

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF SCIENCE

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

**DEVELOPMENT OF A GENERIC FOOD SAFETY MANAGEMENT SYSTEM FOR
SENIOR HIGH SCHOOLS**

BY

**ESHUN EMMANUEL EKOW (PG 7048016) JUNE,
2018**

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SENIOR HIGH SCHOOLS**

**A THESIS SUBMITTED TO THE DEPARTMENT OF FOOD SCIENCE AND
TECHNOLOGY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
AWARD OF THE DEGREE OF**

MASTER OF SCIENCE IN FOOD QUALITY MANAGEMENT

BY

**ESHUN EMMANUEL EKOW (PG 7048016) JUNE,
2018**

DECLARATION

I hereby declare that this submission is my work towards the Master of Science in Food Quality Management and that to my best of neither knowledge it contains no material previously published nor material which has been accepted for the award of any other masters of the university, except where due acknowledgement has been made in the text.

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ACKNOWLEDGEMENT

To all staff of the of Department of Food science, I express my profound gratitude, especially my Supervisor, Dr. Herman Lutterodt for all the painstaking work they put in to get this work thus far.

My appreciation also goes to the staff and students of all boarding senior high schools in the Ga municipality for the cooperation I enjoyed throughout my data collection at their various institutions.

To my parents and siblings for all the support they have offered me throughout my educational life and beyond.

To any other person who has contributed in any way towards the success of this work, I say thank you.

May the Almighty God richly bless all of you.

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ABSTRACT

Lack of personal hygiene among food handlers is one of the most commonly reported practices that contribute to foodborne illness. A cross-sectional study was conducted in selected senior high schools. Questionnaires were designed to elicit information on written policies and procedures on food safety management including procedures for ensuring safety of food brought in by food vendors, procedures for ensuring safety of food prepared in kitchens, procedures for ensuring safety of foods brought from home, procedures on receiving and storing of food, as well as a crisis management plan that details the roles and responsibilities of staff and procedures for accounting for and releasing students in the event of an out-break of a food-borne illness. Only two schools (33.3%) had at least 2 written policies on ensuring food safety, and these policies were on ensuring safety of food brought from home by students and safety of food brought for sale by external vendors. Also, 66.7% of schools did not have an outbreak crisis management plan defining staff roles in an emergency. Though all schools had equipment for food preparation, none had equipment for ensuring food safety such as thermometers. The results of the present study indicate that senior high schools in the Greater Accra Region have limited to no systems in place to manage the safety of food served to students, placing these students at an elevated risk for food-borne diseases. It is recommended that schools be mandated to adopt and implement food safety management programs to safeguard the health and wellness of students.

KEY WORDS: Food-borne illness, food safety, food safety policy, food safety equipment, food service staff, senior high schools.

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LIST OF ABBREVIATIONS

BSI	British Standards Institute
CDC	Center for Disease Control
FAO	Food and Agric Organization
FDA	Food and Drug Authority
GHS	Ghana Health Service
GNA	Ghana News Agency
HACCP	Hazard Analysis and Critical Control Points
MDAs	Metropolitan Municipal and District Assemblies
MDG	Millennium Development Goals
SHS	Senior High Schools
SDG	Sustainable Development Goals
USDA	United States Development Agency

WHO

World Health Organisation

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Outbreaks of many foodborne diseases are due to contaminations that occur during food preparation with the food service establishments (Pantry). Cases of food poisoning are prevalent in schools as a result of cross- contamination during food preparation. (Scallan and Angulo, 2011). The outbreaks of foodborne diseases in school feeding programs/ pantry system can result in life threatening diseases, huge medical cost and the spread of infection to other students and staff, thereby leading to disruption of learning in schools. (Scharff 2012)

The Ghana Food and Drugs Authority (FDA) food safety management guidelines for food hygiene identify the essential principle of food hygiene applicable throughout the food chain (including primary production through to the food consumer) to achieve the goal of ensuring that food is safe and suitable for human consumption.

This document follows the food chain from primary production to the final consumer, setting out the necessary hygienic conditions for producing food which is safe and suitable for consumption. This project provides the baseline structure for the other, more specific guidelines applicable for institutions or sectors (Second cycle pantry system). This provides assurance that the food is suitable for human consumption and provides health education programme which effectively communicate the principles of food hygiene to consumers.

In the last decade, the apparent incidence of foodborne disease has increased worldwide, despite the introduction of HACCP, and the proliferation of food safety management regulations (Maurice, 1994). The increased incidence of foodborne diseases, caused among others by changes in agricultural and

food processing practices stresses the need for effective food quality and safety assurance systems. Current approaches to food safety that rely heavily on regulated inspection and sampling regime cannot efficiently guarantee its protection since 100% inspection and sampling is financially and logistically impossible.

This approach allows the requirements in this thesis/document to be flexible and sensibly applied with the proper regard for the overall objective of producing food which is safe and suitable for consumption. In so doing it takes into account the wide diversity of activities and varying degree of risk involved in producing food.

A need exists for controlling the activities of people whose actions are aimed at preparing food intended for consumption by others by means of food laws. To ensure effective food control, it is crucial that the food service programme contains food control regulatory activities that are enforced by health authorities or local authorities so as to provide learners (students) with the necessary protection. This requires a safety and sanitation system that will consistently provide the certainty that food is prepared and served under safe and sanitary conditions.

Lack of knowledge on good hygiene practices is the main source of food borne diseases which impact negatively on the education of the learners. Good hygiene practices ensure that foods provided to learners are safe and free of biological hazards which are responsible for food poisoning outbreaks or foodborne illness in schools. Policies are needed at the school level to support and provide the necessary guidelines for the effective implementations of school food safety management system. A supportive environment to ensure safe food storage, preparation, transportation and consumption is needed in all schools. Well-constructed kitchens and storage rooms are needed to ensure hygienic food preparation and storage. (WHO, 1997:1-4).

On February 12, 2010, the Daily Graphic newspaper in Ghana published that about 100 students of Archbishop Porter Girls Senior High School (a boarding school in Ghana) were plagued by stomach pains, vomiting, diarrhoea and general weakness after meals due to food poisoning. The food industry is regulated to ensure a safe food supply; however, there is some degree of risk. All foods must be grown, handled, packed, prepared, stored, and served properly to ensure food remains safe for consumption.

Although the vast majority of cases of food-borne illness are mild, a significant number are fatal, a high incidence of acute infections and chronic sequel can lead to billions of dollars in medical costs, loss of productivity and frequent recalls. The problem of food safety is not only a problem in developing countries but also in developed countries, which have advanced food chain monitoring systems.

1.2 Problem Statement and Justification

Food safety is the assurance that food will not cause harm to the consumer when it is prepared and or eaten accordingly to its intended use. Millions of people fail it and many do suffer from serious illness/disorders, long term complications or die as a results of eating unsafe food. Foodborne and water borne diarrhea are the leading causes of illness and globally kill an estimated 2.1 million people annually mostly of whom are children of school going age in developing countries.

A lack of documented food safety management system where activities involving receipt of food ingredients/raw materials are recorded and properly stored (poor warehousing) and documented processing of food for students consumption is lacking hence resulting in numerous food safety incidents.

Documentations and equipment measurements and calibration is absent therefore food where temperature regulations are must to avoid microbial growth is overlooked resulting in food safety incidents.

