business and Social Sciences, 3*(4). https://doi.org/10.2139/ssrn.2819536

Banda, F., & Jimaima, H. (2017). Linguistic landscapes and the sociolinguistics of language vitality in multilingual contexts of Zambia. *Multilingua*, *36*(5), 595-625. https://doi.org/0.1515/multi-2017-3047

Bans-Akutey, A., & Tiimub, B. M. (2021). Triangulation in research. *Academia Letters*, *2*, 1-6. https://doi.org/10.20935/AL3392

Barrett, T., & Feng, Y. (2020). Effect of observational evaluation of food safety curricula on high school students' behavior change. *Journal of Food Protection, 83*(11), 1947-1957. https://doi.org/10.4315/JFP-20-086

Beavers, A. S., Murphy, L., & Richards, J. K. (2015). Investigating change in adolescent self-efficacy of food safety through educational interventions. *Journal of Food Science Education, 14*(2), 54-59. https://doi.org/10.1111/1541-4329.12055

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Bulled, N., Poppe, K., Ramatsisti, K., Sitsula, L., Winegar, G., Gumbo, J., ... & Smith, J. (2017). Assessing the environmental context of hand washing among school children in Limpopo, South Africa. *Water International*, *42*(5), 568-584. https://doi.org/10.1080/02508060.2017.1335140

Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J., & Quick, V. (2013). Food safety in home kitchens: a synthesis of the literature. *International Journal of Environmental Research and Public Health*, *10*(9), 4060-4085. https://doi.org.10.3390/ijerph10094060

Byrd-Bredbenner, C., Abbot, J. M., & Quick, V. (2010). Food safety knowledge and beliefs of middle school children: implications for food safety educators. *Journal of Food Science Education*, *9*(1), 19-30. https://doi.org/10.1111/j.1541-4329.2009.00088.x

Carbone, E. T., Scarpati, S. E., & Pivarnik, L. F. (2013). Food safety practices assessment tool: An innovative way to test food safety skills among individuals with special needs. *Journal of Food Science Education*, *12*(1), 7-16. https://doi.org/10.1111/j.1541-4329.2012.00161.x

Centers for Disease Control and Prevention. (n.d.). *About cholera in the United States*. Centers for Disease Control and Prevention. https://www.cdc.gov/cholera/about/about-cholera-in-the-united-states.html

Centers for Disease Control and Prevention. (2023, April 29). *Four simple steps to food safety*. Centers for Disease Control and Prevention. https://www.cdc.gov/foodsafety/keep-food-safe.html

Check, J., & Schutt, R. K. (2012). *Research methods in education*. Sage Publications.

Chileshe, J. H. (2023). Zambia. In *Indigenization of African economies* (pp. 81-132). Routledge.

Cronin, U. P., & Wilkinson, M. G. (2009). The growth, physiology and toxigenic potential of Bacillus cereus in cooked rice during storage temperature abuse. *Food Control*, *20*(9), 822-828. https://doi.org/10.1016/j.foodcont.2008.10.018

Diplock, K. J., Dubin, J. A., Leatherdale, S. T., Hammond, D., Jones-Bitton, A., & Majowicz, S. E. (2018). Observation of high school students' food handling behaviors: Do they improve following a food safety education intervention? *Journal of Food Protection, 81*(6), 917–925. https://doi.org/10.4315/0362-028X.JFP-17-441

Draxten, M., Fulkerson, J. A., Friend, S., Flattum, C. F., & Schow, R. (2014). Parental role modeling of fruits and vegetables at meals and snacks is associated with children's adequate consumption. *Appetite*, *78*, 1-7. https://doi.org10.1016/j.appet.2014.02.017

Ebert, M. (2018). Hygiene principles to avoid contamination/cross-contamination in the kitchen and during food processing. In A. Fetsch (Ed.), *Staphylococcus aureus* (pp. 217-234). Academic Press. https://doi.org/10.1016/B978-0-12-809671-0.00011-5

Endres, J., Welch, T., & Perseli, T. (2001). Use of a computerized kiosk in an assessment of food safety knowledge of high school students and science teachers. *Journal of Nutrition Education*, *33*(1), 37-42. https://doi.org/10.1016/s1499-4046(06)60008-0

Food and Agriculture Organization of the United Nations (2024, February). *Q&A on food safety. Food safety and quality*. https://www.fao.org/food-safety/background/qa-on-food-safety/en/

Feldman, L. Y., Merrill, K., Golding, M. A., Memauri, T., Driedger, S. M., Ross, N. L., & Protudjer, J. L. (2022). Children's perspectives on food allergy in schools: A qualitative study. *The Journal of School Nursing*, *40*(6), 653-661. https://doi.org/10.1177/10598405221130694

Feng, Y., Bruhn, C. M., Elder, G., & Boyden, D. (2019). Assessment of knowledge and behavior change of a high school positive deviance food safety curriculum. *Journal of Food Science Education, 18*(2), 45-51. https://doi.org/10.1111/1541-4329.12157

Fleary, S. A., & Ettienne, R. (2019). The relationship between food parenting practices, parental diet and their adolescents' diet. *Appetite, 135*, 79-85. https://doi.org/10.1016/j.appet.2019.01.008

Gama, A., Kabwe, P., Nanzaluka, F., Langa, N., Mutale, L. S., Mwanamoonga, L., ... & Sinyange, N. (2017). Cholera outbreak in Chienge and Nchelenge fishing camps, Zambia, 2017. *Health Press Zambia Bull*, *2*(1), 12-19. https://www.semanticscholar.org/paper/Cholera-Outbreak-in-Chienge-and-Nchelenge-Fishing-%2C-Gama-Kabwe/b71fbaf8a0dbba68d25bdbc9c483209b3a08ec72

Giroux, S., Blekking, J., Waldman, K., Resnick, D., & Fobi, D. (2021). Informal vendors and food systems planning in an emerging African city. *Food Policy, 103*, 101997. https://doi.org/10.1016/j.foodpol.2020.101997

Gizaw, Z. (2019). Public health risks related to food safety issues in the food market: A systematic literature review. *Environmental Health and Preventive Medicine, 24*, 1-21. https://doi.org/10.1186/s12199-019-0825-5

Haapala, I., & Probart, C. (2004). Food safety knowledge, perceptions, and behaviors among middle school students. *Journal of Nutrition Education and Behavior*, 36(2), 71-76. https://doi.org/0.1016/s1499-4046(06)60136-x

Haruyama, J. L. (2023). Shortcut English: Pidgin language, racialization, and symbolic economies at a Chinese-operated mine in Zambia. *African Studies Review*, *66*(1), 18-44. https://doi.org/10.1017/asr.2022.112

Hewett, P. C., Willig, A. L., Digitale, J., Soler-Hampejsek, E., Behrman, J. R., & Austrian, K. (2021). Assessment of an adolescent-girl-focused nutritional educational intervention within a girls' empowerment programme: A cluster randomised evaluation in Zambia. *Public Health Nutrition*, *24*(4), 651-664. https://doi.org/10.1017/S1368980020001263

Hsiao, H. S., Tsai, F. H., & Hsu, I. Y. (2020). Development and evaluation of a computer detective game for microbial food safety education. *Journal of Educational Computing Research*, *58*(6), 1144-1160. https://doi.org/10.1177/07356331209249

Hu, W., Grbich, C., & Kemp, A. (2007). Parental food allergy information needs: A qualitative study. *Archives of Disease in Childhood.* https://doi.org/10.1136/adc.2006.114975

Kanno, H., Sakurai, T., Shinjo, H., Miyazaki, H., Ishimoto, Y., Saeki, T., & Umetsu, C. (2015). Analysis of meteorological measurements made over three rainy seasons and rainfall simulations in Sinazongwe district, southern province, Zambia. *Japan Agricultural Research Quarterly: JARQ*, *49*(1), 59-71. https://doi.org/10.6090/jarq.49.59

