**UNIVERSITY OF EDUCATION, WINNEBA**

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**DEPARTMENT OF HOSPITALITY AND TOURISM EDUCATION**

# FOOD SAFETY PRACTICES AMONG FOOD VENDORS: A COMPARATIVE STUDY BETWEEN ST. LOUIS COLLEGE OF EDUCATION AND OPOKU WARE SENIOR HIGH SCHOOL

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**OCTOBER, 2021**

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## DECLARATION

I, **FAUSTINA BUSUMBRU**, hereby declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole for another degree elsewhere.

SIGNATURE …….

DATE:……..

**SUPERVISOR'S DECLARATION:**

I hereby declare that the preparation and presentation of this work was supervised by me in accordance with the guidelines for the supervision of thesis laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: **DR. GILBERT OWIAH SAMPSON**

SIGNATURE …….

DATE:……..

# DEDICATION

This thesis is dedicated to all the ones who made a difference in the execution of this work.

## ACKNOWLEDGEMENT

In accomplishing this task, I have been greatly indebted to so many people without whose assistance could ever have achieved this feat. I want to seize this opportunity to thank Dr. Gilbert Owiah Sampson, Dean Faculty of Vocational Education and my supervisor for his patience, guidance, constructive criticisms and useful suggestions which helped me to make this project work successful. God bless you.

I am highly indebted to all the vendors in St. Louis College of Education and Opoku Ware School in the Kumasi metropolis for the provision of most of the information I needed to make this project work a success. My deepest thanks go to my family and loved ones for their priceless support, assistance and encouragement throughout this work.

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## ABSTRACT

Food safety activities among food vendors remain a crucial problem for people, food corporations and food control authorities in both industrialized and developing countries. One therefore has a strong conviction that there is a need for a thorough study into the phenomenon of food poisoning in schools caused by food vendors to validate the claim that mortality incidence among the school going youth has a correlation with their food intake on school premises. A comparative review of food safety practices between food suppliers at St. Louis College of Education and Opoku Ware School was the key objective of the report to evaluate food storage pratices adopted by food vendors. Exploratory and descriptive research designs were used. A population of 200 food vendors from St. Louis College of Education and Opoku Ware School, a total of 104 vendors were purposively sampled to participate in the study. Interview guide and questionnaire was the data collection instrument used. It was revealed that vendors at St. Louis College of Education demonstrated better food safety practices than food vendors at Opoku Ware School and they also had better health outlook of themselves when it comes to hygiene. It was discovered that, foodstorage practices adopted by vendors contributes about 48% at St. Louis College of Education compared to 14% at Opoku Ware Senior High School. Also, about 57% of food vendors at Opoku Ware School had more knowledge on food safety than their counterpart at St. Louis College of Education who had 22%. It was recommended that the Ghana Education Service and school authorities should organize training for food vendors in all educational institutions. It was also recommended that GES establish a requirement for food vendors operating in all educational institutions to receive periodic training on food safety and do regular medical checks up and reviews. It was concluded that school authorities particularly Opoku Ware School should ensure that much attention is given to the quality of foodstuffs procured for food preparation for the students

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

Healthy food is a basic human right and leads to health, growth and a forum for economic change and poverty alleviation. Food protection though is an increasingly important public health problem to avoid and or monitor foodborne diseases. Food-borne infections cover a wide variety of diseases and are responsible for major morbidity and global mortality (Bari, & Yeasmin, 2018; Waltner-Toews, 2019; Rohr et al., 2019). In response to the increasing number of foodborne diseases, governments globally strengthen their efforts to improve food safety (Gizaw et al., 2014). Thus, food safety remains a public health issue worldwide because foodborne pathogens are widespread. Thus, patrons are gradually worried about food safety.

The global spread of infectious disease is difficult to estimate; however, it has been recorded that thousands of people, mostly students, die every year from foodborne diseases (Gizaw et al., 2014). The World Health Organization (WHO, 2010) reports that about 1.8 million school children die each year from diseases such as diarrhoea, most of which are caused by the ingestion of polluted water and food. The social and economic burden correlated with food-borne diseases is increasing globally (Waltner-Toews, 2019). Tagiyeva (2020) indicates that eating away from home could lead to an increased risk of developing a food-borne illness.

The basic human need, as pointed out by WHO (2013), is access to adequate and safe food. It is essential to make the world free from hunger and poverty (World Health Organization, 2013). Food protection is a significant global challenge with foreign trade and public health implications (Ghana Health Service, 2012). Foodborne diseases in schools have been

identified globally owing to poor levels of hygiene (Adolf & Azis, 2012; Nhlapo et al., 2014) and have an effect on children's health, academic success, development and potential well-being.

The global burden of foodborne diseases has been calculated by WHO and estimates that one in ten people get sick of food poisoning and so 0. 42 million dies per year (WHO, 2015). A high risk group from microbiological contamination was identified as salad and leafy green vegetables such as lettuce, cucumber, tomato, radish, carrot, cabbage and spinach. Fresh produce is more likely to cause food-borne disease outbreaks in the future (Stine et al., 2011; Mritunjay & Kumar, 2015).

Given the growing number of foodborne diseases, policymakers across the globe are intensifying efforts to enhance food protection and have taken steps to that purpose. The International Health Assemblies approved a resolution asking for greater focus on food protection from the World Health Organisation (WHO, 2012). Food-related diseases are a concern of public health in both developed and development countries (Stroheker et al., 2017). Therefore, food protection is of major significance not just for customers but also for legislative agencies, as well as for the food industry (Fatima et al., 2019).

Food-borne diseases are illnesses and unfounded tracts triggered by food or drinks, which include toxic microbes, fungi, viruses or chemicals, according to the National Digestive Clearing-House. Moreover, resistance in multi-drug foodborne microorganisms has made the food safety situation in public health more fragile (Khairuzzaman et al, 2014). Mohammadzadeh-Aghdash et al., (2018) estimated that each year 325,000 injured individuals were hospitalized, 5,000 of whom died in 76 million US cases of disease. The literature released by the Kingdom of Saudi Arabia, the Ministry of Health, recorded 1,647 food-borne

diseases in 2013. In another 2011 review, 255 cases of foodborne disease were reported to trigger 2066 diseases.

The occurrence of foodborne diseases is sometimes due to unsafe storage of food products at home (Redmond & Griffith, 2009). Food handling errors may occur during food planning, manufacturing, packing, storage and distribution (Dehghan et al, 2017. Studies suggest that where good food preservation and food processing procedures are used, food-borne disease may be avoided (Al-Shabib, Mosilhey, & Husain, 2016). Food protection awareness and behaviors among university students have recently been examined. The research found that the status, awareness and approach to food protection and hygiene were positively associated (Powell, Jacob & Chapman, 2011).

Akabanda et al., (2017) and Bredin et al., (2016) confirmed that more than 50 percent of students in Turkey are not conscious of the protection of testing internal food temperature to decide if meat is adequately cooked. Around 30 million people suffer from foodborne diseases per year in Bangladesh (FAO, 2012). 544 teens had salmonella food toxicity in France in 2010, while 11,200 in Germany were infected by norovirus in several hundred schools in 2012 (Marzono & Balzaretti, 2013). Food is an essential aspect of existence, yet it may trigger sickness and even death if polluted. Food can be polluted from outside or also in the food itself by poisonous compounds. According to Salas (2011), Ghana has 5.8 million food toxicity figures per year.

These outbreaks lead to hospitalization and mortality of the infected persons. Annor & Baiden (2011) also assessed the awareness of hygiene among food processors in Ghana's hotels and identified a link between training for food hygiene and knowledge of food hygiene by workers. Ashanti Food vendors are confirmed to be enteric pathogen carriers, the Salmonella (Feglo and Sakyi, 2012) with most trends that do not relate poor nutritional

hygiene to diseases. According to Osei & Duker (2008), while Ghana accounted for 2700 cholera incidents, Kumasi was among the most affected in the area of Ashanti.

Food-borne diseases can only be avoided by multi-faceted actions of all players engaged in food development, distribution, and control and planning (Antony, 2017). Though the Ministry of Health (MOH) has stated that in 2007 (MOH, 2007), 1348 children in the regional capital Accra suffered from food toxicity alone the reporting culture (WHO,2012) and lack of knowledge from different areas are not accessible. Nevertheless, Malm, et al., (2015) affirmed inadequate food scarcity installations in the schools concerned and there is a shortage of protocols to avoid repeated foodborne diseases in schools in Ghana.

Food poisoning incidents primarily from Ghana's, most of which happened in second cycle institutions (Ababio & Lovatt, 2015). In most of the country's secondary school kitchens, sanitation facilities are identified as poor, and matrons are stated not to consider their activities risky for students (Afoakwa, 2005). This lack of incentive to develop hygiene programs and practice implies possibly poor monitoring of the country's law enforcement system, as suggested by WHO (2012) and Dwomfour-Asare (2015).

### 1.2 Statement of the Problem

Undoubtedly, human survival is highly dependent on proper food intake because of the Complex nature of the human body. For optimal health care and vitality, an individual needs qualitative food devoid of any pathogens. In view of this, the need for food protection and food preservation becomes paramount in all spheres of human existence. The preparation and distribution of food at times becomes an unfortunate platform to engender debilitating health and safety issues for humans of all walks of life. Of utmost concern, food served in educational institutions by private food vendors has been

Observed to be fertile grounds for the spread of avoidable infections thereby creating the need for extra care and attention in food preparation and serving. It has been observed by several authorities on food hygiene that many sicknesses affecting young learners in Ghanaian and African schools emanate from unorthodox food production and preservation approaches leaving in its wake unpalatable consequences. Children in Africa normally undergo many outbreak of diarrhoea annually and around 800,000 children die annually from diarrhoea and dehydration (Esena & Owusu, 2013).This situation is very much unacceptable therefore the need for a change in the status quo.It is therefore an imperative that scientific research approaches are adopted by academia to help forestall the grave situation where food vendors unconsciously become major conduit of food-borne illnesses that are prevalent on the compounds of educational institutions especially the basic and second cycle institution. The practices of some food vendors seem to give rise to the several food outbreaks seen in most schools in Ghana and other West African countries. A situation that requires quick

Reversal, the third mortality cause far from blame when we come to consider the underpinning agents of poor food protection.

Food safety activities among food vendors remain a crucial problem for people, food corporations and food control authorities in both industrialized and developing countries (Osaili et al, 2018; Smigic et al, 2016). One therefore has a strong conviction that there is a

need for a thorough study into the phenomenon of food poisoning in schools caused by food vendors to validate the claim that mortality incidence among the school going youth has a correlation with their food intake on school premises. It is a truism that in developing countries like Ghana, food-borne diseases are increasing on account of lack of proper food management techniques among food vendors particularly in educational institutions where

food safety and healthy standards in personal care and food preparation are underestimated to aid the spread of pathogens from food vendors to patrons (Wambui et al, 2017).

### 1.3 Purpose of the Study

A comparative review of food safety practices between food suppliers at St. Louis College of Education and Opoku Ware School is the key objective of the report.

### 1.4 Specific Objectives

The specific objectives of the study were:

1. To examine the food safety knowledge level of food vendors at St. Louis College of Education and Opoku Ware School.
2. To identify the factors that influences the selection of food stuffs by food vendors at St. Louis College of Education and Opoku Ware School.
3. To compare food safety practices among food vendors at St. Louis College of Education and Opoku Ware School.
4. To assess personal hygiene of food vendors at St. Louis College of Education and Opoku Ware School.
5. To evaluate food storage practices adopted by food vendors at St. Louis College of Education and Opoku Ware School.

### 1.5 Research Questions

1. What is the knowledge level of food vendors at St. Louis College of Education and Opoku Ware School?
2. What factors influences the selection of food stuffs by food vendors at St. Louis College of Education and Opoku Ware School?

3. What are the food safety practices among food vendors at St. Louis College of Education and Opoku Ware School?
4. What is the personal hygiene of food vendors at St. Louis College of Education and Opoku Ware School?
5. How does the food vendors at St. Louis College of Education and Opoku Ware school store food? Food Vendor's knowledge levels significantly affect Food Safety

**1.7 Significance of the Study**

It is critical that the awareness, attitudes and storage of food safety and general food safety activities of food suppliers be evaluated in Kumasi. Therefore, this analysis is an effort to investigate the processes and conditions of food suppliers at St. Louis College and Opoku Ware School. In these analyses, differences in food safety and/or hygiene standards may be identified between food providers in order to promote the implementation of more explicit and efficient services for those classes. Students' confidence and regulatory oversight in healthy food transactions should be realized accordingly and the adverse impact of food poisoning on students reduced.

The belief maintained that most food suppliers pose a health risk to employers will also doubt the willingness of food suppliers to prepare healthy food. In view of the crucial contribution of food suppliers in many students in Ghana towards the economy and food safety and nutrition, facts from the present study can be encouraging of policy regulatory authorities as well as of approaches to healthy food production by vendors. It will support the government's policies to ensure that the food sold to students and others is nutritious and of excellent quality.

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The willingness of food vendors to prepare healthy food may also be doubtful, considering the impression that most food vendors pose a health danger to their patrons. In view of the crucial contribution that food vendors make to the economy and food security/nutrition of many students in Ghana, evidence produced by the current study can enable regulators to establish policies and approaches to healthy food production by vendors. It will support the agenda of the Government to ensure that food supplied to students and other individuals is healthy and of outstanding quality.

## 1.8 Delimitation

This study was restricted to the Kumasi Metropolitan area in terms of study participants. It was restricted to food vendors only in educational institutions; hence the findings could not be generalized to all schools in Ghana. Study has been performed in Kumasi since it is beyond the researcher's scope. It is also one of the cities in Ghana where most vendors operate in school canteens, and a lot of them cook food for students.

## 1.9 Limitation of the Study

There are some obstacles that the researcher has encountered in carrying out this report. A significant weakness arose during the acquisition of data from both institutions. Another drawback was the lack of reliable data on the food-borne outbreak in Ghana. This lack of statistics hindered the researcher's capacity to explain the current food safety situation in Ghana and especially in the Kumasi metropolis.

In comparison, most of the respondents were less literate; this indicates that some of the respondents were unable to read or write. This made it impossible for respondents to have the correct details. The high expense of carrying out the study was also a significant restriction. Transport, internet and printing of study materials are financially taxing in Ghana. The researcher may incur a high expense to employ a data collection research assistant.

## 1.10 Definition of Terms

**Canteen:** It is a spot where meals can be served and enjoyed, where various snacks and beverage items are available. A school uses a canteen to fulfill its students' nutritious and health needs in order for them to have the ability to do the job they do on a regular basis.

**Cross-contamination**: Refers to the transition from one food component to another of germs. Due to interaction with cooked food and infected hands and appliances, it happens mostly in

the kitchen. There are many illnesses that Hands can introduce. For starters, Hepatitis A may be introduced by food handlers who are themselves contaminated by unwashed hands.

**FDA:** Food and Drug Authority

**Food hygiene:** It refers to the steps and procedures required to ensure the consistency of food safety from the first stage (production) to the final stage (production) (consumption). Food hygiene at any level of the food safety line may be an indication of food pollution.

**Food safety:** It is a general word that includes multiple terms, such as the handling, storage and preparation of food to avoid or control pathogens linked to unsafe food protection and to include a nutritious diet that protects the health of the population. Food safety is known as the degree of confidence that food does not damage or disease consumers (Hassan & Dimassi, 2017).

**Food-borne disease:** Any disease originating from the ingestion of infected food, pathogenic bacteria, food-contaminating viruses or parasites, as well as pesticides or environmental toxins such as poisonous mushrooms.

**Food handler**: Any person personally touching prepared or unpackaged food, food tools and utensils or food contact surfaces is a person who is required to comply with the standards for food hygiene.

**Food laws**: involves a broad variety of food laws and related rules governing the way we prepare, deliver, distribute and eat food. It may also be defined as a regulatory act banning any food substance from being adulterated or misbranded (Webster dictionary, 2014)**.**

**HACCP:** (Hazard Analysis and Critical Control Point). It is a system which recognizes, assesses and controls a danger that is critical for the safety of food. It is a method of food protection that prohibits the safety of food being threatened. Companies manufacturing or selling food are required by law to comply with existing hygiene regulations and to act according to HACCP guidelines.

**KATH:** Komfo Anokye Teaching Hospital

**Organoleptic:** It is the sensory properties of a certain food or chemical, the taste, scent and feel of the color.

**Sanitation**: It is the hygienic way of health promotion by avoiding human interaction with the threat of waste as well as by handling and properly disposing of wastewater from sewage.

**USDA**: United States Donor Agency

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

According to Thomé et al., (2016), the fundamental purpose of the literature review of a thesis is to include a framework for the analysis; to explain the study; to ensure that the analysis has not been carried out beforehand to assess where the study falls into the current body of knowledge; to enable the researcher to benefit from prior theory on the topic; to demonstrate how the subject has been previously investigated; As a consequence, this chapter discusses similar research on food protection policies in educational institutions. The analysis would consist of an empiric, conceptual as well as a theoretical review and a conceptual structure used in the research.

## 2.2 Food-Borne Diseases and Illnesses

Contaminated food has been considered to be a primary cause of disease in human cultures since ancient times. Food-borne illnesses are also among the most prevalent health threats in today's world (Mohammad et al., 2018). Both rich and poor countries have major health burdens, varying from moderate illnesses to fatal diseases (Rohr et al., 2019; Bari & Yeasmin, 2018; Newell et al., 2010). However, the burden of foodborne disease is not clearly established at global, regional or national level (WHO Food Safety, 2010).