Food safety is a public health concern especially the foods served to students by the school pantry. Students in Africa usually experience five episodes of diarrhoea per year and about 800,000 people die each year from diarrhoea and dehydration (Mead *et al*, 1999). The estimated number of foodborne diseases reported in Ghanaian hospitals by the Daily guide from the Ghana health service is that 1348 children suffered from poisoning among schools in Madina, Accra from food served by a contracted caterer, Dozens of pupils from the school hospitalized from food poisoning from meals. (Ghana health service, Daily guide, P28)

Food handlers, the people who are directly in the production of and preparation of the food stuffs, are integral to reducing food safety risks. (De Susa, 2008; Chapman, 2009). Lack of personnel hygiene among food handlers is one of the most commonly reported practices that contribute to foodborne illness. (Taulo *et al*, 2009). The majority of the foodborne outbreaks associated with food workers have included transmission of the pathogens to food by the food workers hand. (Guzewich and Ross, 1999; Cakiroglu and Uğar, 2008) and ensuring personnel particularly hand washing has been cited the most effective tool in preventing the spread of foodborne infections (NHS Plus, 2008)

Ensuring basic food safety principles is very important if the problem of food-borne illness is to be reduced, to decrease the government's huge expenditure on food-borne illnesses (Saba *et al*, 2012).

Even though the Accra Metropolitan Assembly has adopted several strategies, interventions and programs targeting improving the state of food safety management practices in senior high schools, much has not been achieved. There is therefore a need for immediate action in order to reduce health care spending as well as reduce losses in productivity.

This research will help policy makers in designing policies that will help check poor food safety practices in senior high as well as junior high and basic schools where the school feeding programme is being implemented to help attain SDG 1.

This study will make significant contributions, both theoretically and empirically to the existing knowledge of literature and also increase the understanding of food safety management practices in the Accra Metropolitan area and provoke future research in order to fulfill the global food safety policies as well as the national food safety policies.

1.3 Objective

- To assess the food safety management systems and hygiene practices in Senior High School Pantries.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 General Overview

A number of food-related crises and scandals in recent years raised the awareness of agrifood companies and supply chains to improve product safety. A food scandal over melamine poisoned milk in China in 2008 made it clear that, due to global trade, hazards can be easily spread to other food chains within the same country, and even to other countries (Okazaki *et al.* 2009; Chan *et al.*, 2009; Ingelfinger 2008). The food-borne outbreak of enterohemorrhagic *Escherichia coli* (EHEC) in Germany in 2011, causing 53 dead and 3842 diseased people (Appel *et al.* 2011), demonstrated the seriousness of the consequences not only for the health of consumers, but also for the economy of the affected industries and countries.

Recently in Ghana, over forty students of Twifo Praso senior high school were rushed to the hospital for food poisoning after having consumed their evening meals (Ghana News Agency, 2013), coupled to this was another incident of food poisoning at Adonten Senior High school in which more than forty students were hospitalized (Ghana News Agency, 2013). These and many more stories of food poisoning, makes it necessary for an evaluation and improvement of food safety management systems in Ghanaian high schools.

2.2 Food safety

The Food and Agriculture Organization of the United Nations in collaboration with the World

Health Organization (2002) define food safety as the concept that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use and is related to the occurrence of food safety hazards but does not include other human health aspects related to, for example, malnutrition.

Food safety is related to the presence of food-borne hazards in food at the point of consumption (intake by the consumer). As the introduction of food safety hazards can occur at any stage of the food chain, adequate control throughout the food chain is essential. Thus, food safety is ensured through the combined efforts of all the parties participating in the food chain (BSI, 2010).

2.3 History of food safety

Terry L. Smith (2011) in an attempt to discuss the history of food safety speculates that the first prehistoric people to enjoy a meal of roasted meat were excited at how much better it tasted relative to raw foods. Inferably, no attention was given to the health benefits or otherwise that came with either of these two meals. He further contends that little did they know that their discovery of fire for cooking their food was also the first step toward reducing food-borne illnesses. Even though history had not provided the details, it is apparent that people had suffered and died from food-borne illness beginning with the very origins of man. He goes on to add that early recorded history makes references to dietary practices and records of mass deaths that suggest the existence of food-borne illness. Consequently, some scientists have interpreted the biblical story of a severe plague following an Israelite feast of quail as a case of mass food poisoning. Similarly, the presence of food-borne illnesses is even demonstrated more strongly through the horrors on the battlefield. Indeed almost every war has a history of an accompanying incident of soldiers dying from disease as opposed to the actual battle. For instance, the defeat of the Golden age of Greece by Sparta, in the famous “plague of Athens” in the century B.C., was most likely due to food-borne illness. Similarly, the fall of the Roman Empire is hypothesized to have been caused by Lead poisoning of

wine. Also, the opium wars between the Britain and China in the nineteenth century is linked to a case of intentional food poisoning while many more soldiers in the Spanish-American war were thought to have died from disease (Typhoid fever associated with the unsanitary conditions of the training camp) rather than in battle.

2.4 Food safety in the world

Food-borne diseases present adverse consequences on health. The morbidities and mortalities culminating from the intake of unsafe food are pegged at thousands of millions of people. Subsequently, the world health organization in May 2000 in its 53rd world health assembly adopted a resolution imploring the WHO and its member states to recognize food safety as an essential public health function. As part of the endorsement, the resolution also beseeched the WHO to develop a Global Strategy for reducing the burden of food-borne disease. The availability of safe food according to the WHO improves the health of people and is a basic human right. Safe food contributes to health and productivity and provides an effective platform for development and poverty alleviation. People are becoming increasingly alarmed about the health risks posed by microbial pathogens and potentially hazardous chemicals in food. It is estimated that up to one-third of the populations of developed countries are affected by foodborne illness yearly, and the problem is likely to be even more widespread in developing countries with the poor being the most susceptible to ill-health. In less developed countries, food and waterborne diarrheal diseases are leading causes of illness and deaths, responsible for 2.2 million deaths annually. A larger proportion of these deaths usually occur in children (WHO, 2002).

The current trend of events in the global food production front as well as processing, distribution and preparation pose new challenges to food safety. To this end, food produced in one country is now capable of being transported and consumed half way across the globe. There are higher demands for a wider variety of foods than in the past and more so is the demand for out-of-season foods and foods most often consumed away from home. The institutionalization of children in schools and childcare facilities coupled with the growing number of elderly persons in hospitals and nursing homes is indicative that food for many is prepared and handled by a few and therefore can be a major source of food-borne disease outbreaks. Further to this is the fact that, unsafe food remains a more serious threat to the increasing number of immune compromised people. In responding to these challenges therefore, WHO and its member states recognize and protect food safety as a vital public health function. In furtherance to this position, WHO requires that food safety should and must be addressed along the entire food chain on the basis of sound scientific information at both national and international levels. It further requires the enhancement of WHO's capacity to assess the risks posed by microbiological and chemical hazards and that of new food related technologies. In demonstrating its commitment to ensuring better health for all, the WHO will continue to support member states in establishing and updating that capacity (WHO, 2002).

2.5 Food safety in Ghana

Various evidences exist as regards the number of cases, outbreaks, type of food and microorganisms involved, the economic value of food-borne diseases to a country's economy as

well as the likely negative impact of the absence of food safety in a nation's food supply system (Doyle, 1993; Bean and Griffin, 1990).

In Ghana food-borne diseases such as cholera and typhoid fever are among the top ten diseases in most health facilities. However, there is little evidence on policy and adherence to food guidelines among stakeholders of the food industry (Agyei-Baffuor *et al*, 2013).

The incidence of food related infections is grossly under-reported in Ghana because, only the very serious episodes are taken to hospital. Invariably, only severe outbreaks may be properly investigated to identify the causative agent (Newman, 2005).

An estimated 30% of the population in developed countries is affected by food-borne diseases every year while the incidence in less developed countries remains largely unknown (Mahami and Odonkor, 2012). According to the Africa Agriculture and Rural Development (AFTAR) World Bank (2006), the number of yearly reported outpatient cases of food-borne diseases is 420,000 with the annual death rate estimated at 65,000. This economic cost to the Ghanaian economy is estimated at US \$ 69 million.

Outbreaks of foodborne illness have been linked to improper food handling practices at the foodservice establishments. (Bas *et al*, 2006, Cakiroglu and Ucar, 2008, Hansen *et al.*, 2010; Da Cunha *et al.*, 2012). The most commonly reported food preparation practices that contribute to foodborne disease include poor environmental hygiene, inadequate cooking, contaminated equipment, improper holding temperatures and food from unsafe sources (Guzewich and Ross, 1999; Da Cunha *et al*, 2012).