Kelly, L. M., & Cordeiro, M. (2020). Three principles of pragmatism for research on organizational processes. *Methodological Innovations*, *13*(2). https://doi.org/10.1177/2059799120937242

Koch, P.A. (2016). Learning, food, and sustainability in the school curriculum. In J. Sumner (Ed.), *Learning, Food, and Sustainability*. (Pp-55-73). Palgrave Macmillan, New York. https://doi.org/10.1057/978-1-137-53904-5_4

Koutsoumanis, K. P., & Gougouli, M. (2015). Use of time temperature integrators in food safety management. *Trends in Food Science & Technology*, *43*(2), 236-244. https://doi.org/10.1016/j.tifs.2015.02.008

Langiano, E., Ferrara, M., Lanni, L., Viscardi, V., Abbatecola, A. M., & De Vito, E. (2012). Food safety at home: knowledge and practices of consumers. *Journal of Public Health, 20*, 47-57. https://doi.org/10.1007/s10389-011-0437-z

Larsen, J. K., Hermans, R. C., Sleddens, E. F., Engels, R. C., Fisher, J. O., & Kremers, S. P. (2015). How parental dietary behavior and food parenting practices affect children's dietary behavior. interacting sources of influence? *Appetite, 89*, 246-257. https://doi.org/10.1016/j.appet.2015.02.012

Lee, S. (2017). Ig E-mediated food allergies in children: Prevalence, triggers, and management. *Korean Journal of Pediatrics, 60*(4), 99. https://doi.org/10.3345/kjp.2017.60.4.99

Leong, S. S., Korel, F., & King, J. H. (2023). Bacillus cereus: A review of "fried rice syndrome" causative agents. *Microbial Pathogenesis*, 106418. https://doi.org/0.1016/j.micpath.2023.106418

Levenstein, H. (2012). *Fear of food: A history of why we worry about what we eat*. University of Chicago Press.

Lincoln, Y. S. (1985). *Naturalistic inquiry* (Vol. 75). Sage Publications.

Lynch, R. A., Dale Steen, M., Pritchard, T. J., Buzzell, P. R., & Pintauro, S. J. (2008). Delivering food safety education to middle school students using a web-based, interactive, multimedia, computer program. *Journal of Food Science Education*, 7(2), 35-42. https://doi.org/10.1111/j.1541-4329.2007.00046.x

Magogodi, L. C. (2022). 11 featured examples: Gastrotourism in Botswana, Zambia and Zimbabwe. In *Sustainable Tourism Dialogues in Africa*, (pp. 191-208). https://doi.org/10.1515/9783110702491-011.

McKim, C. (2023). Meaningful member-checking: A structured approach to member-checking. *American Journal of Qualitative Research*, *7*(2), 41-52. https://doi.org/10.29333/ajqr/12973

Mdundu, B. J. (1988). Home economics syllabus for junior secondary school, grades 7-9. UNESCO. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000211287.

Medecins Sans Frontiers (Doctors Without Borders). (2022, January 31). *How MSF is tackling cholera outbreaks in 11 countries*. https://www.doctorswithoutborders.org/latest/how-msf-tackling-cholera-outbreaks-11-countries

Miggo, M., Harawa, G., Kangwerema, A., Knovicks, S., Mfune, C., Safari, J., ... & Patel, P. (2023). Fight against cholera outbreak, efforts and challenges in Malawi. *Health Science Reports*, *6*(10), e1594. https://doi.org/10.1002/hsr2.1594

Milton, A., & Mullan, B. (2010). Consumer food safety education for the domestic environment: A systematic review. *British Food Journal*, *112*(9), 1003-1022. https://doi.org/10.1108/00070701011074363

Ministry of Education, Science, Technology and Vocational Training and Early Education. (n.d.). *Home economics junior secondary school syllabus*. Curriculum Development Centre, Lusaka, Zambia. https://www.scribd.com/document/786390147/Home-Economics

Mukuni, V. (2022). The informational turn in food safety regulation: Us and zambian beef markets. *Food Studies*, *13*(2), 1. https//doi.org/10.18848/2160-1933/CGP/v13i02/1-13

Mukuni V., & Mukuni K. (2023, July13-17*) Third spaces and benefits of designing food safety curriculum for science classes: Using third space to promote food safety learning* [Paper

presentation]. The European Conference on Education 2023, London, UK. https://doi.org/10.22492/issn.2188-1162.2023.18

Mulenga, I. M., & Mwanza, C. (2019). Teacher's voices crying in the school wilderness: Involvement of secondary school teachers in curriculum development in Zambia. *Journal of Curriculum and Teaching*, *8*(1), 32-39. https://doi.org/10.5430/jct.v8n1p32

Mwaba, J., Debes, A. K., Shea, P., Mukonka, V., Chewe, O., Chisenga, C., ... & Ali, M. (2020). Identification of cholera hotspots in Zambia: A spatiotemporal analysis of cholera data from 2008 to 2017. *PLoS Neglected Tropical Diseases*, *14*(4), e0008227. https://doi.org/10.1371/journal.pntd.0008227

Mwape, K., Kwenda, G., Kalonda, A., Mwaba, J., Lukwesa-Musyani, C., Ngulube, J., ... & Mwansa, J. (2020). Characterisation of vibrio cholerae isolates from the 2009, 2010 and 2016 cholera outbreaks in Lusaka province, Zambia. *Pan African Medical Journal*, *35*(1). https://doi.org/10.11604/pamj.2020.35.32.18853

Nanzaluka, F. H., Davis, W. W., Mutale, L., Kapaya, F., Sakubita, P., Langa, N., ... & Brunkard, J. (2020). Risk factors for epidemic cholera in Lusaka, Zambia—2017. *The American Journal of Tropical Medicine and Hygiene*, *103*(2), 646. https://doi.org/10.4269/ajtmh.20-0089

Nestle, M. (2010). Safe food: The politics of food safety. University of California Press.

Newman, M., Gough, D. (2020). *Systematic reviews in educational research: Methodology, perspectives and application*. In O. Zawacki-Richter, M. Kerres, S. Bedenlier, Bond, M., Buntins, K. (Eds.) Systematic Reviews in Educational Research. Springer VS, Wiesbaden (pp.3-22). https://doi.org/10.1007/978-3-658-27602-7_1

Ngoma, R., Tambatamba, A., Oyoo, B., Mulongoti, D., Kumwenda, B., & Louie, H. (2018). How households adapted their energy use during the Zambian energy crisis. *Energy for Sustainable Development*, *44*, 125-138. https://doi.org/10.1016/j.esd.2018.03.007

Food and Nutrition Service, (2023, January 10). *Nutrition education & food safety*. U.S. Department of Agriculture. https://archive.cdc.gov/www_cdc_gov/healthyschools/nutrition/school_nutrition_education.htm

Olmos-Vega, F. M., Stalmeijer, R. E., Varpio, L., & Kahlke, R. (2023). A practical guide to reflexivity in qualitative research: AMEE guide no. 149. *Medical Teacher*, *45*(3), 241-251. https://doi.org/10.1080/0142159X.2022.2057287

Owens, J. K. (2021). Systematic reviews: Brief overview of methods, limitations, and resources. *Nurse Author & Editor*, *31*(3-4), 69-72. https://doi.org/10.1111/nae2.28

Partnership for Food Safety Education. (2024, March 19). *The core four practices of food safety: fightbac*. https://www.fightbac.org/food-safety-basics/the-core-four-practices/