The burden of foodborne illness is hampered by the reality that only few pathogens can be definitively related to food safety. Sometimes these comparisons are created only during disease conditions (Hoelzer et al., 2018; Rivas et al., 2015). However, the extent of the issue is indefinite, since foodborne pathogens sometimes go ignored or underreported. Latest

figures of 1.8 million fatalities suggest just the tip of the iceberg (see Gibb et al., 2015). Research on the burden of acute gastroenteritis offers the foundation for determining diet-related burdens and correct pathogens often spread through food (Forsythe, 2020; Ali, 2015).

While gastrointestinal diseases are not always foodborne and foodborne diseases do not necessarily trigger gastroenteritis, food is a crucial vector for gastroenteritis-causing pathogens (Waite & Yousef, 2010; Flint et al., 2005). FAO reports that up to 70% of diarrhoea disorders in developed countries are thought to be food-borne. The World Health Organisation (WHO) agrees that food-borne diseases include a broad variety of diseases that are a rising threat to public health worldwide and are major contributors to illness, impaired nutritional status, decreased disease tolerance and loss of productivity (Rohr et al., 2019; Hoelzer et al., 2018; WHO Food Safety, 2010).

The globalization of food delivery chains posed novel food protection issues and led to the global public health problem of foodborne diseases (Waltner-Toews, 2019; Hoelzer et al., 2018; King et al., 2017). This is attributed to the growing industrialization as well as the trade of food goods, accelerated urbanization linked to expanded food preparation and/or use outside the home, as well as the advent of novel or antibiotic-resistant pathogens and food vehicles (WHO Food Safety, 2010). The severity of the problem needs to be assessed in order to implement and continue measures to avoid foodborne diseases at both national and international level.

Because most diarrhoeal infections are resolved within 24 to 48 hours without any medical treatment, most food-based illnesses are not diagnosed and related food-borne disease outbreaks are also not reported (Newell et al., 2010; Flint et al., 2005). Food-borne illness has since been a global health issue and a major source of decreased economic development. Such food poisoning agents correlated with food include Bacillus cereus, Escherichia coli,

Salmonella, Clostridium perfringens, Staphylococcus aureus, Vibrio cholera, Listeria monocytogenes, and campylobacter jejuni, among others (Noor et al., 2019; Gourama, 2020; Hernández-Cortez et al., 2017; Bintsis, 2017; Khan et al., 2016; McCurdy, 2006).

These pathogens are widely contained in undercooked meat and poultry, uncooked tomatoes, unwashed fruits and vegetables, unpasteurized milk, soil and water, among others ( Burkhart, 2019). Staphylococcus aureus, usually referred to as staph, is typically contained in the hands and nose, intestines, and raw wounds and sores of humans. Staph bacteria are considered to be one of the most important sources of skin infections (Sergelidis & Angelidis, 2017; Andersen et al., 2015). Foodborne viral pathogens are also responsible for multiple diseases in humans. Viruses vary from bacteria and parasites that cause comparable diseases (Kirk et al., 2015; Newell et al., 2010). They are spread to humans by feeding through actual or indirect contamination of food.

The most frequent symptoms correlated with these infections vary from moderate diarrhea to extreme pain and diarrhea. Other frequent signs include fatigue, fever, chills, body aches, vomiting, stomach and abdominal cramps, lack of appetite, double vision, and jaundice anorexia (Singh et al., 2019; Ünüvar, 2018). Feed toxins are inserted into food at a variety of points along the journey from the field to the plate. The problem of food mishandling plays a major role in the prevalence of foodborne illness.

Mlay (2018) infers that nearly 97% of all foodborne diseases in most food production outlets are attributed to inadequate food handling by vendors. There is a wealth of legislation in Ghana, as in a number of countries in the African region, but minimal funding to control food security. The organizations, including the Ghana Standards Authority and the Committee on Food and Drugs, are committed to food standards compliance and to educating the general public on food safety issues.

However, the change of food protection infrastructure has not been completely understood and this can be seen in recent cases of foodborne illness and/or infection of food with enteric bacteria in different sections of the world (Feglo & Sakyi, 2012). The most prevalent food-borne diseases in Ghana include typhoid, cholera and diarrhoea. Foodborne pathogens have been reported as the fourth largest source of malaria disease (Akabanda et al., 2017; Osei-Tutu & Anto, 2016; Ababio & Lovatt, 2015; Feglo & Sakyi, 2012).

Contaminated food is a common vehicle for these foodborne diseases, and infections can be spread from contaminated surfaces, food or even hands contaminated by bacteria in the gastrointestinal tract (Todd et al., 2009; Sousa, 2008). Numerous outbreaks in Ghana have been recorded. Low nutritional status reduces people, especially children, who are vulnerable to foodborne illness, particularly food sold in urban schools in developing countries (Esena & Owusu, 2013). However, there are main variables that could contribute to the vulnerability of foodborne diseases, such as age.

Given that there are more than 250 types of food-borne illnesses, most of them may be avoided if such measures are taken. Employing proper personal hygiene, preparing food carefully, and maintaining it at the correct temperature during usage and storage are recommendations that must be followed (Rohr et al., 2019; Bari & Yeasmin, 2018) While any and all are at risk of food-borne illness, certain people are at higher risk than others, particularly infants, and those with weakened immune systems.

### 2.3 Food Vendors

Numerous studies have attempted to examine the attributes of food vendors and have discovered that food vendors do not form a homogenous cluster, but vary according to various socio-economic as well as demographic criteria (Campbell, 2011). Regarding the mode of vending, vendors can be roughly grouped into stationary and ambulatory (Johnston,

2017). Stationary food vendors, who peddled their merchandises from small stalls, kiosks, and so on, are the predominant category in most countries (Campbell, 2011). Ambulatory food vendors denote those that push carts around vending their food. Most food vendors operate from nominated strategic locations, including schools.

The general belief is that most food suppliers, such as colleges, prefer to focus more on urban areas. It is often believed that food vendors are not known for healthy food handling due to their lack of knowledge (Alamo-Tonelada et al., 2018; Nurudeen et al., 2014; Campbell, 2011). As a consequence, the food is cooked and sold in accordance with the environment; food is viewed as a significant public health concern.

### 2.4 Food Safety

The type, seriousness and degree of food safety concerns differ and rely on the case (de Freitas et al., 2019; Waite & Yousef, 2010). Foods are the essential building blocks of living beings, including humans, but in certain cases they can pose threats and become dangerous to human health. As a consequence of the food they consume, numerous individuals worldwide get sick. These food-related diseases are known as food-borne diseases which occur from unhealthy microorganisms. Food may become toxic to human health or even lethal when mixed with microbes, molds, viruses, pests and/or chemical toxins (Forsythe, 2020; Alamo-Tonelada et al., 2018; King et al., 2017).

As a consequence, it is undoubtedly important for patrons to be supplied with a healthy food source. Factors implicated in the possible danger presented by food include unsuitable farming methods, inadequate sanitation at different levels of the food chain, lack of precautionary controls during manufacturing as well as food preparation, inappropriate usage of chemical products, polluted raw materials, food and water as well as improper storage (Gourama, 2020; Mlay, 2018; Campbell, 2011; WHO, 2003). These problems have been

divided into three (3) key groups of food safety, personal hygiene of food handlers and kitchen sanitation.

### 2.4.1 Food Hygiene

Several causes undermine food safety (Uçar et al., 2016). Food Hygiene is adversely determined by the procurement of stale food, by storing food in unsuitable conditions, by cooking vast amounts of food to be processed in unsuitable environments, by storing both raw and cooked food together and cooking, and by storing food using improper techniques (Walsh & Leva, 2019; Uçar et al., 2016). If food is infected in all levels depending on its temperature, humidity and pH values of the environment under which it is stored, the processing and hygiene of the food is compromised. The diet is often possibly detrimental to human wellbeing.

Infection attributable to the ingestion of infected food or water is considered contaminated food (Gupta, 2017). Sources of food poisoning include viruses, microorganisms, pollutants, naturally occurring food contaminants, fish toxins, naturally occurring metabolic diseases, allergic reactions and toxic substances (Wyatt, 2012; Sanlier, 2009). The foodborne pathogens Salmonella, Campylobacter and Enterohemorrhagic Escherichia coli infect millions of individuals each year. Fever, weakness, stomach pressure, vomiting, intestinal pain and diarrhea are signs of food poisoning caused by these infections.

While bacteria typically cause food poisoning, certain parasites and viruses can also be causes. Staphylococcus aureus, Clostridium perfringens, Campylobacter and Bacillus, Salmonella cereus are the most widespread microbes that cause food poisoning (Razei et al., 2017; Granum & Lindbäck, 2012). Improper handling and preparation can lead to contamination if food is cooked at home, in an eatery or in a supermarket. Common causes of food poisoning include not thorough washing of hands, use of utensils or sliced dishes,

causing cross-contamination, eating food that was not stored or cooked at a right temperature, especially meat and poultry, eating raw fish products and eating raw products that were not sufficiently clean.

Prevention of contamination includes control measures at all levels of the food chain, from farm development to food manufacturing and/or preparation. Infections induced by microorganisms are mostly the product of inadequate hygiene of the individual responsible for cooking the food (Gallo et al., 2020; Lund, 2019). This microorganism may be easily reproduced in temperatures below the safe ranges set out in the food protection regulations. Cooked food must not be stored for longer than a few hours at room temperature. This food should be cooled quickly and kept refrigerated; ideally at temperatures below 5°C, because the microorganism will replicate very quickly at room temperature (Hamad, 2012). Temperatures below 5°C and over 60°C enable the replication of microorganisms to delay or end.

### 2.4.2 Personal Hygiene of Food Handlers

One of the most critical periods of the food chain is the food processing phase, and those responsible for carrying out the roles involved at this point are responsible for preventing cases of food poisoning (Abd Lataf Dora-Liyana et al., 2018; Rossi et al., 2017; Ismail et al., 2016). Food handling firms must include stable employees who do not have any illnesses and must be open to daily medical check-ups. In addition, in order to remain safe, it is also important for food handlers to take particular care of their personal hygiene and to have appropriate food handling behaviour (Ebenezer, 2020).

This is particularly essential because food handlers may cause cross-contamination between raw and cooked food, and can endanger food safety through inadequate food preparation, cooking and storage (Hardiah et al., 2020). Zeb et al., (2020) infer that food-borne diseases

are caused by food tainted by food-processing hands. It should be remembered that food staff have a huge effect on public health. Personal hygiene habits of food handlers are a crucial element in the prevention of foodborne illnesses or food poisoning (Al Mamun et al., 2019; Rossi et al., 2017).

Appropriate personal hygiene is well understood to be the safest way to reduce the risks associated with the infection of many of the bacteria generally known to be responsible for foodborne diseases. Things affecting food production and food hygiene staff are generally categorized as health condition, sickness and disability, personal cleanliness and personal behavior (Rahman et al., 2016). Individuals with any illness that can trigger food poison or individuals considered to be hosts may not be able to touch food. The physician must assess food handlers that have some signs connected to infections.

Normal microbiological tests of food handlers are not widely advised in the WHO consulting report, but if food handlers suffer from a disease that involves symptoms such as jaundice, diarrhea, headache, cough, skin rash, skin injury, sore neck, boils or wounds, food intended for the public will not be authorized to be handled (Lee et al., 2017; Ismail et al., 2016). Studies have since found that health care units include food preparation sites and that workers should report their diseases.

Nyamari (2013) submits that the safety procedures to be practiced by food handlers would require accurate obedience to personal hygiene standards and the wearing of different, safe garments such as caps and gloves to better maintain their hygiene. These garments must be washed and taken care of regularly (Lee et al., 2017; Rahman et al., 2016). Studies such as Gallo et al., (2020) showed the food fails personal hygiene handlers is among the activities that have led to foodborne diseases. As a consequence, thorough hand washing is the most commonly ignored procedure. The practice of inappropriate hand washing (Sani & Siow, 2014) can be a key factor in the transmission of food-borne diseases by cross-contamination.

Ayçiçek et al., (2004) took samples of bare hands and hands with gloves during the preparation process and observed that the load of bacteria in bare hands was considerably higher than that of hands with gloves was the most common bacterium to be identified. Aureus, Bacillus, Ecolis (14/180). Furthermore, studies revealed that food handlers were not cautious enough to wash their hands correctly and carry safety clothing such as gloves, caps and socks (Pragle et al., 2007; Green et al., 2007).

Terms and conditions where food handlers must wash their hands before food processing begins; prior to handling clean equipment and unpackaged food; before serving food and touching clean utensils and equipment; before cooking raw food to avoid food ready-to-eat from becoming infected during the food preparation; after touching every part of the body; (Insfran-Rivarola et al., 2020; Rossi et al., 2017; Soares et al., 2013).

The remaining things are used after the kitchen is left and after the dishes are cleaned, after hitting the fridge handle, door or some other place commonly utilized in food storage, after touching clothes, before and after accessing places where food is cooked and processed and after handling cash and gloves have been worn (Insfran-Rivarola et al., 2020; Rossi et al., 2017; Soares et al., 2013).

Washing hands and wrists with soap under clean flowing sea, finger-rubbing; using a nail pin on clean nails; rubbing arms and wrists with soap and water; hand-rubbing with soap for ten to fifteen seconds; wiping hands with hot air or paper towel and shutting off tap with a towel (Adane et al., 2018; Reboucas et al., 2018; (Suen et al., 2019; Gammon & Hunt, 2019; Ataee et al., 2017; Scott & Herbold, 2010).

Studies such as Margas et al., (2013) have shown that, of all types of hand dryers, drying methods, pose the highest risk of infection, as hand dryers are less than the ideal replacement for hand dryers after being cleaned, because these technologies enable bacteria to disperse.

Paper towel usage must also be promoted instead (Uçar et al., 2016). Overall, human beings are the main cause of food poisoning; pose a danger to food safety as carriers.

Potential causes of infection may be established along with various external influences, including paws, accessories, clothes, hair and moustache, and derived factors internally such as breathing, wounds and spitting (Uçar et al., 2016). It has been known that food processors have been able to disperse approximately 10,000 to 100,000 microorganisms per minute (Marriott et al., 2018; Lau et al., 2016). Food handlers must also stop such habits at the manufacturing center, such as smoking, sneezing, laughing, chewing and feeding. They do not carry accessories, such as watches or hairpins, while preparing food for public consumption.

### 2.4.3 Kitchen Sanitation

Kitchen sanitation is another important concern in providing food protection. As Uçar et al., (2016) has pointed out to mitigate foodborne diseases in the manufacturing and distribution of food, it is important to eliminate the risk of contamination in the positioning, arrangement and decking of kitchen utensils, to set up an area in such a way that it is prepared for inspection, cleaning and disinfection, repair and to ensure that surfaces and materials are placed.

The sanitation plan is thus important in every food service preparation region as it guarantees that all surfaces are washed regularly and eliminates the possibility of bacteria or other contaminants being moved from the unclean surface to the clean kitchen equipment (Uçar et al., 2016; Darko et al., 2015). Matters pertaining to kitchen hygiene should be discussed well before the completion of the kitchen building. The plan, as well as the interior design of the kitchen, must be arranged in such a way as to encourage appropriate hygiene practices,

including safety against cross-contamination (Alamo-Tonelada et al., 2018; Uçar et al., 2016; Nurudeen et al., 2014).

The kitchen must be built of sturdy products that are simple to clean and easy to care for. These tools must be clear of any contaminants that could cause food unsuitable for consumption, such as pathogens, or raw materials, pathogenic microorganisms and pollutants, food components and other food-producing compounds that have been contaminated by foreign substances (Mlay, 2018; Abd Lataf Dora-Liyana et al., 2018; Lee et al., 2017). Surfaces must be constructed in such a way that they do not absorb soil, prevent foreign substances from contaminating food, and do not cause thick liquids or molds to be formed (Park & Kim, 2016).

Pests, as per Uçar et al., (2016) must be prohibited from accessing food production areas. Drainage should be simple to clean and avoid pests, including mice from accessing and liquids from re-entering the kitchen area (Ababio & Lovatt, 2015; Boxman, 2014). Warnings must be registered and hung on the walls as to the laws that food handlers must comply by and the proper sanitation measures to be accomplished. Dressing rooms that consist of a wide number of lockers to carry both work and civilian clothes may be required for food handlers.

Ventilation devices must be capable of removing smoke, gases, particles and evaporation, maintaining heat inside and preventing water, debris and pests from entering. Filters and other structural elements should be readily available for washing or modification purposes (Kumari & Kapur, 2018; Boxman, 2014). The kitchen must have natural or artificial lighting equal to the day's natural light and must not adversely affect the output or consistency of the food by the scale and color of the lamps. At food storage sites, regular control of humidity and temperature must be carried out.

In order to maintain the kitchen hygienic, continuous disinfection and cleaning steps are as critical as the configuration of the kitchen. As a consequence, disinfection and cleaning schedule for the kitchen should be established and all cleaning and disinfection procedures should be carried out and reported in compliance with this plan. Food managers must be qualified in the cleaning and disinfection of the kitchen (Scott & Herbold, 2010). Equipment that comes into daily contact with food must be constructed of material that can be quickly washed and disinfected, rust resistant and non-toxic. The equipment shall be arranged in such a way as to allow it and the area surrounding it to be properly cleaned. When chemicals must be used to disinfect the facilities, the guidelines for the usage of such chemicals should be followed (Alamo-Tonelada et al., 2018; Uçar et al., 2016; Nurudeen et al., 2014).

### 2.4.4 The Significance of Food Safety

Food is an important aspect of life, but if it is polluted, it may cause disease, or even death, and food can be contaminated with poisonous chemicals from outside or also in food itself. Food protection has been a big issue in the hospitality industry. In the grounds of this, they maintain a hygienic atmosphere and the food is healthy, which makes them exempt from pollution (Mcswane et al., 2004). It also offers customers with nutritious products while it ensures fair hygienic quality operating procedures. It helps to have positive protection in the event of a legal case against institutions so they are aware of daily tests on incoming and outgoing materials for the management of activities. It promotes revenue and patronage.