2.6 The need for food safety

The existence of evidence on serious outbreaks of food-borne diseases on all continents in the past decade depicts both the public health and social significance of these diseases. Consumers across the globe continue to perceive the outbreak of food-borne diseases with increasing concern. Children, pregnant women, the elderly and people affected by other diseases are among the most affected by food-borne diseases. These diseases do not only hugely affect the health and wellbeing of people, but they have economic implications for individuals, families, communities, businesses and countries. These diseases are also noted to aggravate the burden on health care systems and markedly reduce economic productivity. In the long run, the loss of income to poor people as a result of food-borne diseases perpetuates the cycle of poverty (WHO, 2002).

2.7 Food Safety in Schools

Preventing food-borne illness is an important concern in school settings because outbreaks have personal, academic, financial, and legal consequences for each school district (Marx, 2008).

Student absenteeism affects a student's performance in school, and if a food-borne illness outbreak occurred, school districts could experience increased insurance costs, attorney fees, and loss of revenues due to decreased participation in school meals (Marx, 2008). Children are an at-risk population and can contract food-borne illness from eating or drinking a contaminated substance.

In a 10-year study conducted between 1990 and 1999 by the U.S. General Accounting Office ([GAO], 2003), 3% of food-borne illness outbreaks occurred in schools. Daniels *et al.*, (2002) studied the outbreaks that occurred in the period between January 1973 and December 1997 and found there were 604 school-related outbreaks reported to the CDC from state and local health departments. The commonly reported food practices contributing to the school-related outbreaks

were improper food storage, food contaminated by a food handler, and improper holding temperatures (Daniels *et al.*, 2002). Other improper behaviors noted during observational research and survey studies were poor hand washing (Henroid and Sneed, 2004), lack of hair restraints (Giampaoli, Cluskey, and Sneed, 2002; Gilmore, Brown, and Dana, 1998), lack of calibration of thermometers (Henroid and Sneed, 2004), improper reheating (Kim and Shanklin, 1999), inappropriate sanitizing, improper heating and cooling (Henroid and Sneed, 2004), and consumption of food in a preparation area (Giampaoli, Cluskey and Sneed, 2002). In general, these studies found proper food-handling practices in schools were not being followed consistently.

Prior to the requirement for HACCP implementation, there was evidence that school food service administrators were aware of the need for food safety plans. In different state and national studies conducted prior to the food safety HACCP policy mandates, food service managers in one study and directors in others were asked their familiarity of knowledge of HACCP and frequency of policies in place. Hwang, Almanza, and Nelson (2001) conducted a study among school food service managers in Indiana schools to identify factors related to HACCP implementation. The majority of the responding managers (n = 107, 66.5%) indicated they were familiar with HACCP, yet of those, only 22 school operations had a HACCP program in place, although 30 respondents (45%) indicated they were interested or would be implementing HACCP in the near future. Young and Sneed (2002) found that 22% of food service directors (FSDs) in Iowa were familiar with HACCP. Giampaoli, *et al.* (2002) found in a national study that 30% of school FSDs reported to have implemented HACCP. Of the 445 schools contacted in the 2006 School Health Policy and Program Study, 71.4% of the schools had written HACCPbased plans (O'Toole *et al.*, 2007). Thus, the HACCP mandate did appear to result in plan development. In another study, the SNA (2008) found that, after the USDA mandate, 85% of schools reported HACCP implementation.

School food service operations use a variety of food production systems, such as conventional onsite, commissary, satellite, cook–chill, and base kitchens (Unklesbay *et al.*, 1977). Nettles and Gregoire (2000) identified that school districts with enrollments of less than 8,500 primarily had conventional onsite kitchens (69.6%) or conventional base kitchens (54%). The majority of school districts with enrollments greater than 8,500 had conventional onsite kitchens (31%) or conventional base kitchens (45%). There has been a trend for school districts to change production systems to central production as a way to streamline operations and to combat budget constraints. As these changes occur, facilities and equipment items need to be adequate to ensure proper temperature holding and controls for products during transportation to service sites (Almanza and Sneed, 2003). The Food Safety Assurance Pyramid (Gravani, 2008) comprises three overarching areas: prerequisite programs, on-going employee training, and total management commitment. This is the foundation of support not only for the pyramid but for the success of the HACCP program. Commitment and support from management and administration are critical; without this support the HACCP program may not work in school operations (National Advisory Committee on Microbiological Criteria for Foods [NACMCF], 1998).

2.8 Food safety implementation in boarding schools

Food safety inspection is lacking in some schools, although federal law requires schools across the country to have food safety inspections twice a year, nearly 9,000 schools during the 2007-2008 school year did not. According to data from the U.S. Department of Agriculture's Food and Nutrition Service, almost 27,000 schools in the U.S. received one food safety inspection or were not inspected at all (Alexa Nameth, 2010).

The global importance of food safety is not fully appreciated by many public health authorities despite a constant increase in the prevalence of food-borne illness. Numerous devastating outbreaks of salmonellosis, cholera, enterohaemorrhagic *Escherichia coli* infections, hepatitis A and other diseases have occurred in both industrialized and developing countries. In addition, many of the re-emerging or newly recognized pathogens are food-borne or have the potential of being transmitted by food and/or drinking water. More food-borne pathogens can be expected because of changing production methods, processes, practices and habits (Abdussalam and Käferstein, 1993).

While food safety is considered to be an important issue in school foodservice, there have been several recent outbreaks of food-borne illness in schools and research shows that safe sanitation and food-handling practices are not always followed in school meal programs.

There are thousands of types of bacteria in the environment but most of them do not cause harm, some bacteria are useful to the body and keep the digestive tract healthy, pathogens which are also harmful bacteria get into contact with food and water supply can cause food-borne diseases or food poisoning. These bacteria could result in food-borne illnesses as a result of the channels raw food products are sourced from, the way they handled during storage, the way they are sanitized before use etc. (Medeiros *et al*, 2004).

Infections can lead to inflammation, decreasing nutrition status, further compromising the immune systems. This is not good for students since it retards their studies.

Food safety education is most effective when the messages are geared towards changing behaviors that most likely are the causes of food-borne illnesses. Food education is more effective if the messages are targeted towards specific audience

Furthermore, poor hand and surface hygiene is also a significant contributing factor (Cogan *et al.*, 2002) in up to 39 % of domestic or school food poisoning outbreaks (Ryan *et al.*, 1996). Overall, research has found that the most common behaviors impacting the control of numerous pathogens include proper hand washing and personal hygiene, safe and adequate cooking of food, storing foods at safe temperatures, and effectively washing surfaces and equipment to prevent cross-contamination (Medeiros *et al.*, 2004; Medeiros *et al.*, 2001a; Medeiros *et al.*, 2001b).

2.9 Food safety management systems

Food safety management systems are systems that are put in place to ensure that food products produced during preparation and processing are wholesome for consumption and of good quality. Examples are prerequisite programs and HACCP. Prerequisite programs (PRPs) provide the foundation for HACCP in an overall food safety management program. PRPs are those practices that are needed before and during the implementation of HACCP otherwise the system will not be functional (Tuominen *et al.*, 2003; WHO, 1998). The PRPs needed include GMP, GHPs, SOPs, SSOPs, and GAPs (FSRIO, 2005; Tuominen *et al.*, 2003; Wallace and Williams, 2001). Food safety management systems are beneficial in a number of ways which includes;

- it aids in detecting hazards that are likely to occur during the food processing procedure hence measures can be put in place to prevent such hazards
- it ensures compliance to food safety laws
- it improves food safety standards
- it promotes teamwork among staff hence making their work more efficient
- Protects your customers
- Improves control of food processes

- Provides a process for continuous self-inspection and self-improvement
- Provides a defense against complaints and legal action
- Develop procedures to reduce the risk of an outbreak
- Monitor processes to keep food safe □ Verify that food served is consistently safe

(School Nutrition Association, 2005).