Phiri, P., Nzala, S. H., & Baboo, K. S. (2015). Factors associated with the recurring cholera outbreaks in Sinazongwe district of southern Zambia. *Medical Journal of Zambia*, *42*(4), 184-192. https://www.semanticscholar.org/paper/Factors-Associated-With-the-Recurring-Cholera-in-of-Phiri-Nzala/f4112ea0f7fa90d78b30a8d968e3e40ee050e9af

Quick, V., Corda, K., & Byrd-Bredbenner, C. (2012). Middle schoolers' food safety cognitions and intended behaviors: A food safety computer game intervention. *Journal of the Academy of Nutrition and Dietetics*, *112*(9), A55. https://doi.org/0.1016/j.jand.2012.06.197

Ramos, A., Cooke, F., Miller, E., & Herbert, L. (2021). The food allergy parent mentoring program: A pilot intervention. *Journal of Pediatric Psychology, 46*(7), 856-865. https://doi.org/10.1093/jpepsy/jsab019

Raza, A., Fox, E. L., Morris, S. S., Kupka, R., Timmer, A., Dalmiya, N., & Fanzo, J. (2020). Conceptual framework of food systems for children and adolescents. *Global Food Security, 27*, 100436. https://doi.org/10.1016/j.gfs.2020.100436

Redmond, E. C., & Griffith, C. J. (2003). Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection*, *66*(1), 130-161. https://doi.org/10.4315/0362-028x-66.1.130

Reid, K. (2023, July 5). *Cholera: Facts, faqs, and how to help*. World Vision. https://www.worldvision.org/clean-water-news-stories/what-is-cholera-facts#:~:text=In%20these%20cholera%2Dendemic%20countries,through%20contaminated%20water%20and%20food.

Ricci, A., Martelli, F., Razzano, R., Cassi, D., Lazzi, C., Neviani, E., & Bernini, V. (2020). Service temperature preservation approach for food safety: Microbiological evaluation of ready meals. *Food Control, 115*, 107297. https://doi.org/10.1016/j.foodcont.2020.107297

Richards, Skolits, G., Burney, J., Pedigo, A., & Draughon, F. A. (2008). Validation of an interdisciplinary food safety curriculum targeted at middle school students and correlated to state educational standards. *Journal of Food Science Education*, *7*(3), 54-61. https://doi.org/10.1111/j.1541-4329.2008.00051.x

Rippberger, A. (2024, March 19). *The core four practices of food safety | FightBAC*. Partnership for Food Safety Education. https://www.fightbac.org/food-safety-basics/the-core-four-practices/

Rippberger, A. (2023, August 16). *Food safety classroom materials | Fight BAC!* Partnership for Food Safety Education. https://fightbac.org/kidsfoodsafety/curricula-and-programs/

Rose, J., & Johnson, C. W. (2020). Contextualizing reliability and validity in qualitative research: Toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of Leisure Research, 51*(4), 432-451. https://doi.org/10.1080/00222216.2020.1722042

Roy, M., & Giraldo-García, R. (2018). The role of parental involvement and Social/Emotional skills in academic achievement: Global perspectives. *School Community Journal, 28*(2), 29-46. http://login.ezproxy.lib.vt.edu/login?url=https://www.proquest.com/scholarly-journals/role-parental-involvement-social-emotional-skills/docview/2166969249/se-2

Russell, A. F., Kagan, O. S., & Huber, M. M. (2020). Parent perspectives on food allergy management and safety during the covid-19 pandemic. *Journal of Food Allergy (USA), 2*(2), 142-151. https://doi.org/10.2500/jfa.2020.2.200033

Safety, N. a. F. (2006, May 15). *Five keys to safer food manual*. Retrieved from https://www.who.int/publications/i/item/9789241594639

Sasaki, S., Suzuki, H., Fujino, Y., Kimura, Y., & Cheelo, M. (2009). Impact of drainage networks on cholera outbreaks in Lusaka, Zambia. *American Journal of Public Health, 99*(11), 1982-1987. https://doi.org/10.2105/AJPH.2008.151076

Sasaki, S., PhD., Suzuki, Hiroshi, M.D., PhD., Fujino, Y., M.A., Kimura, Y., M.A., & Cheelo, M. (2008). Impact of drainage networks on cholera outbreaks in Lusaka, Zambia. *American Journal of Public Health, 99*(11), 1982-7. Retrieved from http://login.ezproxy.lib.vt.edu/login?url=https://www.proquest.com/scholarly-journals/impact-drainage-networks-on-cholera-outbreaks/docview/215089913/se-2

Shahbaz, M., Bilal, M., Moiz, A., Zubair, S., & Iqbal, H. M. (2020). Food safety and covid-19: Precautionary measures to limit the spread of coronavirus at food service and retail sector. *Journal of Pure and Applied Microbiology*, *14*(1), 749-756. https://doi.org/10.22207/JPAM.14.SPL1.12

Sharif, M. K., Javed, K., & Nasir, A. (2018). Foodborne illness: Threats and control. In *Foodborne Diseases* (pp. 501-523). Academic Press.

Sherman, J., & Muehlhoff, E. (2007). Developing a nutrition and health education program for primary schools in Zambia. *Journal of Nutrition Education and Behavior*, *39*(6), 335-342. https://doi.org/10.1016/j.jneb.2007.07.011

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63-75. https://doi.org/10.3233/EFI-2004-22201

Siegel, J. (2008). Pidgin in the classroom. *Educational Perspectives*, *41*, 55-65. https://files.eric.ed.gov/fulltext/EJ877778

Simon, G. A. (2012). *Food security*. University of Roma Tre: Rome, Italy. https://www.scirp.org/reference/referencespapers?referenceid=3688996

Sivaramalingam, B., Young, I., Pham, M. T., Waddell, L., Greig, J., Mascarenhas, M., & Papadopoulos, A. (2015). Scoping review of research on the effectiveness of food-safety education interventions directed at consumers. *Foodborne Pathogens and Disease*, *12*(7), 561-570. https://doi.org/10.1089/fpd.2014.1927

Songiso, M., Hikaula, S., Shamapango, J. L., & Zulu, T. B. (2007*). Zambian basic education course: Nutrition education* (pp. 1-127). Government of the Republic of Zambia, Ministry of Education. Retrieved from https://www.fao.org/4/ag066e/ag066e00.htm

Stahl, N. A., & King, J. R. (2020). Expanding approaches for research: Understanding and using trustworthiness in qualitative research. *Journal of Developmental Education, 44*(1), 26-28. Retrieved from https://www.jstor.org/stable/45381095

Stenger, K., James, K., Patton, P., Albrecht, J. A., Perry, C., Larvick, C., & Schwarz, C. (2013). Use of technology to reach families with young children with food safety information. *Journal of Nutrition Education and Behavior, 45*(1), 86-89. https://doi.org/10.1016/j.jneb.2012.05.003

Sustainable Sanitation Alliance. (n.d.). *Cholera poster* [infographic]. Susana. https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/5138#

Tamason, C. C., Tulsiani, S. M., Siddique, A. K., Hoque, B. A., & Mackie Jensen, P. K. (2016). What is cholera? A preliminary study on caretakers' knowledge in Bangladesh. *Journal of Health, Population and Nutrition, 35*, 1-4. https://doi.org/10.1186/s41043-016-0040-6

Taylor, S. D. (2006). *Culture and customs of Zambia*. Greenwood Press.

Taylor, S. L., & Baumert, J. L. (2020). Food allergies, sensitivities, and intolerances. In *Present Knowledge in Nutrition* (pp. 535-548). Academic Press.