Recently, the desire for healthier food by customers is on the rise; thus, people are searching for a food joint that delivers nutritious food, and therefore prefer to market their commodity to them as a consequence of good food hygiene. The sponsors have faith in the industry. Customers like their food handlers and gain faith in them as they feed from them because they realize they're serving healthy food. It projects a healthy body image that represents the

personality of food managers as it maintains a balanced lifestyle for both the family and the city. Washing the face and hands with soap and water every day helps avoid skin infections, diarrhoea-related diseases such as cholera and dysentery. It also assists in the prevention of avian influenza (bird flu). It is ideal for bleeding conditions.

### 2.5 Purchasing and Storage of Food

According to the American Society for Nutrition (2012), purchasing food from local farmers raises a variety of obstacles, including perceived nutrition, expense and affordability of local goods, food protection and accountability issues, and shortage of qualified labor in food preparation. Certain food elements, such as beef, poultry, eggs, fish, everyday goods and a mix of chilled meals, such as tuna and lettuce, should be carefully picked. This food rich in protein and water are at risk of bacterial infection and, due to their structure, are suitable for promoting bacterial development (Brown, 2005). Brown also stated that another important element in the selection of food products had to do with the general physical characteristics of the commodity. As mentioned above, high-risk items such as raw meat, fruit and vegetables, as well as poultry are typically bought in a chilled or frozen condition.

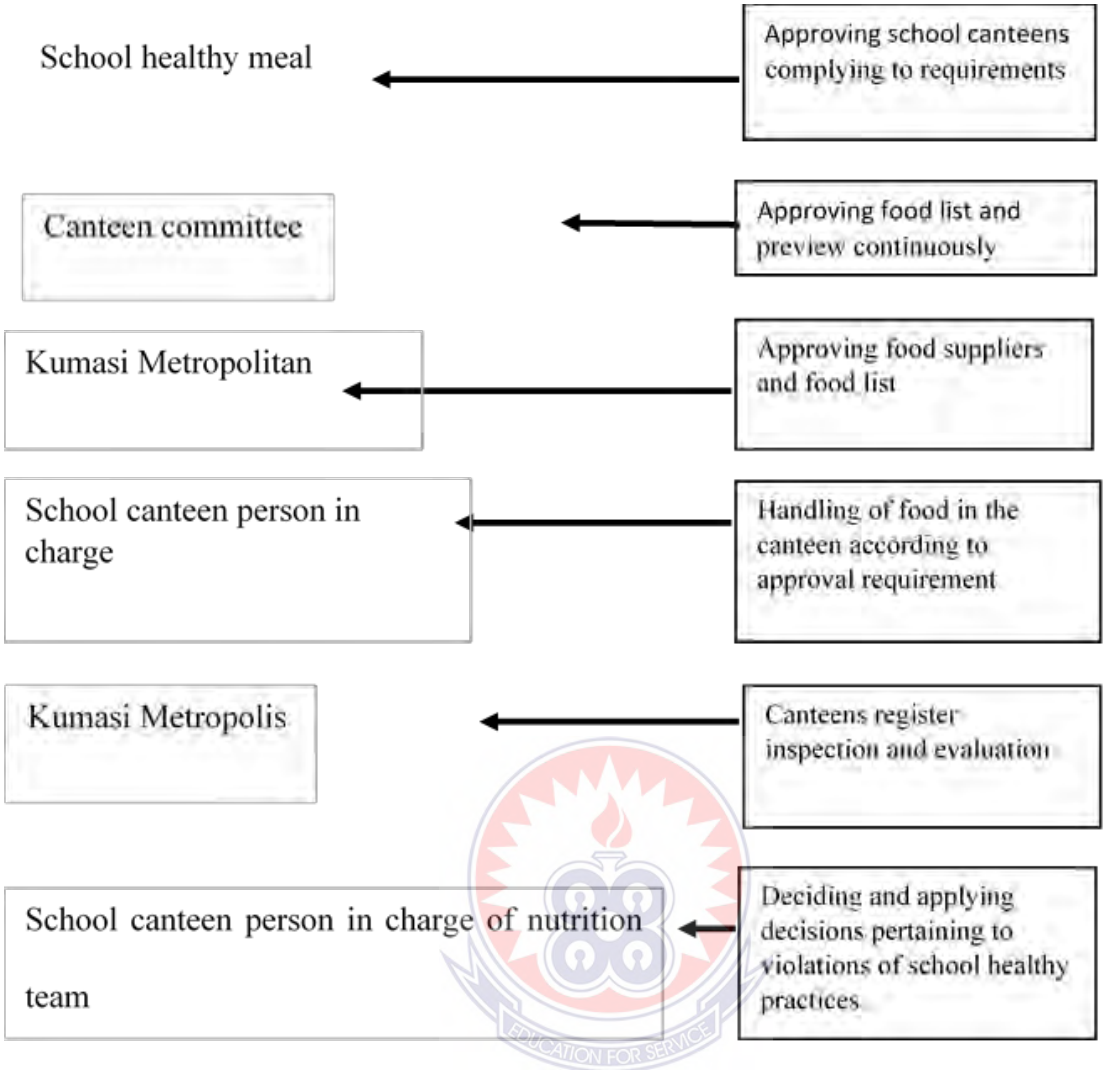
If these cold temperatures are to be preserved, the transport period should be as minimal as practicable and the products shipped in an enclosed cool container. In this way, the development of pathogenic spoilage bacteria can be reduced. However, most of Kumasi's cooks purchase food from renowned food vendors. Food is transported in buses, vans and even in their pockets. Cooks may equate sales across online, wholesale and contract processes to guarantee the most cost-effective and consistent supply. They should prepare basic but complete food item specifics and definitions needed to include information such as scale, nature, consistency, and variety and food safety requirements.

A structured purchasing plan should be defined by the individual responsible for ordering food and supplies in order to maintain a sufficient supply of products to satisfy output requirements (Food Service Manual, 2012). On the other side, cooks in second-cycle schools in Kumasi have insufficient storage facilities required to store perishable food such as fruit and vegetables. In order to ensure that food supplies are processed in the correct location, appropriate storage facilities must be given in the kitchen. Storing food properly can help improve its consistency in such a manner that it can be healthy to consume dried products such as sugar and starch, and proper food safety calls for it to be stored in airtight containers that are clean and dry.

### 2.5.1 Cleaning and Sanitation

Institutions must understand the value of the sanitation officers and the operations carried out during the sanitation process. The sanitation projects should provide full management assistance, including adequate resources for workers, facilities, instruction and materials, visual evaluation (organoleptic assessment), and third-party evaluations of the sanitation programme. Cleaning and sanitation on time with staff touch surfaces that are not regularly washed and sanitized. Kitchen appliances and dustbins must be washed and sanitized regularly. The work area shall conform to the cleanroom principle, and the design standards of the USDA, the FDA and other organizations.

The cleanroom definition implies that establishments can create and retain standard operating procedures for the removal of cross-contamination amongst ready-to-eat items for microbial contamination. Cooks can, as far as practical, guarantee that purchases are purchased from the correct outlets (Codex Alimentarius, 2009). The accompanying map demonstrates the recommended protocol to be practiced to provide students with nutritious and balanced meals.




Source: Fieldwork, 2020

**2.6 Definition of Food Laws**

Food laws are laws passed by particular authorities within a government to preserve public health, provide customers with knowledge, protect against bribery, maintain fair trading practices and protect the environment (Ghana Standards Board, 1992). The goal of the food legislation is to guarantee a high degree of human existence and health security, taking into consideration the protection of animal health and wellbeing, plant health and the climate (General principles of food safety, 2002).

Food control can be described as a mandated regulatory operation, according to the Food and Drug Organization (2011), for the enforcement by national or local authorities of food laws and regulations in order to provide consumer protection and ensure that all food is lawful, nutritious and humane for the planning, handling, transportation, manufacturing and distributor; compliance with safety & quality control. Food control requires administration of food control, food legislation, regulations and guidelines.

### 2.6.1 Food Laws in Ghana

The Food and Drugs Act of Ghana (PNDCL 305B) and Amendment Act 523 aim to ensure that only nutritious and stable foods, medications and other substances are made accessible for public use. Food processing and sales are regulated by food standards developed and enforced by the Ministry of Health's Ghana Food and Drugs Boards. To regulate food safety, there are rules and by-laws. For its compliance, the Metropolitan Medical Officer has the vested control. The Ghana Authority for Standards, the Ministries of Agriculture and Commerce, and the Customs and Excise Ministry are all interested in food protection. Some of the laws in Ghana as seen below;

1. Prohibition against the sale of unwholesome food
    a. A person commits an offence if that person sells or offers for sale of food: -
        i. Which has a toxic or dangerous material in or on it
        ii. This is unhealthy or unsuitable for human or animal consumption.
        iii. It consists of a dirty, putrid, rotting, decomposed or diseased substance, in whole or in part.
        iv. That is harmful to the health of
        v. This is not the essence, content or consistencies of the norms prescribe.
2. Standards of foods; where a standard is prescribed under an enactment for food, a person who manufactures, labels, packages, sells or advertises food in a manner that

the food is likely to be mistaken for food of the prescribed standard, commits an offence.

3. Prohibition against the sale of poor-quality food:
    i. An offence is committed by a person who sells to the detriment of a customer a food that is not of the sort, content or consistency of the item purchased by the buyer.
    ii. It is not a disobedience of the crime referred to in paragraph 1 to argue that the customer was not prejudiced on the basis that the food was obtained for research or for reasons other than consumption.
4. Sale of food under unsanitary conditions
    i. An offence is committed by a person who buys, packs shipments, delivers, shops or shows some product for sale under unsanitary conditions.
    ii. Food shall be prepared and shipped in such a way that its structure, consistency and integrity are maintained and the dissipation of its nutritional properties from the environment and all other degrading conditions shall be reduced.
5. Closure of premises
    i. On Authority, the Minister shall order the closing of any premises where food is processed, cooked or sold; where the Authority has cause to suspect that food is exposed to the risk of contamination, the Ministry may in the circumstances of the situation make a further order necessary (Food and Drugs Act, 1992).

## 2.7 Food Safety Systems

To advance the applicability and regulation of food safety, efficient food control systems are required. The most widely used globally licensed food safety systems are currently the ISO 22000, HACCP, and PAS 220 systems.

### 2.7.1 Hazard Analysis and Critical Control Points (HACCP)

The American Pillsbury Company first hired HACCP in the 1960s to develop 'zero defect' goods for the US Army and NASA. It started to be used as a reference point of official regulation by the Food and Drug Administration (FDA) in the 1970s (Uçar et al., 2016). It was approved in 1992 by the Codex Alimentarius Commission and published for the first time as an international HACCP standard. It has also been utilized by the food sector to protect and manage the threats of emerging dangers that could endanger food protection (Pierson, 2012).

HACCP initially had three guiding principles: the detection and evaluation of food product-related dangers, the identification of critical control points for the control of identified hazards, and the development of a critical control point surveillance scheme. The HACCP has five (5) preliminary measures, as it is used today, and is regulated by seven (7) rules. The preliminary measures were established by Codex and should be completed before the seven (7) HACCP concepts are introduced.

The initial measures help to ensure the introduction and maintenance of the HACCP framework in the most productive way possible (Mortimore & Wallace, 2013). For any organization working inside the food chain, no matter how large, the HAACP scheme is appropriate. In the implementation process, complex preliminary condition systems would help the HACCP framework. The necessities of this provisional condition method must now

be followed by an organization dealing with implementing this framework. Global laws, standards of conduct or other prerequisites for food protection include provisional condition systems.

Overall, provisional condition programs cover factories and machinery, workforce preparation, hygiene and sanitation, chemical control repair, waste management, collection and transport (Pierson, 2012). The five beginning phases involve the assembly of the HACCP team; product description; recognition of the planned use; development of the flow diagram; and on-site flow diagram validation. While the HACCP framework's seven (7) standards include the conduct of a threat analysis; the selection of essential control points; the setting of critical limits for each CCP; the development of a reporting system for each CCP; the establishment of corrective actions; the establishment of verification protocols and the establishment of recording and record keeping. HACCP is an internationally recognized framework and this system must be adopted by companies within the food industry in most countries.

### 2.7.2 ISO 22000

The International Organization for Standardization (ISO) released a standard known as ISO 22000 in 2005 for the Food Protection Management Framework (Uçar et al., 2016). An amalgamation of provisional condition programs is the ISO 22000 system; the HACCP concepts and implementation measures established by the basic components of Commission on Codex Alimentarius, and ISO 9001:2000. It began to be used in more than 50 countries just two years after it was discovered (Surak, 2007).

The primary approach of the ISO 22000 specification is to incorporate a prevention mechanism that prevents consumers from foodborne diseases. This norm, along with amenities, staff and machinery, governs all the processes in the food chain. In industries, the

applications of the Food Safety Management System involve manufacturing control, product control, machinery control, repair, general hygiene procedures, personnel and visitor hygiene, transport, storage, product details, preparation, supply selection and assessment, coordination and other related concerns (Arvanitoyannis, 2009).

The key purpose of this requirement is to provide a mechanism in place to monitor the adverse hazards that can result from process failures and to maintain the quality of the product and the well-being of the customer. Supervision of food protection of commodity, architecture, development and quality management decides the possible hazards and eradicates them (Uçar et al., 2016). ISO 22000's core function is not only to maintain food protection, but also to increase the sensory and nutritional consistency of food. It also plays a vital function in the quality safety of food processing service activities. In addition, by creating a more practical usage of capital to improve efficiency, this standard helps minimize operating costs and thereby guides the organization to a method of total consistency (Surak, 2007).

### 2.7.3. PAS 220 (Publicly Available Specification)

In collaboration with the Food and Drink Companies Confederation of (CIAA), this specification was developed by the major global food suppliers with the goal of eradicating the shortcomings of the ISO 22000 food protection framework standard. The PAS 220 norm, which strengthens the preliminary conditions systems, was collectively released by Nestle, Unilever, Danone and Kraft, the sector representatives, commonly recognized as 'G4' (Uçar et al., 2016). The basic PAS 220 is applicable to all company groups and was made accessible in 2008. The PAS 220 specifications are projected to be used in accordance with the globally agreed ISO 22000 standards (Boisrobert et al., 2009).

The ten sub-titles in the ISO 22000 standard were illustrated by the content and themes of PAS 220 and added 5 of their own, resulting in the following 15 things (Boisrobert et al., 2009):

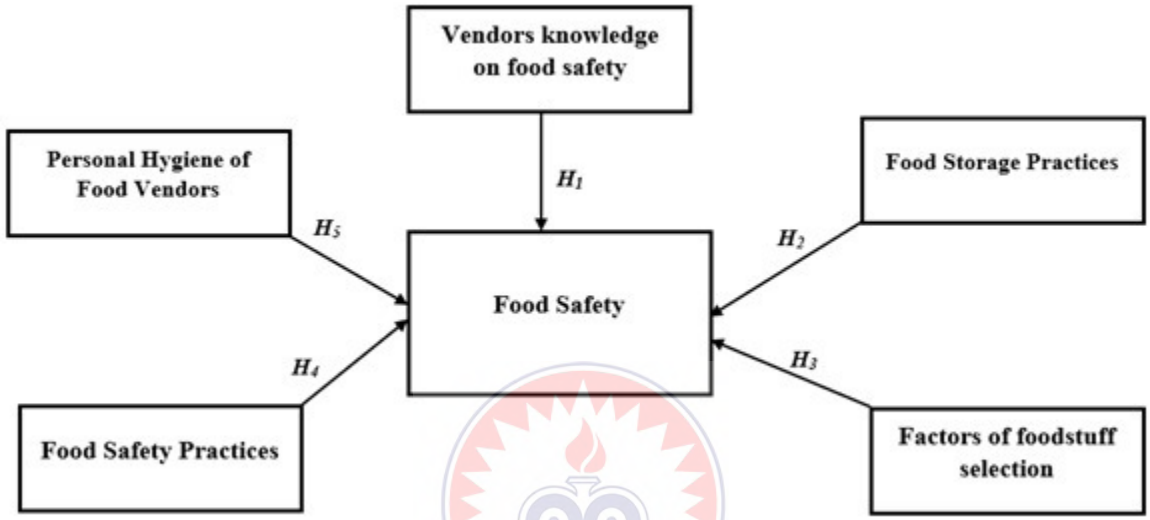
1. Buildings structure and placement
2. Workplace placement, houses and their wings
3. Plants helping (air, water, energy)
4. Support services for waste and sewage, including
5. Adequacy, cleaning and preventive treatment of the appliances
6. Control of products bought
7. Against cross-contamination controls
8. Sanitation and Washing
9. Regulation of pests
10. Hygiene of employees and lodgings of workers
11. Re-processing processes
12. Procedures of product recall
13. Storage
14. Informing customers about goods
15. Protection of foods, biodefense and bioterrorism

Food protection, as defined by Uçar et al., (2016), ultimately deals with the ingestion process, where the presence and level of food hazards are of primary concern. It is a crucial imperative to conform to stringent monitoring measures across the food chain, provided that threats to food safety will arise at every point of the chain. Consequently, the duty to guarantee food quality is felt by all participating in the food chain. Numerous considerations are included in the construction of food protection schemes.

Therefore, legislation and guidelines shall set minimum sanitation requirements, food suppliers must apply food safety controls and measures and regulated agencies must monitor and audit food companies to ensure they perform their activities in a compliant with the regulations in effect. Cases of food poisoning that endanger public health around the world

occur as a result of food pollution at multiple levels, from processing to food consumption. While the risk factors for food protection seem to be easy to monitor in theory, research and recent procedures show that in practice there is always a long way to go (Uçar et al., 2016).