2.9.1 History of food safety management systems (HACCP)

HACCP began in the early 1960s. The US National Aeronautics and Space Administration (NASA) needed a system to ensure that astronauts did not become sick from food eaten in space.

The Pillsbury Company, along with the United States Natick Laboratories and NASA, developed the HACCP system to ensure food safety (School Nutrition Association, 2005)

During the 1990s HACCP was mandated for seafood, meat and poultry processing plants based on USDA/FDA regulations. In the mid-90s commercial food services, schools with central kitchens and hospitals began to use HACCP Programs voluntarily because HACCP contributes to effective risk management (School Nutrition Association, 2005).

As of July 2005, Child Nutrition Programs have a legislative mandate to implement food safety programs based on HACCP Principles. Child Nutrition Programs are the first segment of retail foodservice operations to be mandated to implement a food safety program based on HACCP principles (School Nutrition Association, 2005).

HACCP stands for Hazard Analysis Critical Control Points and utilizes the following seven principles:

1. Identify Hazards
2. Identify Critical Control Points
3. Establish Critical Limits
4. Establish Monitoring Procedures

5. Establish Corrective Actions
6. Establish Verification Procedures
7. Establish Record Keeping Procedures

2.10 Predisposing factors for poor food safety practices

Several studies have reported inappropriate food handling practices in school foodservice, such as unsafe food handling with bare hand contact, infrequent changing of gloves between tasks, insufficient hand washing, inappropriate hair restraints, improper eating and drinking in food preparation areas, and inadequate cleaning and sanitation of utensils, equipment, and facilities (Henroid and Sneed, 2004; Giampaoli, Cluskey, and Sneed, 2002; Gilmore, Brown, and Dana, 1998).

The USFDA (2006) identified risk practices and behaviors that contributed to food-borne illnesses: improper holding/time and temperature; poor personal hygiene; and contaminated equipment/prevention of contamination.

2.10.1 Knowledge on food safety

Foodservice workers play a major role in prevention and control of outbreaks of food-borne illness and in meeting the goal of serving safe food (Lin and Sneed, 2005).

Socioeconomic class and educational level can affect food safety knowledge and awareness, with lower levels of knowledge related to lower educational levels and lower socioeconomic classes (Sudershan *et al.* 2008).

Only knowledgeable, motivated, and skilled employees who are trained to follow the proper procedures together with management that effectively monitors employees' performances can ensure food safety (Cohen *et al.* 2001).

Studies have found that food safety training is positively associated with self-reported changes in food safety practices (McElroy and Cutter, 2004; Clayton, *et al*, 2002), and improved attitudes (Wie and Strohbehn, 1997).

Food businesses must make sure that food handlers and people who supervise food handlers have skills and knowledge in food safety and food hygiene for the work they do (Food standards Australia New Zealand, 2002).

Food handlers are those of your staff who are involved in any activity in your business that involves food or surfaces likely to come in contact with foods. It covers your staff whose work involves manufacturing, processing, preparing (such as chopping, cooking, thawing), delivering, transporting or packing your food and your staff that clean your premises and equipment (Food standards Australia New Zealand, 2002).

There are two broad categories of skills and knowledge required. These can be summarized under two categories.

2.10.1.1 General practices

- Personal hygiene practices and responsibilities about their health that all food handlers preparing food know and put into practice.
- Food handling practices to prepare and store food correctly.
- Hygiene practices to keep the food premises and equipment clean and well maintained.

2.10.1.2 Specific practices

Skills and knowledge needed for more specific food handling operations, such as receiving food into the premises, cooking, reheating and cooling food, controlling the time food is at room temperature and disposing of food (Food standards Australia New Zealand, 2002).

It is very important for managers to educate all employees about food safety, train them to use appropriate food handling procedures, and monitor their performance. To ensure safe food handling and change incorrect food handling behaviors, employees must be provided with accurate knowledge and be motivated to apply that knowledge. Moreover, ongoing reinforcement of training programs must be given regularly in the workplace so that employees consistently use desired food handling practices (Rennie, 1994).

2.10.2 Availability of food safety policy

Safe food is important in preventing food-borne diseases. It is a legal requirement to document food preparation procedures to ensure that food served is safe to eat. Food handlers must read the food safety policy and sign to show that they understand its content (Merican, 2000).

A supervisor must check monthly that the food safety policy is being adhered to and record outcome in the food safety diary (Merican, 2000).

The need to protect the public against infections is of paramount importance in the food industry.

Food safety policies and procedures are therefore used to create safety management and such safety policies include procedures, quality assurance and the use of HACCP (Agyei-Baffuor *et al.*, 2013)

Ensuring food safety is a transdisciplinary task involving, government ministries, departments and agencies (MDAs). While the enactments are made by Parliament and the regulations made pursuant to these enactments provide the main corpus of food law, the work of these MDAs are critical for the successful development and application of food laws and improvement in food safety (Fairman and Yapp, 2004).

In Ghana, the Ministry of Health, Standard Board and Food and Drug Board oversee issues about food safety. For instance, the major aims of Ghana Standard Board (GSB) includes; establishment and promulgation of standards with the objective of ensuring high quality in goods produced in

Ghana, whether for local or for export; and promoting standardization in industry and commerce; promoting industrial efficiency and development, promoting standards in public and industrial welfare, health and safety (Ackah C, 2010). Again, one of the core mandates of the GSB includes; Article 3(2) (d) to maintain the necessary machinery to ensure that goods prepared and manufactured for export are distinctly marked for export only, and to provide for issue of a certificate to the effect that goods comply with known requirement of standards in the country to which they are or about to be *consigned*, before the export of such goods are permitted. Others include; Article 3(2) (k) to cooperate with representatives of any industry, or with any government department, local authority, or other public bodies or persons with a view to securing the adoption of standards safety (PNDC Law 305, 2011).

Policies are of utmost essence with regards to food and every substance human beings ingest. A number of researches have been carried out with regard to policies aligned with food, typical of these is a study by the Allen Consulting Group (2002) where they evaluated the benefits and costs of Food Safety Programs as well as the National Risk Validation Project (Food Science Australia and Minter Ellison, 2002) which also identified high-risk sectors throughout the food supply chain based on food-borne illness data and proceeded to highlight where Food Safety Programs could be justified on benefit/cost grounds. With regard to general food service, the National Risk Validation Project (NRVP, 2002) identified two sectors where Food Safety Programs would be justified by the high food safety risk; catering operations serving food to the entire public and eating enterprises for instance restaurants, cafes, and takeaways (Jouve *et. al.*, 1998). Food safety management policy must consider public health impacts, which may include impacts relevant to the whole population as well as specific groups or individuals. In effect, food safety management policy should not have adverse effects on protection of public health and safety,

incidence of contamination of food and incidence of food-borne illness but must favorably be inclined towards all these variables to ensure its maximum good (Crossley and Motarjemi, 2011). The 2006 report Annual Cost of Food-borne Illness in Australia identified the fact that there is a risk that the effects of food-borne illness on the economy may increase, unless interventions can decrease the incidence of these illnesses (Abelson *et al.*, 2006). Food safety management policy guidance that targets specifically at retail or food service has the potential to underpin arrangements that will significantly reduce food safety risks in the sector, which is currently over-represented in causal and costing data (Crossley and Motarjemi, 2011).

It is worthy of note that good regulatory practices consistent with the principle of minimum effective regulation and effective implementation will aid in achieving regulatory objectives, and at the same time have proper regard for the limited resources available to many businesses within the sector of catering and hospitality (Abelson *et al.*, 2006).