Tembo, M. S., Ph. D. (2002). What good is Zambian etiquette? Contemporary aspects of African Culture. *The Free Library.* Retrieved from https://www.thefreelibrary.com/What+Good+Is+Etiquette%3F+Understanding+the+Norms+of+Good+Behavior+in. . .-a094142616

The World Bank (n.d.). *Education statistics*. https://datatopics.worldbank.org/education/country/zambia

Thomas, M. A., Serenje-Chipindi, J., & Chipindi, F. (2020). Comparing course syllabi from a to z: Examining the contexts, contents, and concerns for social foundations of education in Australia and Zambia. In *Course syllabi in faculties of education: Bodies of knowledge and their discontents, international and comparative perspectives* (pp. 38-50). Bloomsbury Academic. https://doi.org/10.5040/9781350094277.0008

Trepka, M. J., Newman, F. L., Huffman, F. G., & Dixon, Z. (2010). Food safety education using an interactive multimedia kiosk in a wic setting: Correlates of client satisfaction and practical issues. *Journal of Nutrition Education and Behavior*, *42*(3), 202-207. https://doi.org/ 10.1016/j.jneb.2008.10.001

Trexler, C. J., & Roeder, D. (2003). Using qualitative research methods to ascertain elementary students' understandings of food safety. *Journal of Food Science Education*, *2*(2), 25-31. https://doi.org/10.1111/j.1541-4329.2003.tb00022.x

Umasunthar, T., Leonardi-Bee, J., Hodes, M., Turner, P. J., Gore, C., Habibi, P., ... & Boyle, R. J. (2013). Incidence of fatal food anaphylaxis in people with food allergy: A systematic review and meta-analysis. *Clinical & Experimental Allergy*, *43*(12), 1333-1341. https://doi.org/10.1111/cea.12211

UNESCO. (2006). *National school health and nutrition policy*. Health and Education Resource Center. https://healtheducationresources.unesco.org/library/documents/national-school-health-and-nutrition-policy-0

UNESCO. (n.d.). Zambia. International Bureau of Education. https://unesdoc.unesco.org/ark:/48223/pf0000190205

UNICEF. (2024, February 15). *What UNICEF is doing about the cholera crisis in Africa*. UNICEF USA. https://www.unicefusa.org/stories/what-unicef-doing-about-cholera-crisis-africa

UNICEF. (n.d.-a). *United nations children's fund, Zambia budget brief health 2023*. https://www.unicef.org/esa/media/12571/file/UNICEF-Zambia-Budget-Brief-Health-2023.pdf

UNICEF. (n.d.-b) *Report by UNICEF on esaro guidance note to support safe school operations during cholera outbreaks.* ESARO Guidance Note to Support Safe School Operations during Cholera Outbreaks. https://www.unicef.org/esa/media/13676/file/UNICEF-ESA-Guidance-%20Note-Safe-School-Operations-Cholera-2024

United Nations. (n.d.). *World Food Safety Day - Resources | United Nations*. https://www.un.org/en/observances/food-safety-day/resources#:~:text=If%20it%20is%20not%20safe,utilization%20dimension%20of%20food%20security

USDA. (2024). *Food safety and inspection service*. Keep Food Safe! Food Safety Basics | Food Safety and Inspection Service. https://www.fsis.usda.gov/food-safety/safe

Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, *18*, 1-18. https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-018-0594-7

Webb, M., & Morancie, A. (2015). Food safety knowledge of foodservice workers at a university campus by education level, experience, and food safety training. *Food Control*, *50*, 259-264. https://doi.org/10.1016/j.foodcont.2014.09.002

Whited, T., Feng, Y., & Bruhn, C. M. (2019). Evaluation of the high school food safety curriculum using a positive deviance model. *Food Control*, *96*, 324-328. https://doi.org/10.1016/j.foodcont.2018.09.004

Willemsen, A., Wiggins, S., & Cromdal, J. (2023). Young children's mealtimes and eating practices in early childhood education and care: A scoping review of 30 years of research from 1990 to 2020. *Educational Research Review*, *38*, 100503. https://doi.org/10.1016/j.edurev.2022.100503

Wong, K., & Heacock, H. (2014). Fitness lunch bag: The ability to keep foods cold and out of the danger zone. *BCIT Environmental Public Health Journal*. https://doi.org/10.47339/ephj.2014.150.

World Health Organization. (2022). *Food safety*. https://www.who.int/news-room/fact-sheets/detail/food-safety

World Health Organization. (2022-a). *WHO global strategy for food safety 2022-2030: Towards stronger food safety systems and global cooperation*. World Health Organization. https://www.who.int/publications/i/item/9789240057685

World Health Organization. (n.d.). *Multi-country outbreak of cholera, external situation report #19 - 18 October 2024*. World Health Organization. https://www.who.int/publications/m/item/multi-country-outbreak-of-cholera--external-situation-report--19---18-october-2024#:~:text=Overview,in%20deaths%20is%20deeply%20concerning.

Zambia Statistics Agency. (n.d.). https://www.mlss.gov.zm/wp-content/uploads/2023/08/2021-Labour-Force-Survey-Report.pdf

Zimmerman, T., Goetz, T., & Ibrahim, S. A. (2021). Peanuts, the immune system, and food safety: Assaying commercial products for peanut residues in a remote hands-on activity. *The American Biology Teacher, 83*(9), 584-588. https://doi.org/10.1525/abt.2021.83.9.584

APPENDIX A. Interview Questions

Interview items for parents and guardians of school-age youth in Zambia.

The following questions are about you and your child or children who are in school (Kindergarten to 12th grade). Please provide as much detail in your responses.

13. Have you or your child ever gotten sick from consuming food? If so, describe your experience and how you delt with the illness. (symptoms, hospital visits, etc)
14. What influence do you have over the classes and type of classes that your child is taking? Do they choose classes, or do you suggest them?
15. What other things influence your school-age children's decision making when it comes to food and food related course work?
16. What other things influence your decision making when it comes to food? (price, allergy information, distance to grocery store, etc.)

These next questions will focus on your eating habits and food preparation techniques. Please respond to them to the best of your knowledge and with a lot of detail.

17. How often do you eat in a restaurant? Describe any steps you take before eating your meal
18. How often do you eat homecooked meals? Describe any safety steps you take before and during meal preparation and consumption
19. Describe any food safety related steps you take when packing a meal or snacks for your children (packing food with icepack, handwashing, reading food labels for allergies, etc)
20. Are you the primary food preparer (cooking or storing of food) in your home? If so, do you involve your child in preparing food? Why or why not?
21. How often do you think about food safety when you prepare food (storing food properly, washing hands, cleaning utensils, cooking at proper temperatures, allergies, packing snacks, etc.)
22. Do any of your school-age children have allergies? If so, how has this influenced your food relationship/precautions you take in your home?

These next questions require you to think about the factors that have influenced your knowledge regarding food safety

23. Describe any experiences you have had that have helped you learn about food safety (your own parents involving you in food prep, any experience with allergies, getting food poisoning, etc)
24. Describe any experiences you have had that have prevented you from learning about food safety

Demographic questions

6. Relationship to child
7. Grade level of your child
8. Gender of child (or children)
9. Level of school completed.

    Some high school

    Highschool

    Some college

    College

    Some graduate or professional school

    graduate or professional school

    other
10. Employment status

Thank you for taking the interview. If you would like to be entered in the drawing for $100 visa card or Airtel money, please provide your phone number or email.