**Fig. 2.1 Conceptual Framework**




Source: fieldwork 2020

## 2.8 Hypotheses Development

The current study looked to conduct a comparative analysis of food safety between food vendors at St. Louis College of Education and Opoku Ware School. All these literatures have researched into the variable. The relationships established in the framework were hypothesized as follows;

## 2.9 Empirical Literature Review

### 2.9.1. Food Vendor's knowledge levels significantly affect Food Safety.

Tannus, Barbosa, & Silva (2016) food protection awareness and procedures is researched by food handlers, head chefs and administrators in Salvador, Brazil's hotel restaurants. This research concluded that the food handlers of the restaurants of the hotels have reasonable standards of expertise, behaviors and self-reported activities. The degree of awareness about the measures used in hand-washing however was unsatisfactory for most respondents, and some self-reported activities pose a food safety danger.

In addition, the average metric achieved across the checklist at the assessment or in compliance was poor, and most of the restaurants had no appropriate facility design (layout) to follow reasonable hand hygiene practices. Most handlers have earned instruction in food protection and personal hygiene; nevertheless, some training needs to be recycled since most of them have not engaged in training in the last six months.

Nevertheless, the role of the nutritionists in restaurants greatly affected the implementation of the new regulations in restaurants, as well as the engagement of the handlers in school, demonstrating the development of a healthy atmosphere among food handlers. The level of expertise of the chefs and managers of restaurants was unsatisfactory, while most reported receiving food safety training. It is noted that part of the organization and oversight duty of the restaurants had little understanding of the regulations implemented in the establishments and did not adequately conceptualize the HACCP system. The level of expertise of the chefs and managers of restaurants was unsatisfactory, while most reported receiving food safety training.

In institutional food services, Sousa et al., (2016) analyzed food safety awareness, positive bias and evaluation of risk among food handlers. The outcome revealed the features of the participants' training courses on safe food handling procedures. Participants recorded that they enrolled in an average of 19.1 (26.3) training courses and that around 8.5 (15.6) months ago, the last training course was finished.

The high observed standard deviation was impacted by the training course program of the company, with 52 percent of companies delivering training courses more regularly (quarterly, monthly, fortnightly and weekly). In general, in the office, 95% of handlers earned instruction. The duration of training courses is not required by Brazilian law (Brasil, 2004b), explaining instead that food handlers should be trained annually and authorizing the organization to assess this frequency. The semi-annual course frequency has contributed to an improvement in the expertise of school and hospital food handlers (Da Cunha et al., 2014b).

There has also been a strong incidence in other research of professional food handlers in some food facilities in Brazil, such as in hospitals (92.2 percent) (Ferreira et al., 2013) and schools (93.2 percent) (Da Cunha et al., 2012), where training courses are compulsory by law (Brasil, 2004b). The number of food handlers not trained in commercial restaurants in Brazil, on the other hand, is higher at 41.5 percent (Da Cunha et al., 2014b).

The average food protection awareness rating was 67 percent. There were no substantial variants of understanding between certified food managers (67.1 percent) and untrained food managers (61.8 percent) ($p=0.33$). This result is distinct from other studies since it reveals a close association between knowledge and planning (Al-Shabib, Mosilhey, & Husain, 2016; Pichler, Ziegler, Aldrian, & Allerberger, 2014). Unlike other food facilities, institutional food programs most certainly conform to health legislation.

The concerns that had several right answers were not the use of jewelry in food, not expired food, not the use of undercooked bovine food, and the need for food managers to be removed from direct interaction with food in situations of illness that could increase a specific risk of infection. Such results converge with those of Da Cunha et al., (2014b). Food handlers have been shown to have knowledge of any microbiological risks, but there are certain gaps in food protection knowledge.

The best method of sanitizing hands was connected to one question with a lower number of correct responses. As recommended by Brazilian statute, the handlers were unable to recognize the need to use a bactericidal agent to better disinfect their paws (Brasil, 2004b). The level of hand hygiene is usually poor in the foodservice (Green et al., 2005).

Thus, the incidence of FBD is raised by poor hand hygiene coupled with the low prevalence of this procedure. Another issue with a low percentage of right responses concerns the possibility of propagation of disease via the ice. Both in food or ice, microorganisms such as Vibrio cholera may restore their viability when food is thawed (Waturangi, Pradita, Linarta, & Banerjee, 2012). Awareness can inspire appropriate activities in the handling of food, according to Byrd-Bredbenner, Berning, Martin-Biggers, & Swift (2013).

The transformation of information into reality, however, is a dynamic operation (Liu et al., 2015). Information can be associated favourably with behaviours and activities, but on this subject, there is some controversy. Some experiments indicate that awareness, behaviours and activities have favourable associations (Abdul-Mutalib et al., 2012; Vo et al., 2015), although others reject this theory (Annor & Baiden, 2011; Da Cunha et al., 2014b).

The realistic and theoretical teaching model tends to be the most effective form of training (Lillquist, McCabe, & Church, 2005), but the potential obstacles that may conflict with appropriate production processes should be taken into consideration when preparing the

training: for example, social pressure (Clayton & Griffith, 2008), job overload, inadequate equipment, lack of content, lack of transparency (Clayton & Griffith, 2008) (Green et al., 2007; Pragle, Harding, & Mack, 2007).

There was a weak positive association (r= 0.17; p< 0.013) between the information score and the period of clinical experience. Again, the gap between the information score and the 'incomplete primary education' community standard of education (p ¼ 0.02) is seen. The degree of education may be a requirement for food handlers to be admitted, since the higher the level of education, the greater the level of competence (Annor & Baiden, 2011; Pichler et al., 2014.).

Kraemer & de Aguiar (2008) indicated that little progress is being made in structured preparation and the growth of food service skills for handlers. They mentioned in their research that skills are learned in food service learning, i.e., in this situation, the teaching is casual and at work.

The extent of expertise of food handlers has clashed with the style of foodservice management. Higher efficiency (8.11 ± 1.85) was demonstrated among those who served in self-managed food service institutions as in outsourced facilities (6.53 ± 1.68) ($p < 0.001$). It was also confirmed that self-managed companies' workers had three times more training in their enterprises than outsourced companies' employees. This can theoretically be due to the idea that through formal educational plans, self-managed organizations typically spend more in their workforce. This is only a theory, however, which should be verified.

In Lebanese homes, Hassan & Dimassi (2017) researched self-reported food protection awareness and activities of Lebanese food handlers. The comparatively low scores of information on food protection and self-reporting storing and handling activities reported by Lebanese food handlers in Lebanese households lead to a higher intake of hazardous food

products and thus a higher vulnerability to foodborne diseases. A large correlation between demographic details and awareness of food protection and self-reporting behaviours has been reported in the present research. The data collected from this study showed strong demand for various customer groups continuing education in food safety.

According to the decision tree report, food managers in Beirut, the north and south were the key groups of concern (failure rate 1⁄4 9.0 percent) for food safety information; food handlers aged 18-25 for self-reported food safety activities, both males (failure rate 1⁄4 50.9 percent) and females (failure rate 1⁄4 39.0 percent); and for overall food safety knowledge and practices, our research, on the other hand, analyzed self-reported awareness of food protection and self-reported behaviours. While explicit guidance on the value of authenticity, it is not feasible to fully eradicate the possibility that respondents may over-report preferred self-reported behaviours. In addition, the analysis focuses on food handlers, so the findings for the entire Lebanese community cannot be generalized. For further consistency, more research could reveal current activities.

Food protection skills, behaviors and activities of food handlers in restaurants in Kuwait were examined by Al-kandari, Al-abdeen, & Sidhu (2019). A description of the association between awareness with practice ($rs = 0.536$, $P < 0.05$), knowledge with attitudes ($rs = 0.407$, $P < 0.05$), practice with attitudes ($rs = 0.317$, $P < 0.05$), knowledge with training ($rs = 0.59$, $P < 0.05$), attitudes with training ($rs = 0.314$, $P < 0.05$) and attitudes with attitudes ($rs = 0.314$, $P < 0.05$) has been identified. In this analysis, Cohen (1988) used the benchmark impact size for the V value of Cramer, suggesting the following. Effect tiny = 0.1, effect moderate = 0.3, effect big = 0.5. The findings revealed that the degree of food safety expertise of food handlers has a significant influence on their food handling activities and attitudes.

Others whose studies also indicate a strong positive association between information, attitudes and behaviours, confirm these findings (Al-Shabib et al., 2016; Sani & Siow, 2014). Several reports have shown that the major risk factors for the largest prevalence of foodborne diseases worldwide are food handling/handlers defects (Osaili et al., 2017).

Therefore, one of the most important interventions for foodborne disease control is food safety instruction for food handlers (WHO, 2013). Some research, although others did not find correlations between awareness, behaviours and activities in food safety; and some demographic influences. An analysis by Ossaili et al., (2017), for instance, found no important ties between the score and income of food safety awareness, Level of education, age and previous courses in food safety.

Research by Lee et al., (2017), however, showed that people without advanced education performed better in knowledge tests than those with primary education (a finding backed by four other studies Key Lee et al., (2017), whereas with the focus on secondary education scored higher. Those of higher education had the most scorers. The study also observed a strong link between KAP scores and years of food service industry job experience (Key Lee et al., 2017).

Hiring staff with a lower educational and/or socio-economic context can decrease the effectiveness of food safety training, according to Zanin et al., (2017). A research by Dudeja et al., (2017) found out that teaching food handlers will lead to improving food safety and quality by using meaningful and oriented food safety materials. Therefore, it is important to provide food handlers with periodic training and to keep them constantly updated (Rebouças et al., 2017).

Nevertheless, preparation alone is also not enough, as many sources have shown (Zanin et al., 2017). While the research works of Pacholewicz et al., (2016) has shown that food handlers

have good food safety awareness about their roles, it did not always seem that they implement this expertise into practice and attitudes. Another research works found that 62% of the handlers of food frequently claimed they did not often follow all food safety procedures and 6% often confirmed that they did not follow all food safety procedures (Griffith & Redmond, 2009, pp. 518-543).

Workers sometimes had ample understanding of the values of food safety, but often they choose not to enforce them. This, however, rather than awareness, should be called a problem of mindset. The "mediator between knowledge and practice" is a mindset (Zanin et al., 2017). An optimistic outlook is an important element in the handler's translation of information into correct behaviours. This highlights the importance of attitude-based teaching as well as practical and theoretical experiences to ensure that the theoretical concepts are better applied (Zanin et al., 2017).

Several scholars have observed that managers, administrators and other functional staff have a crucial role to play in developing a culture of food safety within the plant and establishing conditions that can trigger behavioural improvement (Zanin et al., 2017). Within the context of food service, the culture of food safety is convergence of beliefs and attitudes with food safety, from administrators or owners to frontier employees" (Nyarugwe et al, 2019). A survey of food handlers in nursing homes showed that expectations of what other people felt they had to do were the most important factor for carrying out food safety activities, which gives more prominence to the various ways that other people can strongly evaluate beneficial habits (FSA, 2014).

Other forms of food safety mechanisms are also needed to help promote healthier behavioural attitudes on sanitation and food care (Zanin et al., 2017). Inspiration and self-efficiency can also be given to managers, assistants and coaches. Help and services to food processors are

important for the efficiency of training in food safety (Al-Shabib et al., 2016; Sani & Siow, 2014; Stedefeldt et al., 2015).

### 2.9.2 Food Safety Practices Of Food Vendors Significantly Affect Food Safety.

Yadav, Verma, & Kumar (2017) investigated rural women's experience of food grain storing activities in the district of Faizabad. Around 150 million tons of food grains are produced by India each year. Due to advances in industrial technologies, production has been gradually growing, but losses have stayed stagnant at 10 percent. There was maximum awareness about storage activities among rural women, i.e., 79 percent as a crucial factor affecting their purchasing decisions from a specific vendor. This study concluded that food grain losses are also rising as food production grows. Improper storing methods, high capital costs, and no incentives offered to farmers to cultivate properly dried grains are the factors behind this.

Tibaingana et al., (2018) researched storage activities and their effect on smallholder farmers: Uganda post-harvest study. The use of various forms of storage (sacks, granaries, pans, jerry-can, above the flames, and cribs) indicates the need to store maize for potential use (Odegard & van der Voet, 2014). This, therefore, leads small-scale farmers to damages (Tefera, 2012). In addition, farmers saw storage as an easy way to shield themselves from food and income insecurity. In order to resolve short and long financial hardship, they deem the maize crop to be their main cash crop. This was, however, jeopardized by inadequate storage. In comparison, there was no assistance from extension programs. Household storage is important, and smallholder farmers tend to store at the household level (Park, 2006).

The lack of sufficient storage has caused farmers to sell their maize directly after processing, often at low prices, thereby impacting revenue (Gitonga et al., 2015). Farmers will then only harvest more of their maize if household-level storage upgrades are addressed (Thamaga-Chitja et al., 2004). Adequate food storage means food consistency is preserved, thus

reducing food waste (Tefera et al., 2011). Therefore, it is possible to sell at a better price if storage will preserve efficiency, and this would provide more profits to smallholder farmers while maintaining food security at the same time. While construction and maintenance are relatively easy and inexpensive, conventional types of storage contribute to significant post-harvest losses for smallholder maize farmers in Uganda. The quantity and quality losses considerably decrease the maize available for selling, use and planting. This impacts smallholder maize farmers' profits and food security and ultimately erodes revenue.

Human milk handling and storing practices among mothers with peers who exchange milk, investigated by Reyes-foster et al., (2017). This study evaluated the security of milk care practices documented by a group of 321 parents participating in peer human milk sharing. We also developed an index of safe practices based on the ABM clinical guideline for safe speaking, protection and care of human milk for healthy-term infants.

The results demonstrate that peer donors and consumers of human milk report taking part in multiple good activities for milk handling. Participants recorded largely complying with the requirements set by the ABM for sanitation, storage, and heating. Our results, however also indicate more potential for progress among participants in milk-sharing, where instruction on milk-handling standards could be beneficial. The milk-sharing mothers in our sample reported engaging in activities comparable to or marginally safer than mothers studied in the U.S. as compared with national statistics. Survey on Child Feeding Methods (IFPS) (Labiner-Wolfe & Fein, 2013).

Human milk manipulation and storing among peer-milk-sharing mothers, investigated by Reyes-foster etc (2017). This study evaluated the security of milk care practices documented by a group of 321 parents participating in peer human milk sharing. We developed an index

of safety practices based on the ABM clinical guideline for safe expression, conservation and care of human milk for healthy children.

"While 48 percent of the mothers in our IFPS did not reported their pumping equipment sanitizing, or their equipment only sanitizing, each of 1 to 2 weeks, only 21.1 percent of the donor mothers in our sample answered 'every day or 'never.' In comparison to the IFPS poll, 12 percent of which reported microwave milk, none of our respondents reported microwave milk.

As a result, our sample reported engaging in behaviors that were similarly safe or greater than the IFPS culture as calculated by the general population results of the IFPS. Gribble's (2014b) risk management study offers a guide in an international survey involving 97 women participating in online peer milk sharing. Although Gribble has noted that hand washing has been reported to slightly surpass half of her sample before milk speech, 82.3% of donors in our research have reported hand washing before milk expression.

When the scales of acceptable actions were standardized such that donors and recipients were posed the same questions (washing hands, leaving milk at room temperature for fewer than 8 hours, freezing milk for less than 6 months, and transporting milk to ice), there was no difference in the mean scales for donors or recipients at $p < .05$. Our research did not assess the risk perception of peer milk sharing among respondents, but we found that donors reported engaging in largely safe milk speech and handling practices. Keim et al., (2013) analyzes the bacterial contamination in online milk purchased. Our findings show that our respondents have generally adhered to the protection standards.

The assumption that Keim et al., research used human milk exchanged online and that the vast majority of our respondents did not exchange milk for cash can explain this difference (Reyes-Foster et al., 2015). Steube, Gribble, & Palmquist (2014) argued that as far as tissue

donation is concerned, payment could increase risk (Wylie, 1993) and peer milk sharing should be viewed as a different phenomenon from the sale and buying of human milk, a stance adopted by the American Academy of Nursing in its position on peer milk sharing (2016). As such, while not benefit-driven, it is possible that the donors in our sample have generally adhered to safety practices. It is also possible that respondents may have been more likely than actual respondents to disclose idealized behaviors.

Manandhar et al., studied the definition of Smallholder Farmers' Post-harvest Grain Storage Practices in Developing Countries (2018). Smallholder farmers have a range of grain storage technologies available; each has different pros and cons. Traditional storage options, such as granary and polypropylene bags, are socially appropriate, convenient, require smallholder farmers to make minimal investments and avoid foreign insects, bugs and rodents from attacking crops.

However, they allow air and moisture to pass through the grain; thus, insects, pests and mold already present in the grain may expand and infest the grain during storage. Pesticide use could be useful in destroying insects already present in the grain. They are expensive, though and potentially dangerous to humans, which can make farmers socially unacceptable. In addition, the potency of pesticides and preservatives in grain storage could significantly decrease over time for grain stored for a longer period of time. During use, chemicals should be carefully regulated in order to be effective against pests and mold.

They still need to be re-applied periodically. Adulteration of chemicals and lack of awareness of proper chemical use by farmers could cause health risks and reduce the productivity of grain storage. Hermetic storage machinery limits the transfer of air and moisture to stored grain from the outside world, resulting in less oxygen and moisture in the storage system. This creates an unhealthy habitat for mosquitoes, rats and molds to grow and evolve, offering

efficient power. In addition, hermetic baggage technology is simple to use, requires low costs and is easily available to smallholder farmers. However, as they are susceptible to punctures from sharp spots, nuts, insects and rodents while transporting or storing food, the consistency of these bags is of major concern. Punctures in the bag may also be packed with grain, but there are also openings for air to enter the storage bag, which greatly decreases the storage space of the grain.