Food safety management policy has the tendency to impact upon government mechanisms at all levels. Specifically, food safety management policy guidance for retail/food service should consider potential impacts on local governments as the key regulators of the sector (Jouve *et al.*, 1998). Enforcement agencies both at the local and national level, food safety agencies and departments of health and trade may all be impacted, although the extent of impact may vary. This can be done by considering impacts on government in relation to implementation and maintenance of food safety systems, investigating and monitoring food-borne illness, enforcement and surveillance. This will further include the response to food-borne illness outbreaks as well as health care costs in addition to emergency care, general practitioner and specialist services (Bryan, 1988).

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CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

The research was carried out in senior high schools within the Accra Metropolis of the Greater Accra Region. Accra Metropolitan is among the sixteen (16) Municipal and Districts in the Greater Accra Region. The Metropolitan Administrative Capital is **Accra**. The Municipality is also home to the regional capital of Greater Accra Region. This, of course, makes it the largest urban centre in the region. The Municipality shares boundaries with Ga East District to the North, Adenta District to the North-East, Ga South District to the West and Ledzokuku-Krowor to the East and the Gulf of Guinea to the south. The Metropolitan has about twenty-two senior high schools, include that of Accra girls sec, Accra High school, Achimota sec, Aquinas sec, La Presby senior sec, Kinbu sec, O'reilly senior high and Presby Boys sec, St. Mary's Girls school

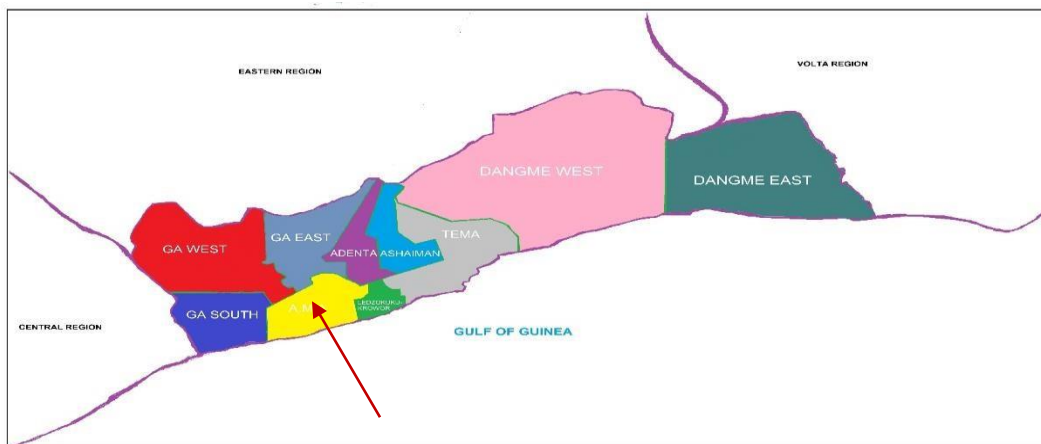


Fig 3.1: A map of Greater Accra Region showing Accra Metropolitan (arrowed section)

Source: www.ghanadistricts.com

3.2 Research design

The study was cross sectional in nature, which was designed to find out from the schools in the Accra Metropolitan Area the level of implementation of food safety management systems in senior high school kitchens/Pantry. A cross sectional design was adopted because it is suitable for descriptive studies such as this. It is relatively inexpensive and takes up little time to conduct. Moreover, outcomes of personnel perceptions can be assessed by using this design. Finally, it is suitable for a descriptive study such as the current one. Random and complete census sampling techniques were used to select schools and administer the questionnaires for data collection.

3.2.1 Inclusion Criteria

According to the Ghana Education Service we have two classes of senior high schools. The selection criteria used for this cross-sectional study was based on the Class of the school. The single sex schools (either Boys or Girls) and the mixed school (Both Boys and Girls). Also based on this school the Gender of the school is considered hence 2 strictly males schools (Presby Boys and Accra Academy), 2 strictly female schools (St.Marys Girls and Accra Girls) and 2 mixed

schools (Achimota School and O'reilly school) was used. Random sampling technique was employed for this collection of the data.

3.3 Sources of data

The study employed primary and secondary data. Primary data was collected from the selected senior high students within the municipality. Secondary data was obtained from reports and records from the offices of the Metropolitan authority, internet sources, newspapers, journals, and articles, published and unpublished books.

3.4 Sample and Sampling Techniques

3.4.1 Sample size

This study employed 100 respondents and the choice of the sample size was guided by a number of factors stipulated by Selltitz (1976) on the importance for sampling in a study.

3.4.2 Sampling procedure

Using the total sample for the study, a simple random sampling technique will be employed to select members of all the respondents from eight senior high schools within the Municipal mainly the Accra Girls School, St.Marys girls school, Achimota Secondary, Accra Academy, O'reilly Secondary, St.Marys Girls and Presby Boys Senior High-Legon.

3.5 Data Collection instrument

The study employed focus group interviews as a data collection instrument. In this method, the various actors in the food service chain in the participating schools were categorized into Matrons, Cooks, Team Leaders, Supervisors, Pantry Servers, store keepers and students. An interview guide will be prepared for each of the categories. Face to face interview were conducted to collect

information on workers hygiene practices and attitudes using the questions adopted from the Food Safe Schools (Need Assessment and Planning Guide, National Coalition for Food - Safe Schools).

3.6 Data Analysis Procedures / Statistical Analysis

The statistical package for social scientists (SPSS Version 20) or Minitab 2016 will be used to analyze the data. The package summarizes and creates appropriate tables and examines relationships between variables. The analyses included cross tabulation and computation of frequencies that was obtained from closed-ended questions. Information obtained from the questionnaire/checklist will be categorized as adequate or inadequate by comparing with the food and drugs Authority's food code/food safety and hygiene practices guidelines and calculating the suitability of each variable percentage.

Frequency tables will be constructed for the questionnaire items in line with the objectives of the study as an initial step in the analysis. The frequency tables on the demographic variables will be constructed as a way of describing the sample population. Cross tabulation tables will be constructed for all multiple response questionnaire items in an attempt to reduce analyses-output and thereby create compact results of manageable proportions.

3.7 Ethical Consideration

Authorization to collect data was obtained from the various Senior High Schools.

The questionnaire of each respondent was coded to ensure anonymity and each interview session will last for 3mins. Data collection will be done by means of interview with various categories of food handlers (Matron, supervisors, team leaders, pantry/server and cooks) of the various schools

after the appointment to conduct the interview had been made with individual school headmasters or mistresses.

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CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Introduction

Six senior high schools were selected for the study. Respondents were taken from each senior high school. The schools included Achimota Senior High, Accra Girls, St. Mary's Girls, Accra Academy schools, Presby Boys- Legon and O'reilly school.

The data was analyzed under seven (7) categories based on the food safety systems and food hygiene practices and the observational studies from the questionnaire.

4.2 Demographic information about Respondents

A total of 100 interviews were conducted, including 6 student respondents: 1 from each of the 6 schools, and the remaining 94 from the 6 schools based on the following categories; Matrons, cooks, dining hall masters, store keepers, pantry servers and team leaders and the total respondents were a maximum of twelve (12) from each school.

■ Matron ■ Student ■ Cooks & servers ■ Storekeeper ■ Dinning Hall master
Dinning Hall master

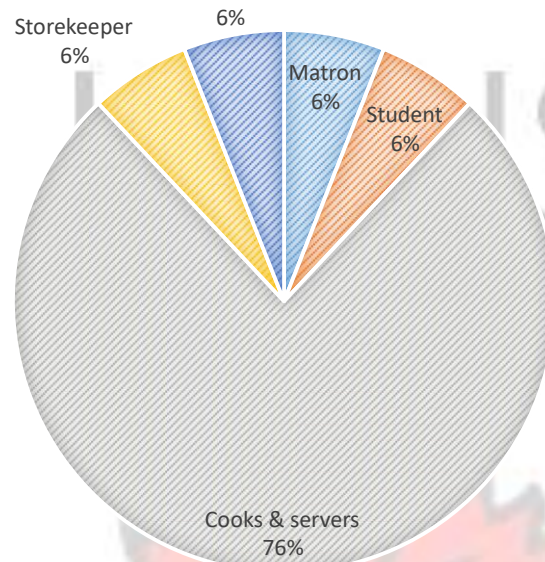


Fig 4.1 Types of Respondents

The majority of the individual respondents were females, representing 76% with respect to that of males which were only 24%. This means that more females took part in the study than males. This is very significant in that it explains that the food preparation industry remains female dominated. In fact, the 24% males were all workers (servers) and dining hall masters whose role has no direct bearing on the food preparation but are in charge of supervising the eating session and are thus mainly assigned to ensure orderliness. No male caterer or cook was encountered during the study.