APPENDIX B. Codebook with Code Descriptions, Categories and Quotes from Participants

Code name	Code Definition/description	Code Categories	Example
Hears some things about food safety and also observes on her own (Information)	Parent has encountered food safety information in the media or through community members because of cholera outbreaks	food safety information	"Yes, it is heard on the radio, on TV, even others, they do come in schools. They come and teach the children about hygiene, and we have got posters. Yes, we put them where they are washing hands…" Participant 18 Do you ever hear about hygiene on the news? "Yes I do"" Participant 16 "There's news which comes. Diarrheal disease outbreaks are there. We have ads on the TV. We've seen that on the TV. There's Adverts encouraging us to wash hands, maybe detergent or soap adverts and the kids pick that up." Participant 20 "They come and teach the children about hygiene, and we have got posters. Yes, we put them where they are washing hands…Even when they are going to school, they are put on the walls so that the children can see." Participant 19
Eats out sometimes but uses specific restaurant with handwashing station Feels the need to wash hands after greeting	Behavior parent engages in to prevent foodborne illness or sickness (includes temperature controls, handwashing, smelling tests, cooking, separating foods, and others). Also includes food handling	current food safety practices	"Most of the time when I'm in town you find that I use Hungry Lion, they do put water and hand wash. So first you start by washing your hands just to keep safe because you've been going

people to avoid getting sick (handwashing)	behaviors both inside and outside the home.		around and greeting others sometimes you meet someone you know a way you greet them so you feel your hands are dirty you can just so At least you wash just to keep clean. After washing then you eat..." Participant 12
Washes food before eating when outside the home (food handling)	What does parent do to prevent foodborne illness or sickness	current food safety practices	"let's say you're in town and you need to eat do you ever buy food and what do you do "I wash it"" Participant 16
Cooks most of the time. Ensures that food is safe for eating (Cooking)	What does parent do to prevent foodborne illness or sickness	current food safety practices	"So when it comes to home cooked food, are you the one who is doing the cooking or someone is helping you to cook food?"Most of the time it's me. There is someone who helps but most of the time it's me and I make sure that this food is good to be eaten"" Participant 18
Uses a food warmer. Packs foods that are simple and do not contain too many ingredients. Is cautious of the season when packing food (Food packaging)	What does parent do to prevent foodborne illness or sickness	current food safety practices	" And then do you pack food that won't go bad or you use a food warmer?... "Warmer. And when packing I should be conscious. There are certain types of food that easily go bad. So I need to make sure I need to know even the seasons, we need to read seasons. When it's in the hot season, pack plain, plain, plain things like sandwiches..." Participant 19
Usually packs foods that will not easily go bad for children (Food packaging)	What does parent do to prevent foodborne illness or sickness	current food safety practices	"So I avoid the things that easily go bad. I don't put gravy, I don't put fresh tomato. Sometimes I put cucumber, though they're not fans of cucumber, I try to

			balance, to give them a balanced meal" Participant 20. "If it's hot season, it goes bad easily. I usually just, I bake, I usually pack baked foods or maybe you buy some snacks for them Things like that." Participant 5
Cholera has influenced how often parent eats out (Cholera)	how covid and cholera impacted food safety practices	covid and cholera	"Okay, I love eating food like... Like packed food. Not like... I say like chapati. I don't... Because of this outbreak of cholera. That makes me fear because I may not know if that is completely clean" Participant 7
Because of cholera, parent is cautious of where they eat (Cholera)	how covid and cholera impacted food safety practices	covid and cholera	"Because of this outbreak of cholera. That makes me fear because I may not know if that is completely clean, I don't want to... Oh, and there is hygiene of being taken. Yeah, so it's rare. I choose where there is a clean place, that's where I can buy." Participant 7
Sometimes child eats from school cafeteria (Eating habit)	eating habits for both parent and child(ren)	eating habits	"Sometimes they eat here [school cafeteria], but every day I pack something for him. Yes. But he doesn't like cooked food. So maybe we just put ma-crisps, biscuits and juice." Participant 6
Does not eat at restaurants (Eating habit)	eating habits for both parent and child(ren)	eating habits	"Do you eat at restaurants/ how often and what precautions you take? "No"" Participant 9
Sometimes the younger children eat food from school and other	eating habits for both parent and child(ren)	eating habits	"So for the younger children, are they eating food at school or you have to pack for them? "Here at school they eat porridge. They cook porridge

times they come with packed food (Eating habit)			at 8.30 they have to eat porridge but from home we pack since me I stay very far [name of town] that side I just come with food here then I cook from here when I pack for the young ones but for these others the children they come with food packed food " Participant 11
Allergies in the home have changed eating habits (Allergies)	eating habits for both parent and child(ren)	eating habits	"They have changed [eating habits because of allergies] because I don't normally buy those food, like a capenta, I stopped completely. Booger I don't buy because it would make a lot of costs for me to buy these food than others they are not eating. So I just buy maybe super... The food at least which all of us we eat together" Participant 11
Packs food for child when it is available (Food handling)	eating habits for both parent and child(ren)	eating habits	"If I have food then I will pack it for them" Participant 16
Eats out often times due to work schedule Eats foods that are familiar as a precaution (eating habit)	eating habits for both parent and child(ren)	eating habits	"Since I work I usually eat outside of my home, especially lunch. Supper is at home usually. I go for the simplest meals, Those that I'm able to know. Whatever they are. Vegetables maybe with fish. Grilled fish. No spices" Participant 19
Rarely eats out. Is cautious about where to eat. (eating habit)	eating habits for both parent and child(ren)	eating habits	"I'm not very adventurous with food. So I have one particular place that I visit. I like chicken and chips. So The few times that I do go out I always go for chicken and chips and there's one particular place and Usually

			it's good. I had one or two cases where the food isn't like tasting so fresh but mostly it's okay" Participant 20
Parent instructed child to be more cautious with food from strangers. (Parental influence)	parental influence on child's (food) safety	curriculum and food safety	"It [eating habits] changed, yes. I told him not to get food from the people he doesn't know, because he didn't know how they prepare it." Participant 6
Sometimes parents choose classes for child (Curriculum and Parental influence)	Parental influence on child's learning	curriculum and food safety	"We choose [classes]. We choose. Yes." Participant 14. "I think if there was a choice, I would love them to learn what they, the school is offering in terms of cooking. But in terms of eating, there's some instances where they say, oh, tomorrow we are cooking and eating as a class. "Participant 5
Child has interest in food (Hidden curriculum)	child's own interest in food helps them learn safety	curriculum and food safety	"Yes, we do [choose classes]. Sometimes even himself [child] he learns about it [food and cooking], he likes watching food network." Participant 6 "She's taking home economics. That's the food related subject. "That was one of her choices. She has an interest in food aspect, mainly in baking. And I think her baking, some cooking" Participant 20
Does not choose classes for children. Is more confident in teachers choosing classes (Parental influence, Curriculum)	parent does not choose coursework for children. Parent believes teachers are better equipped at choosing classes for children	curriculum and food safety	"Coming to classes to speak the truth, I don't choose. Yes. The teacher himself knows how to put it. Because he is the one who is teaching them,. I may go in a wrong way." Participant 10

Children are enrolled in food related coursework (Curriculum)		curriculum and food safety	"Do your children have classes that have to do with food, maybe even nutrition or do you know? "Yes they have." Participant 10
Is not confident when it comes to choosing classes for child (curriculum/ parental influence)	Parent is hesitant at choosing coursework for child(ren)	curriculum and food safety	"I can't choose [classes]. Yes, it depends to the level of the child. Because I can't ehh, maybe I can't send the child to the higher grade where she will not be able to perform well." Participant 13
While some foods are not in the syllabus, parents should be sensitized on food safety especially in hot weather (curriculum/ parental influence)	food related curriculum should cover seasonal changes, especially how to keep food safe in hot seasons	curriculum and food safety	"Yes, it's there [food topics]. In the syllabus there's nutrition, the topic for nutrition. Where they learn about the food hygiene, how to keep their food, and where they learn the right food for their bodies" Participant 13. "There are certain types of food that easily go bad. So I need to make sure I need to know even the seasons, we need to read seasons. When it's in the hot season, pack plain, plain, plain things like sandwiches" Participant 19
Child will choose classes when they get to grade 7 (curriculum/ parental influence)	child is enrolled in standard classes and will only be able to choose in grade seven	curriculum and food safety	"If the child goes to preschool then they proceed to baby class then go to grade one. If they get to grade 7 then they will choose classes for themselves" Participant 17
Chooses classes for children. Believes that it is important for kids to learn about food to prevent illnesses. (curriculum/ parental influence)	parent chooses coursework for children because parent believes food related coursework/ classes are important	curriculum and food safety	It's better [for child to be enrolled in food course] because I'm the one who suffers. When someone that one is sick, it's me to look for the medicine, even me to see that the child will be better. So it's me, it’s me who