Compared to hermetic baggage technology, self-made silos are more durable as they are made from layers of metal or plastic sheets covered with grass and clay. However, the self-made silo is permanent and usually designed for outdoor use (Chigoverah, 2016). It cannot be moved from one position to another. Hermetic metal silos still achieve hermetic quality, and the grain stored in them has comparatively lower losses than most conventional forms of storage (De Groote et al., 2013). However, compared to other storage systems, metal silos are relatively costly, so smallholder farmers would require credit or subsidies to purchase these devices. The most important feature of grain storage systems is the capacity to store grain for a prolonged period of time, preferably several months, with minimal losses in grain quantity and quality.

Improved storage facilities suitable for smallholder farmers should be cheap, easy to manufacture, use and locally accessible for building materials. It should also ensure sufficient strength and longevity, so that it can be reused for many years to store grain safely and effectively. Although most smallholder farmers in developing countries prefer to store their grain in their living area to guarantee their protection, a better storage system for in-home use should be placed in place.

The initial cost of capital investment and the size of the facilities are main limitations on the introduction of storage mechanisms by smallholder farmers in developing economies. The

required grain storage solution should therefore fulfill the following specifications for these farmers: (1) adequate storage conditions for grain; (2) local market availability; (3) ease of location within residential units; and (4) ease of transport from one destination to the other. Such innovative form storage of grain can mitigate losses and maintain continuity in order to ensure food protection.

### 2.9.3 Selections of Food Stuffs by Vendors Significantly Affect Food Safety.

Al-shabib et al., (2016) studied a cross-sectional sample of male food handlers working in restaurants at King Saud University, Saudi Arabia, on food safety awareness, behaviour and practices. Table 3 provides a description of the associations between the stages of awareness, behaviours, activities, preparation and experience. For awareness with experience and preparation with mindset, no connection could be derived. A strong positive association was found between attitude, knowledge ($r2=0.371$, $p < 0.05$), preparation knowledge ($rs=0.107$, $p < 0.05$), personal hygiene knowledge ($r2=0.303$, $p < 0.05$), personal hygiene training ($rs=0.174$, $p < 0.05$) and personal hygiene attitudes ($rs$ 1⁄4 $0.173$, $p < 0.05$). Nevertheless, these similarities were significant and substantial, but there was not a really large correlation.

These results showed that the degree of understanding of food safety of food handlers would impact their behaviours and activities in the proper handling of food. These observations are in line with other research that has found a strong positive association between the three groups (Sani & Siow, 2014). This study shows that good awareness could contribute to the right attitude among the respective food handlers in food hygiene and sanitation. In comparison, awareness and temperament have indicated a significant association with the degree of work.

Research by Ansari-Lari et al., (2010) showed that awareness and attitude had a strong positive association. Research by Acikel et al., (2008) stated that awareness tends to change

behaviour when working on the use of jewellery. For the effectiveness of food safety preparation, management should offer inspiration and support to the workers involved in food handling.

Al-Shabib et al., (2016) reviewed a cross-sectional study of male food managers working in restaurants at King Saud University, Saudi Arabia, on food safety awareness, attitudes and activities. Table 3 offers an overview of the relations between the phases of perception, behavior, actions, planning and experience. No relation could be derived for knowledge with experience and planning with mind. There was a clear positive correlation between attitude knowledge ($r2=0.371$, $p<0.05$), planning knowledge ($rs=0.107$, $p<0.05$), personal hygiene knowledge ($r2=0.303$, $p<0.05$), personal hygiene instruction ($rs=0.174$, $p<0.05$) and personal hygiene attitudes (rs 1⁄4 0.173, $p<0.05$). However, these comparisons were significant and important, but there was not a very strong connection.

Several studies have shown that personal hygiene education alone is not adequate to instill and develop the hygiene habits and practices of food managers (Chang, Lee, & Kwak, 2003; Walker, Pritchard, & Forsythe, 2003); thus, it is necessary to provide hands-on guidance and resources and to set up daily training programs to strengthen the behaviors, expertise and skills of the Sanitation Act (Park et al., 2010).

In Lebanon's hospitals, Bou-mitri et al., (2018) looked at food safety abilities, attitudes and behaviors of food managers: cross-sectional research. The KAP model is useful to maintain the hygienic-sanitary quality of food. Food managers, armed with knowledge of food protection, are expected to change their actions and to improve their practices willingly (Bas et al., 2006). The overall mean percentage of KAP was fair in this study (75.42%) and marginally higher among respondents who had served in government hospitals for more than

21 years. Other qualities typical to food handlers and hospitals have not had a major effect on the overall ranking.

In comparison to the findings, the KAP score in the Jordanian hospital was higher among food handlers (87.9%) and did not differ between participants of differing degrees of experience. However, the KAP scores were marginally different ($p<0.05$) between women (90.0 per cent) and men (86.6) and increased with the level of education at which college (90.7) and university (92.1 per cent) participants rated higher than those at elementary (79.7 per cent) and secondary (86.2 per cent) ranks (Sharif et al., 2013). These results indicate that the overall KAP for food managers in Lebanese hospitals could be greatly improved by focusing on the length of work experience and the framework of institutional governance.

**2.9.4. Food Safety Practices by Vendors Significantly Affect Food Safety.**

Azanaw et al., (2019), a facility-based cross-sectional analysis, examined factors related to food safety practices within food processors. One hundred and eighty-eight food handlers (49.0 per cent) had a good background of food safety. This finding is lower than the findings of the Bahir Dar (67.6 percent), Arba Minch (67.4 percent) (Legesse, et al., 2017) and Dubai (8174 percent). The findings were similar with tests in Dangila City (52.5%), Addis Ababa (52.3%), Imo Province, Nigeria (50%) and Turkey (48.4%) (Baş, 2006). But it is higher than the studies in Gondar City (22.1 per cent) (Gizaw, 2013), South West Nigeria (19.0 per cent) (Faremi, 2018), Ogun, Nigeria (315 per cent) (Tessema, 2014).

The disparity in the nature of the study, the change in preparation and the availability of food safety inputs may be attributed to these differences. In food safety school, about 109 (28.4 percent) of the food handlers were qualified. Compared to results from Bahir Dar (21.8 percent) and Mekelle (15.7 percent), this outcome is higher (Kibret, 2012). Training for food handlers are seen as one solution that can improve the profession of food safety; providing

food institutions with long-term benefits (Gaungoo, 2013). Studies performed in India (Ali et al., 2016), Nigeria (Afolaranmi, 2013), Ghana (Annor, 2011) and Dubai endorse this discovery (Al Suwaidi, 2012).

In the current report, the amount of food handlers who have undergone training on food protection is higher than Bahir Dar (21.8 percent) and Mekelle (5.4 percent) data. As they could get expert guidance during preparation, food handlers who obtained training would have a greater knowledge of proper food handling procedure. Training could increase the overall performance of food handlers in proper food handling practice (Legesse, 2017). Food handlers who earned safety training have better chances of successful food safety practice in this report. This may be because, by experience, qualified food handlers develop strong knowledge.

This was followed by another related research carried out in Sarawak (Rahman, 2016). In order to develop the expertise of food handlers, training programs are necessary (Seaman, 2010). The profession of food safety was also correlated positively with the degree of awareness. For participants with an appropriate level of knowledge, the likelihood of providing a successful food safety procedure was 2.39 times higher relative to those with a bad level of knowledge (AOR= 2.39, 95% CI 1.38, 4.12). It is required that food managers will have substantial expertise and qualifications to hygienically treat food (Kibret, 2012). This could be attributed to those food handlers who had an acceptable degree of experience that could have a better chance of good practice in food handling. Studies carried out in Gondar town and Malaysia backed this result (Asmawi, 2018).

Another associated factor with safety of food practices was marital status. In contrast with divorced handlers, single food handlers have a lower chance of appropriate food safety procedures. The research performed in Gondar town and Dangila town confirms this

(Tessema, 2014). The practice of food protection has been closely associated with the oversight of health practitioners. In food handlers supervised by health practitioners, the likelihood of getting good food safety practice was higher relative to non-supervised ones. The analysis carried out in Arba Minch confirmed the result (Legesse, 2017).

This may be due to supervisors giving food handlers, owners and managers advice. Another factor correlated strongly with successful food handling practice was also a routine medical check-up. The likelihood of good food safety practice among food handlers engaged in routine medical inspection was greater than that of food handlers not engaged in routine medical inspection.

This may be because, during the test, health staff gave food handlers guidance. This finding is compatible with studies in Arba Minch and Dessie (Adane et al., 2018). This research revealed that among food handlers, there was bad food handling practice. Marital status, training in food safety, supervision by health practitioners, regular medical examination, and the level of expertise of food handlers were significantly related to good practice in food handling. The level of competence of food handlers, the provision of food hygiene, safety instruction, frequent monitoring and regular medical examination should be strengthened by owners, managers and local health professionals.

Town, Food & Gofa (2017) in Arba Minch Town Gamo Gofa Public Food Establishments District, Southern Ethiopia, studied food handling practices and related factors among food handlers. The present research showed that there was a deficient practice in the handling of food in the majority of handlers. Of all the respondents interviewed, 32.6 per cent of food handlers had good experience and 67.40 per cent had ineffective food hygiene procedures. This finding is relatively lower than the research conducted in Southeast Asia (54.7%), 71.4% in Ethiopia, 72% at the University of Alexandria, and higher than the study conducted in

Bangkok (15.2 percent). This variation in the prevalence of food handler practice is attributable to the discrepancy in population in the sample environment. Study carried out in Alexandria, for example, uses women working at the University of Alexandria and related socio-demographic inequalities. Possible explanations for disparities may be due to socio-demographic variations, differences in environmental factors, years of study and differences in the history of countries.

Food handlers in age categories 29-34 and ≥ 35 years 3.457 (1.63, 7.35) and 3.454 (1.78, 6.69) are more likely to provide successful food handling procedures relative to their peers. This is verified by study done in a different setting (Cuprasitrut, 2011). This may be food handlers who have gained or acquired greater experience in food handling techniques over long service years due to repeated exposure to work relative to others who have served in a food institution for a brief period of time.

Food managers employed in food and beverage establishments that have subordinates 13.095 (1.71, 100.49) are more likely to have good food management procedures than their peers. This observation is confirmed by an analysis carried out (Soneff, 1994). The involvement of supportive subordinates strengthens the food handling activity of food managers by offering day-to-day practical assistance and guidance on food handling. Food handlers who have a medical check-up of 4.81 (2.16, 10.73) are more likely to have successful food handling procedures than those who do not have a medical check-up. This result is in line with the Gonder report (Gizaw, 2014).

Food workers employed with food and beverage establishments that have subordinates 13.095 (1.71, 100.49) are more likely to provide effective food management procedures relative to their peers. This observation is confirmed by the research carried out (Soneff, 1994). The involvement of supervisors who are supportive strengthens the food handlers'

practice of handling food by providing daily functional assistance and guidance on handling food. Food managers who have a medical check-up of 4.81 (2.16, 10.73) are more likely to have successful food management procedures than those who do not have a medical check-up. This result is in line with the Gonder analysis (Gizaw, 2014).

This is how they would take the appropriate steps to avoid malpractice in food handling because food handlers are well trained. Food managers should also be fully educated in the fundamental standards of food safety and the rules on personal health in order to improve their food handling procedures. Previous planning of food hygiene has minimized the likelihood of a food establishment medical examination.

### 2.9.5. Personal hygiene of food vendors significantly affect Food Safety

In rural communities of Abia State, Nigeria, Ifenkwe (2015) researched food security regulations: reducing the risk of foodborne diseases. Food safety analysis relies on the quantity, consistency and safety of a tripod. This paper reports a steady increase in the agricultural profile of Nigeria, food production methods, and patterns of food consumption. The high rate of food accidents in Nigeria indicates that food manufacturers and handlers are to some degree infringed by the legislation against unsafe (fake, adulterated, sub-standard) food. Given the increase in the number of Nigerians eating out, there is also an urgent need for the legislature to realize as a powerful source of legislation that food business is a serious business and reposition itselfy in Abia State for efficient service delivery to improve food safety.

Other areas of urgent concern, in addition to tracking breaches of food safety legislation, include the implementation of laws against the indiscriminate sinking of boreholes or animal pens in order to minimize waterborne diarrheal and zoonotic diseases in the State of Abia; or

those aimed at forging inter-ministerial partnership and cooperation and, ultimately, effective measures to provide emergency measures

NAFDAC, SON and other groups that fight against practices that pose an immediate risk to public health need to be more funded materially and financially. The activities of NAFDAC should go beyond the destruction of known unsafe goods to the organization of workshops to raise awareness of food safety principles for producers, Industrial food providers and operators (food suppliers, hoteliers and canteen operators).

Lastly, local governments in Abia State should be vigilant on matters of food safety. Strengthening public health facilities in their local health jurisdiction will help them to diagnose individual or intermittent outbreaks of foodborne diseases at a very early stage, dramatically reducing the incidence and prevalence of food-related illnesses in the state of Abia.

# CHAPTER THREE

# METHODOLOGY

## 3.1 Research Design

Both the exploratory and descriptive style of the analysis was followed in this study due to the scope of the study. Exploratory analysis, according to Tobi & Kampen (2018), offers observations and insights into a topic or condition and is typically used where a concern has not been clearly identified. Current research is expected to provide insights into and awareness of food safety practices among vendors in Kumasi.

The descriptive research design, on the other hand, specifies the nature of a given phenomenon (Gray, 2019; Rahi, 2017). This approach was employed to describe variables rather than to test a predicted relationship between variables.

The research followed a mixed-method methodology. The aim of mixed-method analysis is therefore to develop the synergy and intensity that exists between quantitative and qualitative research methods and to explain the phenomena more fully than is feasible by using either quantitative or qualitative methods alone (Leavy, 2017).

## 3.2 Population

The target population for the survey was food vendors at St. Louis College of Education and Opoku Ware Senior High School in Kumasi metropolis. The estimated food vendors in both institutions and its surroundings were two hundred (200).

### 3.4 Sample Technique and Sample Size

A sample size of one hundred and four (104) respondents was selected. Out of which 52 participants were drawn from each institution with 50 being food vendors and the two matrons from both schools to obtain a fair representation of participants. The purposive sampling technique was adopted to draw out the participants of the study.

### 3.5 Data Collection Instruments

This research followed a mixed method approach; thus, the self-governing questionnaire as well as the interview guide, were used for data collection. Since data has been obtained from various sources using different data collection methods, triangulation would be feasible (Creswell, 2014). As a result, the researcher receives information that is more accurate than to a range of methods.

#### 3.5.1 Questionnaires

The questionnaire is used as a general term to include all techniques of data gathering in which each person is required to respond to the same set of question in a pre-determined order (Apuke, 2017). Questionnaires usually are one of the particular forms of primary data collection on which it relies for precision in the data. It is a standard technique used for gathering primary data in more than half of the comprehensive research studies in education.

A valid questionnaire enabled accurate data to be collected, and one that is reliable will mean that these data are collected consistently (Fallon, 2019; Mellinger & Hanson, 2016). Again, the use of the questionnaire ensured consistency, uniformity and stability in response. Its usage made the respondents complete answering the questionnaire at their convenience and also ensured the respondents greater anonymity. Only closed-ended questions were asked.

The reason is to obtain accurate responses, which will facilitate processing. The response format was based on a 5-point Likert-scale rating pattern with weightings of Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1. This was used in the data analysis. Data were processed using SPSS. Descriptive data interpretation (mean and standard deviation) was employed to answer the research questions.

### 3.5.2 Interview

A semi-structured interview guide was generated based on the survey questionnaire administered on the food vendors in the two schools and was designed to interview selected administrators and matrons in the schools. Interviews were administered in compliance with the interview guide (refer to Appendix B). The precise order and choice of interview questions relied on the response of the individual respondents. The interview sessions were tape-recorded after permission to record the session was sought from the respondents.

The benefit of conducting interviews is that it provides the researcher with the freedom to ask random follow-up questions to discuss problems found during the answer inquiry and recording process (Lubben, 1994).

## 3.6 Ethical Considerations

Ethics in research is defined when conducting research as what is right and what is not right to do (Grønmo, 2019) and is an integral part of any research study. The topic of ethics in research is especially significant when, as is the case in this report, human beings are the research subjects. Study ethics (Ryu, 2020) covers the entire research process, including the essence of the issue being studied, the documentation of its theoretical structure, the context in which the research is carried out the data collection instruments used, the methods of data

collection used in the research subjects, the techniques used to interpret the data and how the data is re-examined.

The rights and privacy of study subjects have also been preserved and secured. Again, the researcher was attentive to the cultural and social variations of the study participants, and all research findings were correctly documented with full disclosure of the testing methodology and shortcomings of the research procedure. Respondents were treated with dignity and informed consent was obtained. Ethical considerations were also closely and consistently followed before during and after the analysis. Participation has been purely voluntary.

### 3.7 Reliability and Validity

Numerous authors have advanced different viewpoints on the concept of reliability and validity in mixed methods research. The literature advocates that researchers need to demonstrate that their studies are credible. However, as Vaske, (2019) point out, threats to validity and reliability can never be expunged entirely; instead, the effects of these threats can be reduced by attention to validity and reliability throughout the research. The reliability of a research instrument involves the degree to which it produces the same results repeatedly. For the outcomes of a study to be considered valid, the measurement procedure must first be reliable.