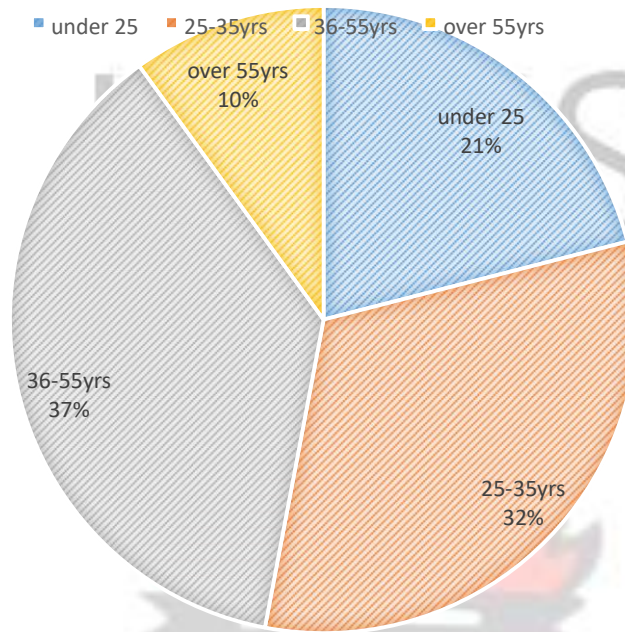


Fig 4.2 Age of Respondents

Out of the 100 participant 32% fall within 25-35years, 28% are within the ages of 36-45% and 19% are within the ages of 46- 65%. This explains that majority of the respondents in the food service sector are youth and a few of the workers are Adult who are almost in their retiring age. A decline in the number of respondents is observed as the age increases demonstrating that the foodservice sector is young people dominated hence there are more young people than old in this sector. Fig 4.2

48% of the respondents have worked in these institutions for more than 5years and out of this number 68% have attended on the job training (food hygiene training). This explains that majority of the experienced workers have food hygiene training which complements the food safety knowledge of the Job. 76% of the respondents are cooks and servers, who forms part of the 39% with primary education. 12% of the respondents are Matrons and supervisors who have received tertiary education. This implies that the team leaders have adequate food safety knowledge to secure the safety of the food prepared. This explains why the matrons have higher

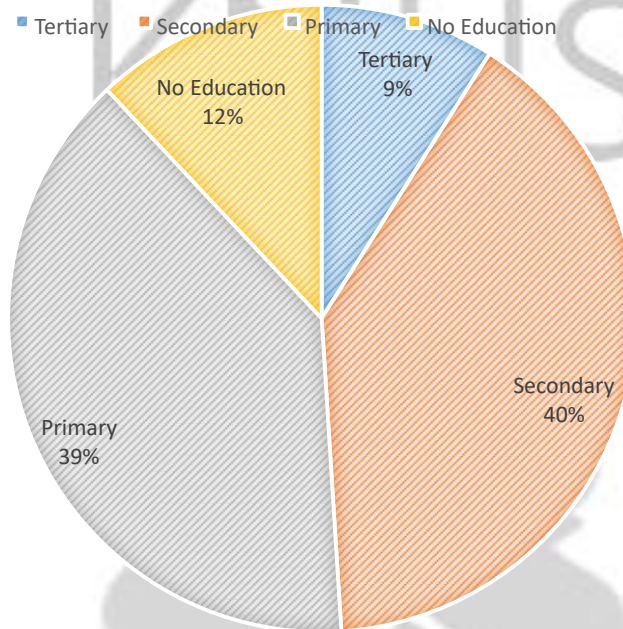


Fig 4.3 Educational Level of Respondents

Educational level for their job role Fig 4.1 & Fig 4.3 which is a prerequisite for their employment since food safety knowledge has a greater impact on the safety of the food to be consumed as well as training factor for the workers under them. 12% of the respondents have no education which is a worry for the food safety of the meals prepared since these numbers form part of the cooks and servers who have direct contact with the food.

4.3 Written Policies or Procedures on Food Safety

The research sought to find out if the schools had written policies or procedures for ensuring food safety at various levels. These include policy on receiving and storing of food, policy for ensuring

safety of food brought in by food vendors and a policy for ensuring safety of food prepared in the kitchens.

For this area of the study, specific staff were interviewed (focus group interview). Matrons were interviewed on the availability of written policies or procedures on receiving and handling of foods and policies for ensuring safety of food prepared in the kitchen. Dining hall masters were interviewed on policy for ensuring safety of food brought from home and vendors.

The results were summarized as per the assessment questionnaire score frame based on the number of the written policies or procedure details presented in the questionnaire under section B of the food safety systems.

Table 4.3: Availability of written policies or procedures on food safety

Respondent	Frequency(n=6)	Percentage (%)
Ensuring the safety of food received and stored		
Yes	3	50
No	3	50
n (storekeepers)		
Ensuring the safety of foods brought from home		
Yes	1	16.7
No	5	83.3
n (dining hall masters)		
Ensuring the safety of foods brought in by outside vendors		
Yes	2	33.3
No	4	66.7
n (dining hall masters)		
Ensuring the safety of foods prepared and served in the kitchen		
Yes	4	66.7
No 2 n (matrons)		33.3

Frequencies-No. of responses given either yes or no

The result indicates that a few schools have written policies or procedures on some aspects of food safety. Only one school (Achimota; 16.7%) had a written policy on ensuring safety of foods brought from home by individual students. In a similar study by Dawson and Ann (2012), just over

one fourth (27.1%, n = 45) of food service managers indicated policies were in place for food prepared at home and brought in for resale to broader groups (both students and teachers). Whilst (10.1%) of food service managers indicated the existence of policies related to food prepared at home and brought in for a covered dish dinner (not for resale). The presence of a policy on food brought in from home will help schools in identifying hazards of foods prepared from other locations such that those hazards could be eliminated.

In addition, none of the respondents indicated yes to the question on whether they had a written policy on ensuring safety of food brought in by food vendors. However, all schools indicated that they had guidelines they follow before allowing a food vendor to sell food in the school, although there was no documentary evidence of such guidelines. The above finding is in conformity with a similar research that was carried out in Accra by Agyei-Baffuor *et al.* (2013), in which it was realized that 92.14% of respondents in the survey had no written guidelines on ensuring food safety. In addition, Dr. Samuel Sefah-Dedeh in an article presented at the GoGlobal conference in Accra, (2009), identified the lack of enforceable policies as one of the key issues confronting the food service industry in Ghana.

Also, none of schools had a written policy on ensuring safety of food prepared in their kitchens. They all however indicated that they had guidelines that they follow to ensure safety of the foods they prepare, but which are undocumented. Documentation provides a basis for periodic review of the overall food safety program, and certain written records or documentation are needed to verify that the program is working. Documentation is also a pre-requisite for traceability and ability to pinpoint exactly where a hazard may be coming from. Being able to identify the source of a hazard will also put the food service staff in a better position to eliminate that cause and prevent future occurrences. Though undocumented, observations indicated that all schools used the conventional

system of food production. This is the system in which food is prepared in a full production kitchen and served on site. This system offers greater flexibility in food preparation with more emphasis on batch cooking and less on cook-and-hold, thus decreasing holding time and increasing freshness of products (Gregoire and Bender, 1999). Limitations of this production system include increased labor hours, availability of adequate space and equipment, and food safety concerns (Dawson and Ann, 2012). The lack of documentation of the processes in food preparations is a great cause for concern.