			chooses [classes] for them" Participant 18
Will not choose classes for child (curriculum/ parental influence)	parent will not choose classes for child in the future when options are available		"Will you choose classes for your children? "No"" Participant 9
Children's food choices are informed by parental food choices (Parental influence)	Parent chooses food for children	parental influence	"they don't choose we cook whatever we have then them if they don't eat then we give them something. Especially vegetables, we give them vegetables. If we have something, then we give them something, but they don't choose." Participant 11
Children practice hygiene in the kitchen (Parental influence/ Current food safety practices)	Children are aware of hygienic practices and do so when cooking or handling food	parental influence	"There are children who are preparing I'm not the one unless there is specific food I want to eat and I want to cook on my own those are the food I cook but normally since we are a big family so I have almost three children they cook they give them tasks to cook..., it's just a daily routine [hygiene] because they sometimes find that if they are fast, they will not do it." Participant 11
Children encourage each other to practice hygiene though sometimes they cook very fast and don't follow food safety (Parental influence/ Current food safety practices)	Children are aware of hygienic practices but only practice hygiene sometimes	parental influence	"it's just a daily routine because they sometimes find that if they are fast, they will not do it. So if a friend has seen that someone is not even, because even the vegetables, they have to wash the vegetables, they have to clean where they are cooking from as they are cooking." Participant 11

youngest child also practices hygiene (Parental influence/ Current food safety practices)	Even the youngest child is aware of hygienic practices	parental influence	"they know [to practice hygiene]... it's a daily routine where they know that even the ka small one after visiting the toilet she wants to make sure that if there is no water near her she will come and look for hand sanitizer she has to rub the hands this girl baby she will come and rub the hands so it's there" Participant 11
Is responsible for choosing food for all children at the school (Parental influence)	parent works at school and is responsible for choosing foods for all school children	parental influence	"Oh yeah, choosing [food for students]. [I am] Someone who is in charge of the feeding program, ... together with the director." Participant 12
Delegates cooking with children (Parental influence/ Current food safety practices)	Parent takes turns with children to cook for household	parental influence	"We do exchange [cooking] with the children. "Participant 12
Believes it is duty of parents to be cautious of what children are eating (Parental influence/ Parental Beliefs)	Parent believes it is their duty to oversee what their children are eating	parental influence	"I think with that, as parents, we must be very observant with our children, with the food they eat and the food they take. Because some of the foods which they take, they make them feel unwell constantly" Participant 13
Has seen impact of some foods on students at school. Believes parents should be sensitized on food safety (Parental influence/ Parental Beliefs)	Parent works at school and has witnessed the dangers of ill handling food in school children. Parent believes in training parents on food safety	parental influence	"For me, I'm a teacher now and teach the babies. There are some babies which I see some of the food immediately they bring that food-- tomorrow they will not show up at school. They will be at unwell. So I think the must be a sensitization to the parents over the food." Participant 13

Has observed how parents pack foods for their school children. Some parents pack cold foods (Parental influence/ Parental Beliefs)	Parent works at school and has witnessed the dangers of ill handling food in school children. Parent believes in training parents on food safety	parental influence	"I usually observe some parents, they pack the packed lunch for their children in the morning. So sometimes, a cold packed lunch is good for them. At least the body needs warmth for them. Maybe for those who pack in the food warmer, it is better. Not those who pack in the lunch boxes. Because there the food will get cold" Participant 13
Children do not practice hygiene when cooking. Parent has to remind them to wash fruits and vegetables (Parental influence/ Parental Beliefs)	Parent oversees cooking by children as they do not always practice hygiene in the kitchen	parental influence	"I am not going to lie my kids do not have this hygiene at all they just cook. I have to remind them sometimes that wash the tomatoes wash the vegetables they never washed the vegetables" Participant 16
Parent is cautious on what child is eating (Parental influence/ Current food safety practices/ Eating habits)	Parent oversees what child is eating	parental influence	"... most of the time here in Zambia, there are some outbreaks. So those outbreaks, even teachers how to handle the food, even the children, they know about it. So on that one, I'm aware and I'm conscious so that whenever that child is eating that food, I'm able to know where it is coming from and where that food that child is eating" Participant 18
Encourages children to abstain from eating food from unknown sources Packs food for the children	Parent attempts to influence what children are eating by encouraging eating food from known sources. Parent also packs food for children.	parental influence	"... whenever that child is eating that food, I'm able to know where it is coming from and where that food that child is eating" Participant 19

(Parental influence/ Current food safety practices)			
Parent encourages handwashing ((Parental influence/ Current food safety practices/ handwashing)	Parent encourages child(ren) to wash hands	parental influence	"I usually insist, I usually tell them to wash their hands after using the bathroom, before eating make sure you wash your hands and I tell them what not washing hands to do so yeah we usually wash our hands before eating after using the bathroom. And also before cooking, I need to wash my hands" Participant 20
Because of cholera, parent practices safety by using clean tools. Practices hygiene even when there is no cholera outbreak	Due to cholera, parent uses clean kitchen utensils but also practices hygiene when there are no reported cholera cases	covid and cholera / current food safety practices	Yes because of cholera we need to be prepared we need to make sure that the buckets that are used for water are clean and everything is clean so that we do not get sick...Even without cholera a person needs to be well prepared and clean. And food needs to be cleaned too. We do not need to wait until some disease comes along before we practice hygiene. Every person needs to be clean" Participant 15 "We wash our utensils. And even if the vegetables before we cut we wash and before we cook also we wash again. Yes, we wash our hands before that cooking the food." Participant 6. we have and we have learned a lot. Even where I stay near, there's a ka-compound. The children were getting sick of Cholera so I always warn my child not to eat the food from the vendors who sell on the street and wash fruits before eating even

			if it's a guava he plucks from the tree I tell him he should wash it." Participant 6
Handwashing is main food safety practice because of cultural food	Participates in handwashing because culture informs handwashing before eating nsima	Main food safety practices	"Naturally, yes. Every time. As you know, most of our meals we eat with our hands here. So we always wash our hands before we eat. Naturally now, if I have to eat something, I have to wash my hands. If I were to eat without washing, there's a feeling as if you're... " Participant 3
Practices food safety by warming food before consumption	Parent warms foods before eating	Main food safety practices	"...fortunately at the office we have a food warmer. So we carry food. We have lunch. And we want to eat it. It's a standard practice for most of my colleagues. We just warm it in the microwave." Participant 3
Rarely eats meals outside the home	Parent rarely eats meals outside of their home	eating habits outside home	How often? [eating out] For me, I can say maybe it's rare because we don't go out often. It's once in a while. Maybe you go out somewhere, maybe for a function and then, or you go into town to do something and then maybe you're hungry you just go by hungry lion and then get some food and eat" Participant 4
Washes hands when eating at restaurants but not eating fruits from vendors	Parent only washes hands when eating at restaurants but not before eating fruits	eating habits outside home	"Washing hands at a restaurant yes, but not outside when I buy from the fruits from the street." Participant 4
Packs food for children in school. Packs food in regular plastic container	Parent packs foods for school children but uses regular plastic container which does not prevent spoilage		"Yes [to packing food]... especially grade 8 and grade 10 and 11 but when because it was the school was a distance from home,... So she would just say give me money or buy