The primary objective of validity is to ensure truthfulness or the ability of specific research to present findings that agree with the theoretical or conceptual values (Hayashi et al., 2019) Validity of mixed methods research is concerned with 'truth' in research findings (Mohajan, 2017). Hatala & Cook (2019) describe validity in mixed methods research as to how accurately the account characterizes respondents reality of the social phenomena and is sound to them. An account is valid if it describes those features of the phenomena accurately that it is intended to represent (Mohajan, 2017).

The current research demonstrates internal validity by ensuring that the data collected can answer the research questions accurately. External validity was assured by guaranteeing the outcomes of this study can be generalized to more extensive situations, and content validity was certified by ensuring the data instruments used reasonably covers the items that it intends to cover. These ensured careful sampling of domains to guarantee their representativeness. Also, the researcher, from the start, established appreciable contact with all the respondents to guarantee access to first-hand information and original sources. To ensure accuracy and precision in observation, and give more credibility to the information provided, a peer validation exercise was undertaken. Finally, the whole study was carried out per good practice, and adherence to all relevant research ethics suggested by the literature.

### 3.8 Data Analysis Plan

The study adopted a descriptive statistic; thus, mean, median, standard deviation, Skewness, Kurtosis, frequencies and percentages was used to analyze the data. The statistical software for social sciences (SPSS) now, statistical product for service solution version 21 was used to organize, summarize, interpret and communicate information obtained. The questionnaire was coded, edited and categorized.

The questionnaires were coded in terms of independent variable which consisted of educational Level of Food Vendors as EL, storage practices of Food Vendors as SP, Food Vendors Knowledge in Food Safety as FVK, Factors that influence the selection of foodstuffs as SFS, and personal hygiene of Food Vendors as PH. The dependent variable consists of food safety as FS. Tables were constructed to represent the five Likert type scaled response subgroups of “strongly agree,” “agree”, “not sure”, “disagree”, and “strongly disagree” for analysis and discussions.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1 Demography of Respondents

The questionnaire to the respondents sought to find out the demographic characteristics of the respondents used for the study. The respondents' demographic characteristics included gender, age, educational background, marital status, and length of employment. The study collected the demographic characteristics of respondents because the researcher wanted to make sure that food vendors meet the criteria of the particular respondents for the study. The criteria were respondents who are food vendors and work at Opoku Ware School and St. Louis College of Education.

**Table 4.1 Demographic Analysis of the Respondents**

| Variables | School | | | | Total |
|---|---|---|---|---|---|
| | St. Louis CE | | Opoku Ware | | |
| | N | % | N | % | |
| **Gender** | | | | | |
| Male | 20 | 20 | 5 | 5 | 25 (25%) |
| Female | 30 | 30 | 45 | 45 | 75 (75%) |
| **Education** | | | | | |
| Basic education | 6 | 12 | 23 | 46 | 29 (29%) |
| SHS | 19 | 38 | 15 | 30 | 34 (34%) |
| Training College | 2 | 4 | 0 | .0 | 2 (2%) |
| Tertiary | 20 | 46 | 11 | 22 | 34 (34%) |
| Other | 0 | 0 | 1 | 2 | 1 (1%) |
| **Age distribution of respondents** | | | | | |
| Below 18 | 5 | 5 | 7 | 7 | 12 (12%) |
| 19 – 25 | 30 | 30 | 24 | 24 | 54 (54%) |
| 26 – 30 | 12 | 12 | 4 | 4 | 16 (16%) |
| 34 – 45 | 3 | 3 | 11 | 14 | 14 (14%) |
| 46 and above | 0 | 0 | 4 | 4 | 4 (4%) |
| **Marital Status** | | | | | |
| Single | 41 | 41 | 29 | 29 | 70 (70%) |
| Married | 8 | 8 | 19 | 19 | 27 (27%) |
| Widow | 0 | 0 | 1 | 1 | 1 (1%) |
| Divorced | 1 | 1 | 1 | 1 | 2 (2%) |
| **Years of employment** | | | | | |
| < 1 year | 7 | 7 | 3 | 3 | 10 (10%) |
| 1 – 5 years | 33 | 33 | 42 | 42 | 75 (75%) |
| 6 – 10 years | 10 | 10 | 2 | 2 | 12 (12%) |
| 11 years and above | 0 | 0 | 3 | 3 | 3 (3%) |
| **Total** | **50** | **50%** | **50** | **50%** | **100%** |

Table 4.1 presents the results on the demographic characteristics of the respondents. Analysis on the gender distribution of the respondents shows that 75% of the respondents were female with 25% being male. This shows that majority of the food vendors that operated at the schools were female.

Regarding the level of education of respondents Table 4.1 shows the respondent's level of education. Out of 100 respondents, 29 representing 29% had basic education, 34 representing 34% had SHS education, 34 representing 34% had Tertiary education and two representing 2% had been to the Training College with only 1% possessing other forms of education.

With regards to basic education, the majority (46%) out of the 29 respondents were from Opoku Ware School with 12% being in St. Louis College of Education. Moreover, 38% of the 34 respondents who had SHS education were from St. Louis College of Education whereas 30% were from Opoku Ware. That notwithstanding, 46% of the 34 respondents who had Tertiary education were from St. Louis College of Education with 22% coming in from Opoku Ware. This suggests that majority of the respondents had either Tertiary or SHS education with most of them being at St. Louis College of Education.

Age distribution of respondents as indicated in Table 4.1 shows that 54 respondents representing 54% were within the 19 – 25 age range, 16 representing 16% were within the 26-30 age range, 14 representing 14% were within the 31 – 35 age range, 12 representing 12% were below18 with four representing 4% being 46 years or above. Furthermore, majority of the respondents, 7% who were below 18 were vendors at Opoku Ware School. Most of the respondents within the 19-25 age range, 30% were vendors at St. Louis College of Education with 24% being at Opoku Ware School. Similarly, majority of the respondents in the 26 – 30 age range, 12% were vendors at St. Louis College of Education with only 4% being at Opoku Ware. That notwithstanding, majority of the respondents within the 31 – 45

age range were vendors at Opoku Ware School. All four respondents who were 40 years or above were vendors at Opoku Ware School. This gives a clear indication that most of the vendors were below 45 years of age with the majority of them working at St. Louis College of Education.

Additionally, Table 4.1 gives the results on the marital status of the respondents. Out of the 100 respondents, 70 representing 70% were single, 27 representing 27% were married, and two representing 2% were divorced with only 1% being widowed. Furthermore, 41% of the single respondents were from St Louis with 29 being at Opoku Ware School. However, 19% of the married respondents were from Opoku Ware School with only 8% being from St Louis College of Education. Each of the divorced respondents was either from both institutions with the only widowed vendor coming from Opoku Ware School. This means the majority of the food vendors were single with most of them working at St. Louis College of Education.

Table 4.1 presents the results on the working experience of the respondents. Out of 100 respondents, 75% had been in employment for 1-5 years, 12 representing 12% had been in employment for 6-10 years, and 10% had been in employment for less than a year with only three representing 3% being in employment for 11 years or above. Furthermore, 42% of the respondents who had been in employment for 1-5 years were from Opoku Ware School with 33% being in St. Louis College of Education. Additionally, 10% of the respondents who had been in employment for 6-10 years were in St. Louis College of Education with 2% coming from Opoku Ware School. For vendors who had been in employment for less than a year, majority, 7% were at St. Louis College of Education with 3% being at Opoku Ware School. All three respondents who had been employed for 11 years and above were from Opoku Ware School. This shows that most of the vendors had been working for the past five years or less and the majority was at St. Louis College of Education. This implied that most of the vendors have worked actively for between 1 to 5 years and they had not experienced in the

vending business. Majority of them 42% are from Opoku Ware Senoir High School which made them inexperience in food storage and safety practices.

### 4.2 Food Vendor's Knowledge on Food Safety

This section of the results presents the food vendor's knowledge on food safety as it pertains in the two schools surveyed.

**Table 4.2 Descriptive Statistics of Food Vendor's Knowledge Level on Food Safety**

| Statement | St. Louis CE | | Opoku Ware | |
|---|---|---|---|---|
| | **Mean** | **±SD** | **Mean** | **±SD** |
| Washing hands with soap and water reduce the risk of food contamination | 3.92 | 1.175 | 3.64 | 0.875 |
| Using gloves while handling food reduces the risk of food contamination. | 3.62 | 1.008 | 4.44 | 0.972 |
| Proper cleaning and sanitization of utensils increase the risk of food contamination. | 3.82 | 1.119 | 4.06 | 1.114 |
| Reheating cooked foods can contribute to food contamination. | 4.14 | 0.783 | 4.30 | 0.763 |
| Washing utensils with detergents leave the food from food contamination. | 4.50 | 1.055 | 3.68 | 0.913 |
| Salmonella is among the foodborne pathogens. | 4.64 | 0.776 | 3.72 | 0.64 |
| Cross-contamination is when microorganism from a portion of contaminated food is transferred by the food handlers' hands or kitchen utensils to another food. | 3.42 | 0.702 | 4.52 | 0.707 |
| **Composite Score** | **4.01** | **0.945** | **4.05** | **0.855** |

Scale: Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1.

Table 4.2 shows the Food Vendor's knowledge level on food safety. The study revealed that majority of the respondents agreed that washing hands with soap and water reduces the risk

of food contamination (M=3.92, =1.175), and using gloves while handling food reduces the risk of food contamination (M=3.62, =1.008).

Moreover, majority of the respondents agreed that salmonella is among the foodborne pathogens (M=4.64, =0.776) and cross-contamination is when microorganism from a portion of contaminated food is transferred by the food handlers' hands or kitchen utensils to another food (M=3.42, =0.702).

However, majority of the respondents disagreed that proper cleaning and sanitization of utensils increase the risk of food contamination (M=3.82, ±=4.06), reheating cooked foods can contribute to food contamination (M=4.14, =4.30) and washing utensils with detergents leaves the food from food contamination (M=3.50, =3.68).

Additionally, with a composite mean score of (M=4.05, =0.855) the food vendors working at Opoku Ware SHS had a piece of better knowledge on food safety than their counterparts at the St. Louis College of education (M=4.01, =0.945).

It is recognizable from the analysis above that overall food managers' experience of food protection has been really high. Food handlers took a keen interest in the washing of hands with soap, using gloves while handling foods, proper cleaning and sanitization, washing of utensils and a general idea of salmonella as a food pathogen and cross-contamination. More so, the results found food vendors at Opoku Ware SHS to have a superior knowledge level regarding food safety than the vendors at the St. Louis College of Education.

The current study found the food managers' overall awareness of food protection was very good in that the food vendors took a keen interest in the washing of hands with soap, using gloves while handling foods, proper cleaning and sanitization, washing of utensils and a general idea of salmonella as a food pathogen and cross-contamination. More so, the results found food vendors at Opoku Ware SHS to have a superior knowledge level regarding food

safety than the vendors at the St. Louis College of Education (See Table 4.2). Furthermore, the study indicated that, Opoku Ware knowledge level of the food vendors determines about 57% as compared to 22% at St. Louis College of education (See Table 4.2)

The results support the findings of Tannus, Barbosa & Silva (2016) who in their study on food safety knowledge and practices of food handlers of the hotel restaurants have acceptable knowledge levels, attitudes and self-reported practices. This result holds to true for several reasons. This could be as a result of the periodic training programs organized for vendors at the respective school could be a major factor which influences the knowledge of vendors on food safety.

That notwithstanding, most of the food handlers particularly have had sufficient years of working experience in the industry hence not surprising vendors in the school have better understanding or knowledge on food safety. That said, there remains significant amount of uncertainty regarding the reason vendors at Opoku Ware School have better knowledge on food safety than those at the training college. Contrary to the situation in Brazil as indicated by Tannus, Barbosa & Silva (2016) there remains little to be seen regarding the training of food vendors in Ghana.

### 4.3 Factors Influencing the Selection of Foodstuffs

Table 4.3 presents the factors influencing the selection of foodstuffs among food vendors at Opoku Ware SHS and St. Louis College of Education.

**Table 4.3 Factors Influencing the Selection of Foodstuffs**

| Statement | St. Louis CE | | Opoku Ware | |
|---|---|---|---|---|
| | **Mean** | **±SD** | **Mean** | **±SD** |
| Perceived nutritional value of the foodstuffs | 3.86 | 1.08 | 4.01 | 1.13 |
| Physical characteristics (freshness, texture etc.) | 4.70 | 0.61 | 3.74 | 0.63 |
| Seller storage conditions | 4.74 | 0.73 | 3.80 | 0.83 |
| Vendor's general business environment (Hygiene) | 3.69 | 1.03 | 2.48 | 1.11 |
| **Composite Scores** | **4.25** | **0.86** | **3.51** | **0.93** |

Key: Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1.

Table 4.3 shows respondents' views on the factors influencing the selection of foodstuffs collected using the five-point Likert scale. From the table, majority of the respondents agreed with the following; that their choice of foodstuff is influenced by their perceived nutritional value of the foodstuff (M=4.01, =1.13), physical characteristics (freshness, texture etc.) of the foodstuff (M=4.70, =0.61).

Besides, most of the respondents also agreed that they pay attention to the seller's storage conditions for the foodstuff when they are selecting foodstuffs (M=4.74, =0.73) and also an overwhelming majority of the respondents indicated they pay equal attention to the vendor's general business environment (M=1.72, =1.80) before they select the foodstuff.

The composite score outcome shows that food vendors operating at the St. Louis College of Education (M=4.25, =0.86) dedicate more effort into the selection of foodstuffs than their counterpart working at the Opoku Ware SHS (M=3.51, =0.93).

It was concluded that most food vendors' selection of foodstuffs is to a large extent influenced by their perceived nutritional value of the foodstuffs, physical characteristics of the foodstuff, storage conditions as well as the general business environment of the selling vendor. That notwithstanding, it is found that food vendors at St. Louis College of Education

are more particular about the factors that influence the selection of foodstuff than those at Opoku Ware.

Another interesting finding to emerge from the study was that most food vendors' selection of foodstuffs is to a large extent influenced by their perceived nutritional value of the foodstuffs, physical characteristics of the foodstuff, storage conditions as well as the general business environment of the selling vendor (See Table 4.3). The results are in sync with the position of Brown (2005) who maintained that before a buyer purchases food ingredients attention needs to be paid to the general physical characteristics of the product. Furthermore, the finding on the nutritional value as an influencing factor in the selection of food ingredients corroborates the findings of the American Society for Nutrition which pointed out that sourcing food from local farms presents several challenges which include the perceived nutritional benefits of the particular ingredient, cost as well as the availability of the product and also food safety. Furthermore, the findings affirm the works of Yadav, Verma & Kumar (2017) who discovered storage practices among rural women was a critical factor in their decision to select a particular ingredient for food preparation.

### 4.4 Food Safety Practices of Food Vendors

The results as presented in Table 4.4 concerns the food safety practices of food vendors operating at Opoku Ware SHS and St. Louis College of Education in the Kumasi Metropolis.

**Table 4.4 Descriptive Statistics on Food Safety Practices**

| Statement | St. Louis CE | | Opoku Ware | |
|---|---|---|---|---|
| | Mean | ±SD | Mean | ±SD |
| After handling raw meat or poultry I always wrtash my hands with soap and water | 3.48 | 1.04 | 4.20 | 0.90 |
| All food handlers dry their hands by using kitchen or dry cloth | 3.72 | 0.90 | 3.82 | 0.80 |
| Most food handlers have taps for washing vegetables | 2.64 | 1.01 | 2.70 | 1.15 |
| Food vendors wash fresh fruits and vegetables under running tap twice. | 4.20 | 0.73 | 4.10 | 0.71 |
| Food vendors have separate knives for raw and ready to eat food items. | 3.18 | 0.94 | 2.86 | 0.95 |
| Food vendors treat chopping board in between use for raw and ready to eat food by washing with water | 2.73 | 0.91 | 2.38 | 0.95 |
| All food handlers keep leftover foods in a freezer | 2.64 | 0.90 | 2.20 | 0.93 |
| Handling is an important procedure in order to reduce the possibility of food pollution | 3.90 | 0.95 | 3.96 | 0.76 |
| Composite Score | 3.31 | 0.92 | 3.28 | 0.89 |

Key: Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1.

Table 4.4 shows respondents' assertions on food safety practices. From the table majority of the respondents agreed that they always wash their hands with soap and water after handling raw meat/poultry (M=4.20, =0.90), and dry their hands by using kitchen or dry cloth (M=3.82, =0.80). Most food vendors were however not sure of the assertion that they have taps for washing vegetables (M=2.70, =1.15).

Majority of the vendors agreed that they wash fresh fruits and vegetables under running tap twice (M=4.20, =0.73), but were not sure that they have separate knives for raw but ready-

to- eat food items (M=4.20, =0.73) and also treating chopping board in between use for raw and ready -to -eat food by washing with water (M=3.18, =0.94). Moreover, majority of the respondents were not sure that food handlers keep leftover foods in a freezer (M=2.64, =0.90) but agreed that wearing gloves is an important practice to minimize the risk of food contamination (M=3.96, =0.76).

The composite scores show that vendors at St. Louis College of Education boasted of the higher mean score (M=3.31, =0.92) compared to vendors at Opoku Ware with a score of (M=3.28, =0.89). This implies that the vendors at St. Louis have adopted high standards of food safety practices than their counterparts at Opoku Ware SHS.

The main basic steps for food safety were highlighted from the discussions; cleaning, separating, cooking and chilling. It is indicative that vendors did not pay particular attention to separation (using separate knives and chopping boards) but cleaned foods always and kept leftover foods in freezers for future use. However, it could be inferred that food safety practices adopted by St. Louis College of Education vendors were better than those practiced at Opoku Ware SHS (See Table 4.4). In the candid opinion of the researcher, it can be inferred that vendors at St. Louis College of Education being a Teacher Training institution may be organizing training sessions for its food vendors.