On the availability of written guidelines on receiving and storing foods, three schools, (50%), Achimota, St. Mary's and Accra Academy. The purpose of guidelines on receiving and storing food is first of all to assist schools in tracking defective and hazardous food substances back to the suppliers. This way the suppliers can be made to recall the defective foods. This will save the school from food-borne illnesses as well as prevent financial losses. Secondly, a policy on receiving and storage of foods will spell out to the authorities what methodologies to use so as to avoid wastage and loss of food items. Observations conducted in the schools showed that the lack of policies on receiving and storing food was having consequences. Some schools had defective food items in their stores, some food items were stored on the floor and not on pallets, and this was leading to molding. Also there were signs of rodent and pest infestations in some of the store rooms.

4.4 Availability of outbreak crisis management plan

The objective of an outbreak crisis management plan is to outline the crisis management procedures, the risk assessment process and media communications. It also aids in detecting serious food safety hazard involving food products prepared for consumers and has a coordinated

approach to ensure that food products identified as being a risk to consumers are controlled or withdrawn from the food chain. (Abu Dhabi Food Control Authority, 2009)

As part of the study, Dining hall masters were interviewed on whether the schools have a written crisis management plan for a suspected food-borne illness outbreak with each of the components as outlined above. The results are presented in table 4.4

About sixty six percent (66.7%) of the schools had no written down roles for the staff in the event of a food-borne crisis. Roles and responsibilities for various actors are identified as one of the key actions in managing crisis situations (Cornell and Sheras, 1998). The implication therefore is that in the event of a food-borne crisis, staff will not know how to go about issues, and this can further compound the situation. School crises often raise complicated questions of responsibility. The most worrisome questions of responsibility concern liability and blame. Who is at fault? Unfortunately, fears about this aspect of responsibility can override other significant issues and paralyze efforts to respond to the crisis. Leaders may refrain from making decisions and team members may fail to act. A second aspect of responsibility has to do with jurisdiction or duty. Whose responsibility is it to take action in response to a problem? School personnel may variously classify problems as matters for the police, mental health agencies, parents, or other responsible parties. Turf battles among disciplines or across agency lines often reflect conflicting views of responsibility.

In addition, only three schools (50%), Achimota School, Accra Academy senior high school and Presby Boys School Legon had protocols on identifying and treating food-borne ailments. This is because they have clinics with resident nurses. Early diagnosis of conditions is a key determinant of treatment success as well as reduction in complications. This therefore indicates that in 50% of the schools, food-borne ailments could be handled as other conditions, and this can lead to complications for the victims as well as lead to infection of others.

The results also indicated that only three schools (50%) had guidelines for accounting for and releasing students in the event of an emergency. Again, these schools were Achimota School, Accra Academy senior high school and Presby Boys School-Legon. In crisis and emergency situations, accounting for all at risk persons is very critical in preventing situations where sufferers are overlooked. In addition, the same schools Achimota School, Accra Academy senior high and Presby Boys School -Legon had guidelines on reporting food-borne ailments to the next level of care. School nurses play a critical role in illness surveillance for any disease outbreak. The goal is to quickly identify illnesses that have outbreak potential and take actions to prevent the spread of the illness/disease among the school population or community. Being technical people with requisite training to be able to identify ailments, schools that have resident nurses are likely to be in a better position at diagnosing food-borne illnesses better than those without resident nurses.

However, none of the schools had policies and guidelines on when and how to communicate with parents of students who suffer food-borne ailments. It is very necessary to communicate with parents of students who suffer ailments. That way, allergies and other known chronic conditions suffered by the students can be known so as to help in proper treatment. A clear case happened in 2017 at the Kumasi Academy School where the outbreak of the Influenza virus (H1N1) resulted in the death of 30 students due to the absence of Crisis Outbreak Management Plan.

Three of the schools had procedures on how to report food-borne ailments to public health officials or even co-operate with public health officials in the event of a food-borne crisis. These were the Accra Academy, Achimota School and Presby Boys School –Legon. As indicated earlier, food safety is a major public health concern, and bouts of food-borne ailments must be reported to the necessary public health officials for them to help in managing the crisis. Crisis guides routinely recommend establishment of a multidisciplinary crisis response team (Johns and Keenan, 1997). Teams are usually comprised of school staff, but some teams make use of other school division

personnel or community professionals, so that coordination of effort may be complicated by differing lines of authority, responsibilities, and perspectives. For a crisis team to function effectively, at a minimum the members must share common goals, have well-defined roles, and be willing to work together in a coordinated manner. (Cornell and Sheras, 1998). In the case of food-borne crisis management, it is therefore particularly important to coordinate efforts with local public health officials. The Public health officials will then apply epidemiologic investigations to uncover the “time-place-person” factors associated with an outbreak, such as the vehicle (food or beverage), the source of contamination, and the exposed population, the number of ill persons and their characteristics and associated timelines. Various entry points for contamination need to be identified including suppliers, stores, kitchens and cooking areas, foodservices staff, food service equipment and the eating area.



Table 4.4 Availability of Outbreak crisis management plan

Respondents	Frequency(n=6)	Percentage(%)
Definition of staff roles and responsibilities		
Yes	3	50
No	3	50
n = 6 (dining hall masters)		
Procedure for identification and treatment of students with suspected illness		
Yes	2	33.3
No	4	66.7
Procedure for accounting and releasing of students		
Yes	2	33.3
No	4	66.7
Procedure for when and how to report incident to headmaster or local health department		
Yes	3	50
No	3	50
Procedure for when and how to communicate with families of student		
Yes	2	33.3
No	4	66.7
Primary and backup methods for communication within the school		
Yes	1	16.6
No	5	83.3
Information on how to cooperate with public health officials		
Yes	1	16.6
No	5	83.3
Information on when and how to communicate with health care providers		
Yes	2	33.3
No	4	66.7

Frequencies-No. of responses given either yes or no

4.5 Staff development and food safety

In response to question whether all staff have received professional development on and given copies of the food safety policies and procedures, including the crisis management plan related to their job responsibilities 32% of the respondents indicated that they have received no training and the schools have no plans to train them whilst 68% indicated that all staff have received hygiene training. These percentages indicates that more than half of the staff involved in the food processing procedures are have hygiene training but not professional training hence foods prepared by this groups may be potentially hazardous, the risk of food-borne occurrences may be very high since non-certified food handlers are unaware of safe practices during the preparation, service and storage of food. Various studies found staff trained in safe food handling to exhibit more favorable attitudes toward food safety practices and are more likely to practice appropriate food safety behaviors than those who are not trained (Henroid and Sneed, 2004; Young and Sneed, 2002; Hwang *et al.*, 2001). Oakley (1999) noted training of staff led to greater job satisfaction, built program loyalty, and could lead to lower turnover and decreased absenteeism. Staff development and professional training benefits the employee through improved morale and the employer by increasing productivity (Smith and Mazin, 2004)