			when she reached grade 12...No, it's just a plastic lunchbox." Participant 4
Food preparation and handling is delegated amongst mother, daughter and niece	Parent does not participate in cooking since wife, and female children (and niece) participate in cooking	gender as impacting learning and practicing food safety	"I am the main person that [cooks] with the help of the girls. My daughter, my niece." Participant 4
Practices food safety even at restaurants	Parent remembers to practice food safety even at restaurants	eating habits outside home	"We eat sometimes [at restaurants], Maybe you are in town and you eat, but we choose the places to go because some places are just looking at them they are dirty--maybe you can get sick. Yes. And then before eating, obviously you should wash your hands and after eating." Participant 6
Prefers to do cooking and not ask house help Is not comfortable with house helps' hygiene level	Parent prefers to do the cooking themselves since they are not comfortable with house help's level of hygiene	eating habits outside home	"We have house help or nannies or something even when they were babies I would rather do the cooking myself. Maybe I'm paranoid. But I just never just trust the fact that someone else is cooking, you know, the hygiene levels, you know, how made they are. Sometimes, you know, they don't consider washing hands as something very important" Participant 5
Observing how food is prepared at functions and how clean surroundings have helped with thinking about food safety	Parent has learned food safety from observing hygienic practices at functions	Food safety knowledge	"if I'm correct but just by observation you know you go for a function, you see how they're doing the food, how they're preparing it and me being a person who prepares food, I would have ideas to do things differently because I'm very particular as I go somewhere, it's very difficult

			for me to eat food until I see the place is clean" Participant 5
Food is served immediately after cooking as a safety concern	Parent eats food immediately after cooking as a food safety practice	current food safety practices	"And then at school, they cook, immediately they cook they serve" Participant 6
Hygiene is on parent's mind because of their parent who works at medical institution	Parent is mindful of hygiene due to their own parent's influence of hygiene	current food safety practices	"I usually do think about it because like my mom she works from [Hospital name] where the hygiene thing is usually observed so she usually So she usually encourages me to observe the hygiene rules" Participant 7
Covers food as food safety practice	Parent covers food to prevent flies and debris from falling into food	current food safety practices	"When I finish cooking, I usually put a lid on the food so that dirt (all kinds of dirt) doesn't go in the food" Participant 8
Is mindful of food temperature to prevent food safety issues	Parent understands how temperature can impact safety of food	current food safety practices	"In the morning, I usually pack drinks for him but around 11, I'm going to cook for him so that the food is hot and not cold" Participant 8
Avoids cooked foods when away from home Does not cook often, allows children to cook	Parent does not cook often but allows children to cook. Parent also avoids foods that are cooked when outside home	current food safety practices	"Normally When I'm out of home, especially when I'm in town, I don't eat those cooked food. Normally I just take drinks. I'll just get a bottle of coca cola or a Fanta I drink but I normally don't eat this cooked food because I am scared of the same" Participant 11
Parent separates packed foods to avoid spoilage	Parent separates foods to avoid cross contamination and spoilage	current food safety practices/ food safety knowledge	"Normally if it's rice, I will separate the rice and the tomato. Because normally, tomato will go bad easily. So I pack different, in different lunch boxes" Participant 11

Avoids buying food outside the home Is main food handler at home along with daughter	Parent avoids buying foods when eating outside home. Parent is main food handler along with daughter	gender as impacting food safety/ current food safety practice	"Like when I'm in town I don't usually buy food anyhow and I would rather buy a bottle of water. I drink that so then I come home and prepare food and eat." Participant 14
Has house help to do the cooking. House help washes hands before cooking and boils drinking water	Parent is not the only food handler in household. Has house help to do the cooking and boil drinking water	Food safety knowledge/ current food safety practices/ handling food	"They [house help] do they wash their hands preparing food. And they also boil the water before using it to cook or drink. And they also wash the dishes" Participant 15
Usually, only packs rice as packed meal for child and cooks it on school premises	Parent works at same school that child goes to and cooks rice on school premises to prevent spoilage	current food safety practices/ food safety knowledge/ food handling	"I pack rice and cook it here at school. For the other child, I give them money to buy food" Participant 17
Is concerned about traceability of food items and water. Prefers to drink water that is labelled	Parent is aware of dangers of consuming foods from unknown sources and so prefers to drink water from known manufacturers	Food safety knowledge/ current food safety practices	"I wash [the fruits]. Even the water which I buy, it's better you know the what, where it is coming from. For example, there are a lot of these labels which have come. So it's better you buy the one which is known" Participant 18
Smells foods to determine if they are safe for consumption	Parent conducts smell-test on foods to determine safety	Food safety knowledge/ current food safety practices/ handling food	"For home, I usually do the smell test and also like try to find out how long that thing has been in the fridge because sometimes I'm not really at home most of the time" Participant 20
Food related coursework may be seen as too feminine for male students	Parent believes food related courses are viewed as too feminine	gender and food safety/ curriculum	"...because it's a boy's school. I think in Zambia boys tend not to be encouraged to take home-economic nutrition classes. They are more likely to take science and these other subjects for men" Participant 3

Wife and daughter prepare most meals	Parent does not usually participate in food preparation as wife and daughter do most of the cooking	gender and food safety	"My wife and daughter prepare the meals" Participant 3
Wife packs food for school going children. Wife practices food safety for packed foods. Wife packs foods that won't easily spoil	Wife participates in majority of food handling and packs foods for children that won't easily spoil		"Yes, I know [that wife practices hygiene]. She [wife] packs food that won't get rotten." Participant 10
Does not choose classes for child because of lack of choice.The school offers standard coursework School did not offer parent's preference for classes	Parent did not have options in what classes to enroll child because school offers standard classes	curriculum and food safety	"For the one in grade 10, I think he didn't have much option because he was at the same school as at [name of school] Seminary. So at the same school for the junior secondary school, so the only two streams. So either you go into this one or go into the other stream so the administration that side decided to where the child goes but we were asked us to confirm whether those are the subjects we wanted the child to take." Participant 3
Students learn different types of foods at school	Curriculum covers types of foods	curriculum and food safety	"They teach them the different types of food like [in] science. They teach them about protective, energy giving and bodybuilding foods But we have no choice of saying what class to take.." Participant 4
School does not offer food related classes. Parent would love to enroll children in food related courses. Class choice is	Parent would prefer to enroll child(ren) in food related classes, but current school does not offer this option	curriculum and food safety	I think if there was a choice, I would love them to learn what they, the school is offering in terms of cooking." Participant 5. "The one who's in secondary right now is doing "pures" so there's nothing like that and

dependent on the school.			then the primary level they do them because at primary it's compulsory." Participant 18
Daughter follows food safety guidelines and is enrolled in home economics course	Daughter is enrolled in home economics course which offers food safety lessons	curriculum and food safety	"She is in nutrition. She is doing what do you call it, home economics, yes. So when she is preparing foods, I make sure I am there to see that Hygiene is being observed as she is preparing food, knowing that anytime if she makes any mistake, you can get sick." Participant 14
School provides facilities to practice handwashing before meals and encourages eating food from known sources	School encourages food safety by eating food from known sources and handwashing before meals	curriculum and food safety	"..Even the buckets, when you go to school, you are going to find the back. They keep on washing their hands before eating, even after a break, they are not supposed to get food from any how." Participant 18
COVID impacted food safety practices COVID solidified need for proactive food safety measures	Parent believes COVID has impacted why parent practices food safety and has encouraged proactive food safety measures	covid	"That particular incident [of working in community impacted by COVID] just made me realize that people are very needful for someone to be proactive about food safety, or handwashing and other measures" Participant 2
Cholera outbreak near home has prompted concern for food safety. Parent now encourages child to practice food safety	cholera outbreak in parent's community has prompted food safety and now parent encourages child to practice food safety	cholera / parental influence	we have and we have learned a lot. Even where I stay near, there's a ka-compound. The children were getting sick of Cholera so I always warn my child not to eat the food from the vendors who sell on the street and wash fruits before eating even if it's a guava he plucks from the tree I tell him he should wash it." Participant 6