The result is an affirmative one which compares to the works of Kibret (2012). Likewise, Gaungoo (2013) maintained that food handlers given training is used as a method from which food safety procedures can be improved by providing long-term benefits to food establishments. This is supported by Annor (2011). Kibret (2012) continued to indicate that food handlers are expected to have substantial expertise and qualifications for hygienic food handling.

Furthermore, the study showed that there was a statistically significant correlation between food safety practices adopted and the quality of food safety. However, it is worth noting that Food safety practices were a standard high at St. Louis College of Education than it was at Opoku Ware SHS.

### 4.5 Personal Hygiene of Food Vendors at Opoku Ware SHS and St. Louis College of Education

Presented in Table 4.5 concerns personal hygiene of the food vendors operating at the two respective academic institutions surveyed in the study.

**Table 4.5 Descriptive Statistics on Personal Hygiene of Food Vendors**

| Statement | St. Louis CE | | Opoku Ware | |
|---|---|---|---|---|
| | Mean | ±SD | Mean | ±SD |
| Wearing caps and adequate clothing is an important practice to reduce the risk of food contamination | 3.64 | 0.66 | 3.72 | 0.73 |
| Long and painted fingernails could contaminate food with foodborne pathogens | 4.08 | 1.12 | 3.52 | 0.86 |
| Food handlers who have abrasions or cuts on their hands should not touch foods | 4.48 | 0.76 | 3.50 | 0.74 |
| Touching food by hand without gloves lead to contamination and cause food poisoning | 4.00 | 1.05 | 3.74 | 0.99 |
| Most vendors wipe their hands on their kitchen uniforms | 3.58 | 0.58 | 3.64 | 0.63 |
| Food vendors sneeze away from food during food preparation | 2.76 | 0.89 | 2.58 | 0.95 |
| Most vendors stop preparation of food when they observe signs of dizziness, vomiting and diarrhoea | 3.86 | 1.01 | 3.94 | 1.10 |
| **Composite Score** | **3.77** | **0.87** | **3.52** | **0.86** |

Key: Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1.

Table 4.5 shows respondents' assertions on personal hygiene of food vendors. Again, this was measured using the five-point Likert scale. From the table majority of the respondents agreed that wearing caps and adequate clothing is an important practice to reduce the risk of food contamination (M=3.72, =0.73), long and painted fingernails could contaminate food with foodborne pathogens (M=4.08, =0.86), food handlers who have abrasions or cuts on their hands should not touch foods (M=4.48, =0.74) and touching food by hand without gloves lead to contamination and cause food poisoning (M=4.00, =1.05)

Moreover, most of the respondents agreed that most vendors wipe their hands on their kitchen uniforms (M=3.64, =0.63) and most vendors stop preparation of food when they observe signs of dizziness, vomiting and diarrhoea (M=3.94, ±=1.10). On the contrary, most of the respondents were not sure that food vendors sneeze away from food during food preparation (M=2.76, =0.89). The results showed a composite score of (M=3.77, =0.87) for food vendors at St. Louis College of Education whereas those at Opoku Ware obtained a score of (M=3.52, =0.86).

One of the most effective ways of maintaining food safety is checking up on the personal hygiene of food vendors who most often than not are unlicensed, not trained in food hygiene and sanitation, and work under crude unsanitary conditions. From the discussions above, it is revealing that vendors maintained good personal hygiene. Basic practices such as wearing caps, maintaining short fingernails, and staying off food preparation when they observe signs of sickness were strictly adhered to. Also, it can be concluded that respondents at St. Louis College of Education have a better personal hygiene of themselves than the food vendors at Opoku Ware SHS (See Table 4.5).

The findings support Ebenezer (2020) works when it was maintained that it is essential that food handlers take particular care of their personal hygiene. This position was corroborated by the works of Abd Lataf Dora-Liyana et al., (2018); Rossi et al., (2017) and Ismail *et al.,*

(2016) indicated that those responsible for executing duties involved in the food processing phase assume major responsibilities in the prevention of food poisoning.

### 4.6 Food Storage Practices of Food Vendors

Table 4.6 presents the descriptive statistics on the food storage practices of food vendors at the two surveyed schools.

**Table 4.6 Descriptive Statistics on Food Storage Practices of Food Vendors**

| Statement | St. Louis CE | | Opoku Ware | |
|---|---|---|---|---|
| | **Mean** | **±SD** | **Mean** | **±SD** |
| Correct temperature for storing perishable food is 5$^{oc}$ | 3.64 | 0.96 | 4.30 | 0.79 |
| Freezing kills all the bacteria that may cause foodborne illness | 3.12 | 0.94 | 3.34 | 1.09 |
| Meat should be stored in a freezer | 4.32 | 0.59 | 4.20 | 0.40 |
| The ideal place to store raw meat in a freezer is on a bottom shelf. | 4.78 | 0.76 | 3.70 | 0.54 |
| The best way to defrost meat is by using a refrigerator | 3.70 | 1.11 | 3.50 | 1.09 |
| The best way to cool frozen food is by defrosting them. | 4.80 | 0.54 | 3.72 | 0.61 |
| Most food vendors store perishable food in a refrigerator. | 4.00 | 0.61 | 4.12 | 0.72 |
| Leftover food such as stews, snacks and drinks are stored in a refrigerator and used on the next day. | 3.90 | 0.54 | 3.84 | 0.65 |
| Cereals such as maize, groundnut and rice are stored in a cool dry place. | 3.98 | 0.71 | 4.10 | 0.74 |
| Leftover flour is stored in a freezer | 2.94 | 0.98 | 2.88 | 0.77 |
| **Composite Score** | **3.92** | **0.77** | **3.77** | **0.74** |

**Key:** Strongly Agree (SA) = 5, Agree (A) = 4, Not Sure (NS) =3, Disagree =2, Strongly Disagree (SD) = 1.

Table 4.6 shows respondents' assertions on food storage practices of food vendors measured using the five-point Likert scale of 1-strongly disagree, 2- disagree, 3-not sure, 4-agree and 5-strongly agree.

From the table majority of the respondents agreed that the correct temperature for storing perishable food is 5$^{\circ c}$ (M=4.30, =0.79), meat should be stored in a freezer (M=4.32, =0.59), and the ideal place to store raw meat in a freezer is on a bottom shelf (M=4.78, =0.76).

Furthermore, most of the respondents agreed that the best way to defrost meat is by using refrigerator (M=3.70, =1.11), defrosting is the best way to cool frozen food (M=4.80, =0.54), most food vendors store perishable food in a refrigerator (M=4.12, =0.72) and, cereals such as maize, groundnut and rice are stored in a cool dry place (M=3.98, =0.71) and leftover food such as stews, snacks and drinks are stored in a refrigerator and used on the next day (M=3.90, =0.54).

However, most of the respondents were not sure of the assertions that freezing kills all the bacteria that may cause foodborne illness (M=3.12, =0.94) and leftover flour is stored in a freezer (M=2.94, =0.98).

Composite scores of the responses show that food vendors at St. Louis College of Education obtained a mean score of (M=3.92, =0.77) whereas Opoku Ware obtained a mean statistic of (M=3.77, =0.74).

Proper food storage ensures the prevention of any foodborne illness such as food poisoning and diarrhoea. Proper food storage ensures the quality of food is retained, and thus reduces food wastage. Even though there are many avenues for storing foods, most vendors as recognized from the discussions above resorted to refrigeration as the most effective means of food storage. It is important to note that refrigeration was used by vendors to store leftover foods such as stews, snacks and drinks whereas cereals were stored in cool dry places. The

results further showed that St. Louis College of Education food vendors demonstrated better food safety practices than those at the Opoku Ware SHS.

Also, another significant finding from the study concerning food storage practices indicates that food vendors appreciate that the correct temperature for storing perishable food is 5ºC. This result supports the findings of Hamad (2012) who maintained that food should be cooled quickly and kept refrigerated, preferably at a temperature under 5ºC. It is important to note that refrigeration was used by vendors to store leftover foods such as stews, snacks and drinks whereas cereals were stored in cool dry places (See Table 4.6).

Proper food storage ensures the quality of food is retained, and thus reduces food wastage (See Table 4.6). This finding supports those of Tefera et al., (2011) who observed that adequate food storage for the farmers ensures that the quality of the food is maintained over time and thereby reducing food wastage. Even though there are many avenues for storing foods the current study found that most vendors resort to refrigeration as the most effective means of food storage.

### 4.7 Model Summary of Regression Analysis for St. Louis College of Education

Table 4.7 presents the model summary of the measures of variabilities the independent variables relates to the dependent variables for the food vendors at St. Louis College of Education in testing the hypothesis of the study.

**Table 4.7 Model Summary for St. Louis College of Education**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .892[a] | .796 | .786 | .23839 |

a. Predictors: (Constant), Level of education, Personal Hygiene of vendors, Selection of foodstuffs, Food storage practices, Knowledge level of vendors on food safety

Table 4.7 presents the model summary as well as the overall fit statistics for food vendors at St. Louis College of Education. It was realized that the adjusted $R^2$ value of the model is 0.786 with the $R^2$ = .796 which implies that the independent variables explain approximately 79% of the variances in the dependent variable.

### 4.8 Model Summary of Regression Analysis for St. Louis College of Education

Table 4.8 presents the ANOVA test for the variables in the regression model for St. Louis College of Education in assessing how the data fit the regression model.

**Table 4.8 ANOVA[b] for Food Vendors at St. Louis College of Education**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 20.904 | 5 | 4.181 | 73.569 | .000[a] |
| | Residual | 5.342 | 94 | .057 | | |
| | Total | 26.245 | 99 | | | |

a. Predictors: (Constant), Level of education, Personal Hygiene of vendors, Selection of foodstuffs, Food storage practices, Knowledge level of vendors on food safety b. Dependent Variable: Food Safety

Table 4.8 shows the ANOVA statistics for food vendors at St. Louis College of Education. The F-ratio in the ANOVA table checks whether the overall regression model matches the results well. The table shows that the independent variables that are vendor's level of education, personal hygiene, selection of foodstuffs, food storage practices, as well as their knowledge on food safety statistically significantly, predict the dependent variable (Food safety), $F(5, 94) = 73.569$, $p < .0005$ and that confirms that the relationship is significant.

### 4.9 Model Summary of Regression Analysis for St. Louis College of Education

Table 4.9 presents the Coefficients of the relationship between the independent variables and the dependent variables.

**Table 4.9 Coefficients[a] for Food Vendors at St. Louis College of Education**

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| **Model** | **B** | **Std. Error** | **Beta** | **T** | **Sig.** |
| (Constant) | .482 | .245 | | 1.967 | .052 |
| Knowledge level of vendors on food safety | .232 | .075 | .223 | 3.090 | .003 |
| Selection of foodstuffs | -.050 | .047 | -.062 | -1.073 | .286 |
| Personal hygiene of vendors | .345 | .074 | .316 | 4.692 | .000 |
| Food storage practices | .831 | .112 | .482 | 7.412 | .000 |
| Level of education | -.005 | .021 | -.011 | -.221 | .825 |

a. Dependent Variable: Food Safety

Multiple regressions was run to test the relationship between St. Louis College of Education food vendor's level of education, personal hygiene, selection of foodstuffs, food storage practices as well as their knowledge on food safety significantly predict the dependent variable (Food safety). Table 4.9 shows the regression coefficients and the intercepts in the model. From the results, it could be observed that the dependent variable food safety is positively influenced substantially by food storage practices of the vendors, personal hygiene of vendors, and the knowledge level of the vendors on food safety. However, the selection of foodstuffs, as well as the level of education, showed negative influences on the safety of food served by vendors at the St. Louis College of Education.

### 4.10 Model Summary of Regression Analysis for Opoku Ware School

Table 4.10 presents the model summary of the measures of variabilities the independent variables relates to the dependent variables for the food vendors at Opoku Ware SHS of Education in testing the hypothesis of the study.

**Table 4.10 Model Summary for Food Vendors at Opoku Ware**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .652[a] | .425 | .394 | .40077 |

a. Predictors: (Constant), Level of Education of Vendors (OWASS), Selection of foodstuffs (OWASS), Personal Hygiene of vendors (OWASS), Food Storage practice (OWASS), Knowledge (OWASS)

The researcher sought to assess the impact of food safety practices by food vendors at Opoku Ware Senior High School. The model summary shows that the independent variables are explaining about 43% of the variabilities in the dependent variables.

### 4.11 Model Summary of Regression Analysis for Opoku Ware School

Table 4.11 presents the ANOVA test for the variables in the regression model for Opoku Ware SHS in assessing how the data fit the regression model.

**Table 4.11 ANOVA[b] for Food Vendors at Opoku Ware**

| Model | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 11.148 | 5 | 2.230 | 13.882 | .000[a] |
| Residual | 15.098 | 94 | .161 | | |
| Total | 26.245 | 99 | | | |

a. Predictors: (Constant), Level of Education of Vendors (OWASS), Selection of foodstuffs (OWASS), Personal Hygiene of vendors (OWASS), Food Storage practice (OWASS), Knowledge (OWASS)
b. Dependent Variable: Food Safety

Table 4.11 on the other hand presents the ANOVA results on the food vendors' food safety practices at Opoku Ware Senior High School. The results show that the independent variables statistically predict the dependent variable, $F$ (5, 94) = 13.882, p < .0005 hence it can be concluded that the regression model is a good fit of the data.

### 4.12 Model Summary of Regression Analysis for Opoku Ware School

Table 4.12 presents the Relationship coefficients between the independent and the dependent variables.

**Table 4.12 Coefficients for Variables on Food Vendors at Opoku Ware**

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| **Model** | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| (Constant) | .618 | .263 | | 2.349 | .021 |
| Vendor's Knowledge level | .265 | .041 | .573 | 6.507 | .000 |
| Selection of foodstuffs | .130 | .075 | .144 | 1.728 | .087 |
| Personal hygiene of vendors | .192 | .063 | .248 | 3.039 | .003 |
| Food Storage practice | .127 | .071 | .147 | 1.789 | .077 |
| Level of Education of Vendors | .177 | .061 | .249 | 2.884 | .005 |

Table 4.12 shows the coefficient of the regression analysis on food vendors at Opoku Ware School. The results show that dependent variable food safety is highly dependent on the independent variables; knowledge level of food vendors on food safety, selection of foodstuffs, personal hygiene of vendors, food storage practices and level of education. It could be observed that all the independent variables have positive influences on food safety at Opoku Ware Senior High school. Food storage practices adopted by vendors contribute to about 48% of the food safety practices at St. Louis College of Education compared to the 14% at Opoku Ware School (See Table 4.9 and Table 4.12).

### 4.13 Pearson Product-Moment Correlation Analysis

The results in Table 4.13 represents the correlation analysis showing the level of effects observed between the independent variables and the dependent variables.

**Table 4.13 Pearson product-moment correlation analysis**

| | OPOKU WARE SHS | | | | | ST. LOUIS COLLEGE OF EDUCATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **KOV** | **SOF** | **HSV** | **FSP** | **VLE** | **KOV** | **SOF** | **PHV** | **FSP** | **VLE** |
| Food Safety | .483** | .324** | .111 | .175 | .192 | .654** | -.318** | .772** | .804** | -.037 |
| Knowledge of vendors on food safety (OWASS) | | .302** | -.259** | -.053 | -.250* | .326** | -.478** | .523** | .383** | .043 |
| Selection of foodstuffs (OWASS) | | | -.068 | -.004 | .097 | .087 | .066 | .327** | .425** | .177 |
| Personal Hygiene of vendors (OWASS) | | | | -.057 | .121 | .082 | .183 | -.086 | .226* | -.044 |
| Food Storage practice (OWASS) | | | | | .293** | .121 | .030 | .116 | .205* | -.031 |
| Level of Education of Vendors (OWASS) | | | | | | .077 | .259** | .196 | .335** | -.108 |
| Knowledge of vendors on food safety (SLCE) | | | | | | | -.563** | .542** | .462** | -.263** |
| Selection of foodstuffs (SLCE) | | | | | | | | -.205* | -.136 | .080 |
| Personal Hygiene of vendors (SLCE) | | | | | | | | | .670** | -.003 |
| Food storage practices (SLCE) | | | | | | | | | | .080 |

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

**KOV=Knowledge of vendors on food safety; SOF=Selection of foodstuffs; PHV=Personal Hygiene of vendors; FSP=Food storage practices; VLE= Vendors level of education**

A Pearson product-moment correlation was run to determine the relationship the dependent and independent variables taking into consideration the two respective institutions that were surveyed. From the results as being displayed in Table 4.13; it could be observed that at Opoku Ware SHS the independent variables showed a relatively weaker significant positive relationship against the dependent variables as compared to those observed at St. Louis

College of Education; which attained a relatively strong level of significance against the dependent variable that is Food Safety.

At Opoku Ware SHS, the correlation results show that the knowledge level of vendors on food safety ($r$=0.483, $n$=50, p<.05) and selection of foodstuffs ($r$=.324, $n$=50, p<.05) were the variables that significantly influenced the level of food safety knowledge at the school.

Regarding St. Louis College of Education, the results showed that food safety practices ($r$=0.804, $n$=50, p<.05), the personal hygiene of vendors ($r$=0.772, $n$=50, p<.05) and the knowledge of vendors on food safety ($r$=.654, $n$=50, p<.05) by food vendors at St. Louis College of Education have a strong statistically positive relationship with the safety of the food served to the college students. It is worth noting that, vendors' level of knowledge, as well as their level of education, had a negative relationship with the level of food safety at the college. However, the relationship was not statistically significant. The safety of the food was determined by the kitchen environment, the neatness of the vendors as well as coking and serving of the food to the students.