Has encountered food safety information because of cholera	Parent has encountered food safety information because of cholera	cholera / food safety information	"Yes we have heard [information on cholera]. So we usually stop them from playing in the dirt, eating cold food but eating hot food" Participant 8
Cholera has encouraged hygiene (in the kitchen)	Parent believes cholera has informed hygienic practices in their own kitchen	cholera	"We do it normally because they know that we had cholera recently. So we had these other diseases. So they have to keep the place clean as they are cooking" Participant 11. "Hygiene is our daily life because you know that if we don't keep ourselves safe we may suffer from cholera or any other disease. So that's a daily routine. Whenever we wake up we make sure that our place is clean, to avoid getting contaminated diseases" Participant 10
Lack of negative personal experience with food safety issues has prevented learning food safety	Parent believes their lack of negative experience with food has prevented learning food safety	lack of food safety knowledge/lack of information	"I've never been affected directly by the recent Cholera outbreak, but even in COVID, I think during that crisis, that when it was brought to my sense that it's so important." Participant 2 "One is lack of information. We don't know a lot about the same precautions to take if a child has a challenge…You don't know what to do" Participant 4. "In Zambia it's not for that, for people some they are just selling things we don't know where they are preparing them from and people are busy buying. So it's not, people, they need to be educated. They have to be educated, it's not that they know much

			about food hygiene" Participant 11
Has experienced severe foodborne illness	Parent has experienced foodborne illness	experience/ food safety knowledge	"I was sick after eating some vegetables" Participant 12 "I ate something and then I went to the clinic." Participant 16. "At first we just used the remedy at home We used leaves for guavas, Guavas, yes, that's what we did Then after some time we went to the clinic and they just gave us a Panadol [for food related sickness]" Participant 18
Food intolerance has changed eating habits in the home	Food intolerance in the home has impacted eating habits	eating habits/ food allergies or intolerances	"It's a challenge. You know, restriction of what to cook. If I cook this, this one may not eat. This is what may happen to this one may get sick." Participant 4
Child has allergies to sardines	Child is allergic to sardines	food allergies	"Actually, the last one is kind of allergic to you know capenta, the sardine. Yeah so every time I give her she develops a rash" Participant 5. "The child got sick after eating something and he got a rash. Yes, and then we took him to the clinic and then they said it was food allergy" Participant 6
Difficulty in policing what kids eat at school	Parent has no control over what child eats at school	parental influence	"They're cooking at school, it's a bit comfortable than everybody's bringing food from home and we're going to sit and eat. So you become a bit uncomfortable but at the same time you can't really say don't participate because it's going to be like you know

			they'll be very uncomfortable." Participant 5. "I can't always call the teacher and find out the information behind it. I'll say there isn't much information on issues of safety, especially for us with kids." Participant 1

Note. Some code categories overlap and are denoted with "/" to indicate overlap. Table includes used codes in data analysis.

APPENDIX C. Alignment of Research Questions with Literature and Interview Questions

Literature	Proposition	Research questions	Interview question and Food Safety Construct
Raza et al. (2020),	Several studies have focused on what school children know about food safety and not so much what parents know, particularly in the Zambian context. There are different food environments for children of which parents may or may not inform food safety knowledge. For young children [in kindergarten], it is significant to investigate parental involvement, influence, knowledge, and beliefs related to food safety as young children may not be able to express food safety knowledge on their own. Even older children may not make food related decisions on their own. There are many forces that impact food safety knowledge, one major force is allergies.	What do parents know about food safety? What forces have impacted this knowledge (or lack of it)?	Have you or your child ever gotten sick from consuming food? If so, describe your experience and how you delt with the illness (symptoms, hospital visits, etc.) *Food safety construct: cook, clean, separate , chill* How often do you think about food safety when you prepare food (storing food properly, washing hands, cleaning utensils, cooking at proper temperatures, allergies, packing snacks, etc.) *Food safety construct: cook, clean, separate , chill* Do any of your school-age children have allergies? If so, how has this influenced your food relationship/precautions you take in your home? *Food safety construct: separate* Describe any experiences you have had that have helped you learn about food safety (your own parents involving you in food prep, any experience with allergies, getting food poisoning, etc) *Food safety construct: cook, clean, separate , chill*

			Describe any experiences you have had that have prevented you from learning about food safety *Food safety construct: cook, clean, separate , chill*
"**External food environments** are the retail and commercial markets, schools, and informal vendors where consumers interface with food, and reflect aspects of availability, food price, marketing and advertising, and vendor and product properties (e.g., vendor hours, food offered, etc.) **Personal food environments** are the individual and household-level factors that consumers bring to the food environment, such as purchasing power, access, convenience, desirability, and informs why people choose to procure the foods that they do" (Raza et al., 2020 p. 3) "Parent focus groups described the current food preparation activities performed by their children, explored perceptions of their middle school children's food safety knowledge and practices, described the importance they placed on their children	External and personal food environments can also inform what parents know about food safety. Homes (personal food environments) have been identified as the site of applying food safety (Byrd-Bredbenner et al, 2013).	What do the personal and external food environments of parents look like regarding food safety?	How often do you eat in a restaurant? Describe any steps you take before eating your meal. *Food safety construct: clean* How often do you eat homecooked meals? Describe any safety steps you take before and during meal preparation and consumption. *Food safety construct: cook, clean, separate, chill* Describe any food safety related steps you take when packing a meal or snacks for your children (packing food with icepack, handwashing, reading food labels for allergies, etc) *Food safety construct: cook, clean, separate, chill* Are you the primary food preparer (cooking or storing of food) in your home? If so, do you involve your child in preparing food? Why or why not? *Food safety construct: cook, chill* Do any of your school-age children have allergies? If so,

learning about food safety, identified barriers to middle school children receiving and implementing safe food-handling behaviors, and determined strategies to overcome these barriers" (Byrd-Bredbenner et al , 2010, p.20)			how has this influenced your food relationship/precautions you take in your home? *Food safety construct: clean, separate*
"Influencers are the more immediate and individual-level factors that determine the extent to which a determinant contributes or fails to contribute to delivering nutritious, safe, affordable, and sustainable diets" (Raza et al., 2020, p. 3) "Although not all youth said they had been taught how to prevent food poisoning, those who had been taught most commonly learned from family (for example, parents, grandparents) and school (for example, health, home economics class), with a few learning from television (for example, cooking shows) and extracurricular activities (for example, Boy Scouts)" (Byrd-Bredbenner et al, 2010, p.22)	School children may encounter a variety of opportunities to learn food safety, not just from parents. For purposes of this study, the focus will be on parents as sources of food safety knowledge. In the Zambian context, definitions of nutrition include food safety.	In what ways do parents attempt to influence their children's food safety behavior(s) or knowledge?	What influence do you have over the classes and type of classes that your child is taking? Do they choose classes, or do you suggest them? What other things influence your school-age children's decision making when it comes to food and food related course work? Are you the primary food preparer (cooking or storing of food) in your home? If so, do you involve your child in preparing food? Why or why not? *Food safety construct: cook, clean, separate , chill*

"Coupling an education-based approach with a family or household-based intervention that addresses access to and control over economic and food resources may be more constructive for improving nutritional outcomes for adolescents and their children. Additionally, nutrition-related education interventions moving forward should consider more extensive formative work and human-centered design approaches for developing complementary interventions to educational approaches" (Hewett et al., 2020, p. 12)			

Note. Food safety constructs in italics

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