The study also noted that food storage practices at Opoku Ware showed no statistically significant correlation with food safety at the school. However, the situation encountered at St. Louis College of Education was much different as the relationship between food storage practices adopted at the school showed significant positive correlation against food safety at Opoku Ware (See Table 4.13).

**Table 4.14 Hypothesis Testing Decisions**

| Hypothesis | School | Decision |
|---|---|---|
| Food Vendor's knowledge level → Food Safety | St. Louis CE | Supported |
| | Opoku Ware | Supported |
| Storage practices → food safety | St. Louis CE | Supported |
| | Opoku Ware | Not supported |
| Selection of Foodstuffs → food safety | St. Louis CE | Supported |
| | Opoku Ware | Supported |
| Food safety practice → food safety | St. Louis CE | Supported |
| | Opoku Ware | Not Supported |
| Personal hygiene → Food safety | St. Louis CE | Supported |
| | Opoku Ware | Supported |

Table 4.14 presents a summary of the decisions of the outcome of the hypothesis testing. The results show that St. Louis College of Education obtained support on the entire hypothesis posted. However, the relationship between Food Storage and Food Safety Practices and food safety at Opoku Ware SHS was not supported. This shows that food safety is comparatively better at St. Louis College of Education than it is at Opoku Ware SHS.

## 4.14 Analysis of Interview Results

***Knowledge level of food vendors you work with in the school***

The interviewees were asked to assess the knowledge level of food vendors working in the respective schools. The respondents indicated that matrons in both schools gave a positive outlook concerning the knowledge level of food vendors in their respective schools. Selected comments have been given below;

*"oh, their knowledge? All I can say is that we interact with them every day regarding what they're doing and I can confidently say these are women with enormous amount of experience in what they do…. See the woman there…. She's been cooking here for the past 12 years in fact the other one there was here before I was transferred here*

*and I've been here for 13 years and so you can imagine…" [*Respondent 1 (for the sake of anonymity)]

*"we have well trained and experienced food vendors here. We don't normally go for people without some appreciable education. Everything we do here has something to do with people's life so safety is of greater interest to us… so I can say that most of the food vendors here have good understanding when it comes to handling food…"* [Respondent 2]

From the results it can be concluded that most of the food vendors in the schools surveyed have appreciable knowledge levels in handling food.

***Food safety practices food vendors demonstrate in the school***

Concerning food safety practices, the respondents were asked to indicate the food safety practices adopted in their respective schools. The result shows that food vendors at St. Louis College of Education demonstrate standard food safety practices compared to their counterparts at Opoku Ware SHS. The remarks to that effect have been presented below;

*"Me for one am a very strict person and am very particular about food contamination. It could be your worse moment when you consume a food that has been contaminated. So, I make sure we meet every morning for safety briefings just to keep them on their toes… I make sure they demonstrate effective food safety practices and because of that they're very conscious so you seeing them washing Hands with soap and water with clean flowing water, soap, sanitation, clean sweep, cooling once a week and machinery clean and separate food while shopping . In addition, during this covid period we did a lot of engagement with them on how to keep to the covid-19 protocols…. [Respondent 2]*

*"oh, they know what to do I try as much as possible not to interfere in their activities. So, I only come in when there is a problem. However, I observe them from a distance I think they take issues of food safety seriously. Not only that but they keep themselves neat too…" [Respondent 1]*

From the results it could be noted that the respondents believe that the food vendors are up to the task regarding good food safety practices. However, it is obvious that most of the food vendors at Opoku Ware do not take matters of food safety as serious as their counterparts at the College of Education.

***Factors influencing the selection of foodstuffs by food vendors***

The respondents when asked about the factors that influenced their selection of foodstuff for food preparation. Summary of responses revealed that general operating environment of the seller was the most important factor that influenced their selection. Additionally, the issue on the nutritional value of the foodstuff follows it up and then the cost of the items becomes the third influencing factor. Selected comments have been given below;

*"For me when we go to the market, I look at the environment first that is where the items are being sold that is what I consider first before anything else. This is because, the main point in holding up for food safety should start from the very point the cooking process begins. If you buy food from unwholesome sources you've already poisoned the people who will eat the food even before the food is ready…this is because some of the foods remain in those conditions for quite some time before buyers go there to buy…"* [Respondent 3]

*"Here, I think the area the person is selling the items must be clean once it is clean then we focus on the nutritional value of the items if especially it has substitutes and then we consider the cost…"* [Respondent 2]

The results show that food vendors to a large extent are influenced by the general operating environment of the food dealers or the market women who sell the foodstuffs. Another point of influence is the nutritional values of the items as well as the cost. These are the major factors that influence the selection of foodstuffs among food vendors in educational institutions.

***Personal hygiene of food vendors in the school***

The researcher sought to corroborate the findings from the quantitative results hence the respondents were asked to bring out their assessment of the personal hygiene of the food vendors in their respective schools. The results therefore show that the respondents gave a positive outlook of the personal hygiene of the respondents. Summary of the responses shows that the food vendors have good health outlook and personal hygiene. Selected comments have been outlined below;

*"from all indications I believe they are in good health and their personal hygiene is good. Am saying this because if not we'd be experiencing increasing number absenteeism but that is not the case we have here. They're always on duty…"*

[Respondent 1]

*"We have a policy here where they're supposed to attend regular periodic medical checkup and reviews. That way we're assured of the healthy working group always available. Additionally, we have a well-organized leave system in place too just to make sure that vendors have sufficient rest...we have a form that you would have to*

*fill and it has to be filled by a certified medical doctor just to ensure that they indeed attend the hospital for the medical assessment…so far everyone is doing fine"*

[Respondent 4]

From the results it can be concluded that the respondents gave a positive assessment of the personal hygiene of the food vendors working in their respective schools.

The interview results have shown that in both school's food vendors have appreciable knowledge on food safety. The result shows that food vendors at St. Louis College of Education demonstrate standard food safety practices and those food vendors at Opoku Ware do not take matters of food safety as serious as their counterparts at the College of Education. The general operating environment of the seller and the nutritional value of the foodstuff was the most important factor that influenced the selection of food stuffs. Food vendors operating in both schools are largely influenced by the general operating environment of food dealers or the market women who sell. Food vendors operating at both Opoku Ware SHS and St. Louis College of Education are in good health to contribute operating in their respective schools.

### 4.10.5 Chapter Summary

This chapter has presented the results of the current study in relation to previous literature works. The chapter has indicated that Opoku Ware knowledge level of the food vendors determines about 57% of the level of food safety knowledge at the school compared to 22% of vendors at St. Louis College of Education.

Most food vendors' selection of foodstuffs is to a large extent influenced by their perceived nutritional value. Physical characteristics of the foodstuff, storage conditions and the general business environment of the selling vendor also play a role. Foodstuffs by vendors at Opoku Ware School contributes to about 14% of food safety of food prepared by the Vendors in the school compared to the vendors at St. Louis College of Education on the other hand

determined about .06% of the level of food safety of food prepared in the school for student's consumption.

The study showed that there was a significant correlation between food safety practices adopted and the quality of food safety. Food safety practices were a standard high at St. Louis College of Education than it was at Opoku Ware SHS.

Vendors maintained good personal hygiene. Basic practices such as wearing caps, maintaining short fingernails, and staying off food preparation when they observe signs of sickness were strictly adhered to. The study found that food vendors at St. Louis College of Education have a better personal hygiene outlook of themselves than the vendors at Opoku Ware SHS. The result is supported by the regression analysis which evidenced that the personal hygiene of the vendors of St. Louis College of Education contributed to about 31% of the level of safety.

Proper food storage for the vendors ensures that the quality of the food is maintained over time and thereby reducing food wastage. The study found that most vendors resort to refrigeration as the most effective means of food storage. The relationship between food storage practices adopted at the St. Louis College of Education and food safety showed significant positive correlation against food safety at Opoku Ware School. The next chapter provides a review of the key conclusions and the major problems and ideas that emerged during this debate.

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Conclusions

The general knowledge of food handlers on food safety was very good. Food handlers took keen interest in the washing of hands with soap, using gloves while handling foods, proper cleaning and sanitization, washing of utensils and a general idea of salmonella as a food pathogen and cross-contamination.About 57% of food vendors at Opoku Ware SHS have more knowledge on food safety than their counterpart food vendors at the St. Louis College of Education who nad 22%.

The perceived nutritional value of the foodstuffs, physical characteristics of the foodstuff, storage conditions and the general business environment of the selling vendor influences food vendors' selection of foodstuffs.

Comparatively, food vendors at St. Louis College of Education are more particular about the factors that influence the selection of foodstuff than the food vendors at Opoku Ware School.

The main basic steps for food safety were cleaning, separating, cooking and chilling and that vendors did not pay particular attention to separation (using separate knives and chopping boards) but cleaned foods always and kept leftover foods in freezers for future use.

Comparatively, food safety practices adopted by St. Louis College of Education vendors were better than those practiced at Opoku Ware SHS.

Food vendors in both institutions maintained good personal hygiene. Food vendors at St. Louis College of Education have a better health outlook and personal hygiene of themselves than the food vendors at Opoku Ware SHS.

The correct preservation of food maintains food safety and thus eliminates food waste and while a broad variety of storage methods exist, several vendors have opted to refrigerate as the most efficient form of preserving food.

Refrigeration was mostly used by vendors to store leftover foods such as stews, snacks and drinks whereas cereals were stored in cool dry places.

Finaly, 48% of food vendors at St. Louis College of Education demonstrated better food safety practices than those at the Opoku Ware SHS who had 14%.

**5.2 Recommendations**

The following recommendations were placed forward for consideration by the authority based on the observations and conclusions of the report.

Ghana Education Service and school authorities should organize training for food vendors in all educational institutions. This will go a long way to improve their level of knowledge and awareness concerning food safety especially food vendors at St. Louis College of Education.

School authorities particularly Opoku Ware School should ensure that much attention is given to the quality of foodstuffs procured for food preparation for the students.

Ghana Education Service should institute a requirement for all food vendors operating in all academic institutions in the country to undergo periodic medical checks and reviews.

Conditions appropriate for the storage of food should be created to facilitate wholesome preservation and storage of all manner of foods while in stock so as to safeguard the safety of the food prepared for students' consumption.

Males should be encouraged to take up the vending business to promote gender balance, equity and generate income to cater for the family and meet societal responsibilities.

### 5.3 Suggestions for Further Research

The focus of the study has been to compare the food safety practices issues in two educational institutions; that is Opoku Ware School and St. Louis College of Education all in the Kumasi Metropolis. The results therefore cannot be generalized. For this reason, up and coming researchers should consider widening the scope to cover many educational institutions for a more general perspective of food safety practices among food vendors.

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# APPENDIX A

## QUESTIONNAIRE FOR FOOD VENDORS

Dear respondent, I am a student of University of Education, Winneba, Kumasi campus offering MPhil (Catering and Hospitality) programme in the Department of Catering and Hospitality.

I am conducting a study on the topic: **Food Safety among Food Vendors: A Comparative Study between St. Louis College of Education and Opoku Ware School in Kumasi Metropolitan Area.** I am aware of your busy schedule but your involvement in this study is very crucial. I therefore entreat you to kindly respond to the following items appropriately to enable me find answers to the study. The confidentiality and anonymity of your responses are assured. The information you provide will be used for academic purpose only.

Your full co-operation is needed.

Thank you.

If you need further information, please call me on the number:

**0547624044/0208185108**

**Faustina Busumbru**

**SECTION A: BACKGROUND INFORMATION**

**Instruction:** Please, tick (√) the response which corresponds with your background information.

1. Gender: Male [ ] Female [ ]
2. What is your educational level? ……
3. What is your marital status? .....
4. How old are you? ……..
5. What is your length of employment? …….

**SECTION B: Food vendors' Knowledge level on food safety and Factors that influence selection of foodstuffs**

**Instruction:** Below is a table to be completed. It involves statements on food safety knowledge level of vendors in Kumasi metropolis on a 5-point scale of SA, A, N, D and SD. The letters stand for the following;

SA (strongly agree) A (agree), D (disagree) SD (strongly disagree)

For each of the statements, indicate with a tick (√) the one that best reflects what you do.

| S/N | Statements | SA | A | N | D | SD |
|---|---|---|---|---|---|---|
| 1. | Washing hands with soap and water reduces the risk of food contamination. | | | | | |
| 2. | Using gloves while handling food reduces the risk of food contamination. | | | | | |
| 3. | Proper cleaning and sanitization of utensils increase the risk of food contamination. | | | | | |
| 4. | Reheating cooked foods can contribute to food contamination. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | Washing utensils with detergents leaves the food from food contamination. | | | | | |
| 6. | Salmonella is among the foodborne pathogens. | | | | | |
| 7. | Cross contamination is when microorganism from a contaminated food is transferred by the food handlers 'hands or kitchen utensils to another food. | | | | | |
| **FACTORS THAT INFLUENCE SELECTION OF FOODSTUFFS** | | | | | | |
| 8. | Perceived nutritional value of foodstuffs | | | | | |
| 9. | Physical characteristics of food (Freshness, texture) | | | | | |
| 10. | Seller's storage conditions | | | | | |
| 11. | Seller's general business environment | | | | | |

**SECTION C: FOOD SAFETY PRACTICES: KNOWLEDGE LEVEL OF FOOD VENDORS AND PERSONAL HYGIENE OF FOOD VENDORS**

**Instruction:** Below is a table to be completed. It involves statements on Educational Level of Food Vendors and Existing Diseases/personal hygiene of Food Vendors on a 5-point scale of SA, A, D and SD. The letters stand for the following; SA (strongly agree), A (agree), N (Not sure), D (disagree) SD (strongly disagree)

For each of the statements, indicate with a tick (√) the one that best reflects what you do.

| S/N | Statements | SA | A | N | D | SD |
|---|---|---|---|---|---|---|
| | **FOOD SAFETY PRACTICES** | | | | | |
| 1. | After handling raw meat or poultry I always wash my hands with soap and water | | | | | |
| 2. | All food handlers dry their hands by using kitchen or dry cloth | | | | | |
| 3. | Most food handlers have taps for washing vegetables | | | | | |
| 4. | Food vendors wash fresh fruits and vegetables under running tap twice. | | | | | |
| 5. | Food vendors have separate knives for raw and ready to eat food items. | | | | | |
| 6. | Food vendors treat chopping board in between use for raw and ready to eat food by washing with water. | | | | | |
| 7. | All food handlers keep leftover foods in a freezer. | | | | | |
| 8. | I read the food label information I see on pre-packaged foods I buy. | | | | | |
| **KNOWLEDGE LEVEL OF VENDORS ON FOOD SAFETY** | | | | | | |
| 9. | Washing hands with soap and water reduces the risk of food contamination | | | | | |
| 10. | Using gloves while handling food reduces the risk of food contamination | | | | | |
| 11. | Proper cleaning and sanitization of utensils increase the risk of food contamination. | | | | | |
| 12. | Reheating cooked food can contribute to food | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | contamination | | | | | |
| 13. | Washing utensils with detergents leave the food from food contamination | | | | | |
| 14. | Salmonella is among the foodborne pathogens | | | | | |
| 15. | Cross contamination is when microorganism from a contaminated food is transferred by the food handlers' hands or kitchen utensils to another food | | | | | |
| | **PERSONAL HYGIENE OF FOOD VENDORS** | | | | | |
| 15. | Food handlers who have abrasions or cuts on their hands should not touch foods. | | | | | |
| 16. | Food vendors sneeze away from food during food preparation. | | | | | |
| 17. | Most vendors stop preparation of food when they observe signs of dizziness, vomiting and diarrhea | | | | | |
| 18. | Touching food by hand without gloves lead to contamination and cause food poisoning | | | | | |
| 19. | Most vendors wipe their hands on their kitchen uniforms | | | | | |

**SECTION D: STORAGE PRACTICES OF FOOD VENDORS**

**Instruction:** Below is a table to be completed. It involves statement on storage practices of food vendors on a 5-point scale of SA, A, N, D and SD. The letters stand for the following:

SA (strongly agree) A (agree)

D (disagree) SD (strongly disagree)

For each of the statements, indicate with a tick (√) the one that best reflects what you do.

| S/N | Statements | SA | A | N | D | SD |
|---|---|---|---|---|---|---|
| 1. | The correct temperature for storing perishable food is 5c | | | | | |
| 2. | Freezing kills all the bacteria that may cause food borne illness. | | | | | |
| 3. | Meat should be stored in a freezer. | | | | | |
| 4. | The ideal place to store raw meat in a freezer is on a bottom shelf. | | | | | |
| 5. | The best way to defrost meat is by using refrigerator. | | | | | |
| 6. | The best way to cool frozen food is by defrosting them. | | | | | |
| 7. | Most food vendors store perishable food in a refrigerator. | | | | | |
| 8. | Leftover food such as stews, snacks and drinks are stored in a refrigerator and used on the next day. | | | | | |
| 9. | Cereals such as maize, groundnut and rice are stored in a cool dry place. | | | | | |
| 10. | Leftover flour is stored in a freezer. | | | | | |

# APPENDIX B

## INTERVIEW PROTOCOL FOR MATRONS AND ADMINISTRATORS

**Section A: Demography**

Interview No.: _____

Date/Time: _____

Interviewee: _____

School: _____

Female [ ] Male [ ]

What is your assessment of the knowle dge level of food vendors you work with in the school?

What food safety practices do your food vendors demonstrate in the school?

What factors duly influence selection of foodstuffs by food vendors in your school?

What food safety practices have you adopted in your school in the storage of food?

What is your assessment of the personal hygiene of food vendors in the school?

Any comments?