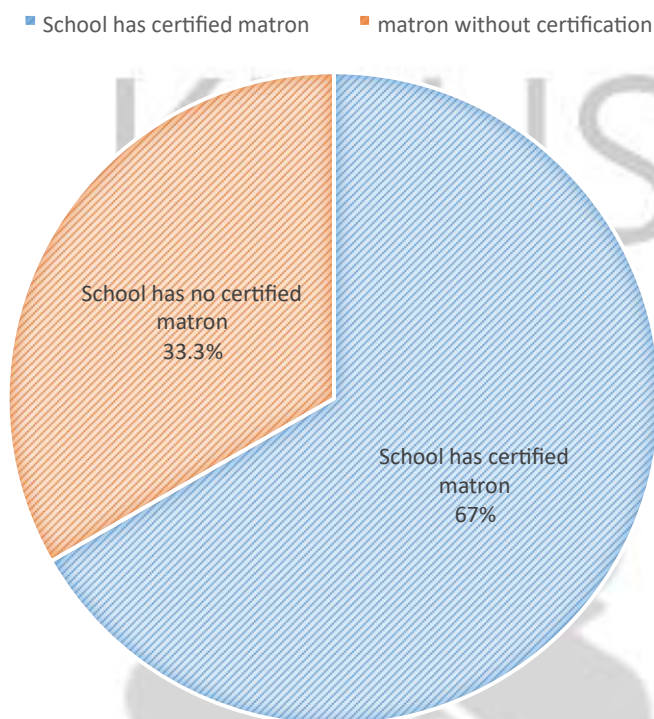


Figure 4.5 Food service certification for Matron

As shown in figure 4.5 the findings on whether the school have at least one matron (the person responsible for overseeing the preparation and service of food) who is certified in food safety and sanitation from an accredited program shows that 67% of the matrons in schools were certified whilst 33.3% were not certified with no plans to do so in the future. These results support findings by Pivanik *et al*, 2009, which found majority (68%) of food service managers to have received food safety education and training in the last three years. The implications of these findings are that if matrons will play their supervisory role, they will be in a better position to use the knowledge they gained from the trainings they have attended to ensure that their subordinates follow the right practices in ensuring food safety in these schools.

Also the findings in figure 4.5 which was seeking to know whether the foodservice manager participates in professional development (which includes on site, example the school or off-site, example national training opportunities) or continuing education on food safety-related topics (food purchasing, preparation practices

etc.) indicates that 8 (67%) of the matrons have undergone professional training at least once in a year. These were found to be the senior matrons of the schools whilst 2 (33.3%) who are deputies have not received any professional training. Most of the matrons have undergone training on food safety which is encouraging but the kitchen staff complained that the matrons do not have an in house training with them after they have trained hence the goal of such trainings are likely not to be met since the kitchen staff are directly involved in the preparation process.

However, the question on whether all foodservice staff receive food safety training at new- hire orientation and periodically through continuing education indicates all the food service staff with the exception of matrons (67%) receive any training prior to hire and very little orientation on hire. Most of them however indicated that they learn on the job. In an action research carried out in Chorkor, a suburb of Accra by Donkor *et al*, (2009), it was realized that education in the form of trainings improved the rate of washing hands always before and during food preparation by 47% whilst separation of raw and cooked food always during storage and using separate sets of equipment for them improved from a previous 13.4% prior to training to 33.3% post training, 91.3% separated the two types of food during storage. Keeping food at safe temperature was assessed only after the workshop, and showed that 27% of the vendors always kept food in the refrigerator if stored overnight, while 59.5% always reheated cooked food before selling. In addition, Debrew *et al*, (2013) and Mensah *et al.*, (2002) in separate studies, established a positive linkage between lack of knowledge about food-borne diseases and the risk of food contamination. Going by the above, it can be said that the lack of training among the direct food handlers (cooks) in senior high schools, is a recipe for disaster. Though it can be argued that the matrons who are supposed to supervise the cooks are themselves trained and can bring their expertise to bear on the food safety behavior of the cooks, it has to be noted that most (75%) of these schools have only

one matron who cannot be at different parts of the kitchen at the same time to be able to see what each and every cook is doing.

Table 4.5: Have you received professional development or training for the work you do?

Response	Frequency(n)	Percentage (%)
Yes	20	21.1
No	75	78.9
Total	95*	100

* (n) All food service staff (store keepers, cooks, matrons and dining hall masters)

The result on table 4.5 which answers the question whether food service staff follow established food and drugs authority food code guidelines and other federal, state, and local guidelines and regulations on food preparation, handling, storage and service shows that 20% of all food service staff follow the FDA code but do not implement HACCP and 75% all food service staff do not follow the FDA code and do not implement HACCP.

Table 4.6: Safe Food preparation in the kitchen

Response	Frequency(n)	Percentage (%)
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All food service staff follow the FDA code but do not implement HACCP	20	21.1
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All food service staff do not follow the FDA code and do not implement HACCP	75	78.9
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Total (n)	95	100
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n = all food service staff (matrons, cooks, servers, store keepers and dining hall masters)

4.6 Food Hygiene Practices and Observational studies

4.7 Raw materials supply and handling:

Institutions usually receive their food supply from various suppliers. These institutions do not visit these suppliers prior to purchase or after purchase. Moreover since most of these institutions consider proximity of the food market to their school traceability is not considered. It is therefore necessary that they have a system of tracking these food supplies so as to identify defective food substances.

Table 4.7 Raw material Supply and Reception

School	Visit to the suppliers	Certificate of conformance from FDA	Receiving/sorting area	Overall Quality
Achimota Senior High School	Frequent visit at the supplier Agboglobhie market	No documentary evidence of inspection	Designated store without pallets. Foods are kept directly on the floor	Accepted as per Matrons decision, no spoilage or contaminations as well as affordability
St.Marys Senior High School	Visit prior to purchase	No documentary evidence of inspection	Area not well kept, scattered grains on the floor	Accepted as per Matrons decision, no spoilage or contaminations as well as affordability
Accra Girls Senior High School	Visit prior to purchase	No documentary evidence of inspection	Designated store without pallets. Foods are kept directly on the floor. Signs of Pest Infestation	Accepted as per Matrons decision, no spoilage or contaminations as well as affordability
Accra Senior High School	Frequent visit to the suppliers at Agboglobhie market	Not Observed	Designated store without pallets. Foods are kept directly on the floor	Accepted as per Matrons decision, no spoilage or contaminations as well as price sense
Presby Boys Senior High School-Legon	Visit prior to purchase	Not Observed	Area not well kept, scattered grains on the floor	Accepted as per Matrons decision, no spoilage or contaminations as well as price sense
O'reilly Senior High School	Visit prior to purchase	Not Observed	Designated store without pallets. Foods are kept directly on the floor. Signs of Pest Infestation	Accepted as per Matrons decision, no spoilage or contaminations as well as price sense

Source: field data (2017)

In addition, tracking food substances will allow store keepers to release foods that would otherwise go bad to be used first. This will save schools a lot of money though price is considered first before purchase. The observations indicated that though all schools had store keepers, not all of them are able to track their food suppliers. The main system of tracking used by the schools was the stores receive vouchers that are issued at the stores. The issue with this system of tracking is that most food materials come in sacks without batch numbers or any form of identification. It will therefore be difficult to track items back to a particular supplier. In addition, most receiving areas which by the way are store rooms, had no pallets for packing foods. This therefore resulted in food substances been left on the floor and close to walls. This practice exposes food to moisture, rodents and pests which are all sources of food contaminations and spoilage.

4.8 Storage facilities/cold storage

Storage areas in all schools also doubled as cold stores, this is because refrigerators and freezers were packed in these rooms only a two schools had different facility for the cold storage, the Presby boys –Legon and the Accra Academy school .Observations showed that most of these rooms were not neat, they had food particles from torn sacks on the floor as well dust and cobwebs covering the windows and floors. This can lead to rodent infestation. Cold storage facilities in most of the schools were in the form of refrigerators with a portion for freezing but no proper calibrated thermometers for the reading of accurate freezer temperatures. Stacking. The freezers were however found to be stacked improperly. Various items including meats, fish and leftover foods were frozen together in same freezers. Most of the schools had no outstanding freezer to salvage food products in case of emergency except Accra Academy which had a modern compound freezer for food products.

Table 4.8 Storage facilities/Cold storage

School	Stacking discipline	Temperature	General level of sanitation
Achimota Senior School	High Items not properly arranged at the stores. Without cart or shelves.	Freezer in a good condition but not well cleaned	Surrounding vicinity free of sources of contaminations
St.Marys Senior High School	Improper stacking of items on the shelves or cart.	Fridge too small, and does not function properly	Adequate
Accra Girls Senior School	High Items not properly arranged. Absence of cart or shelves.	Freezer in a good condition, and faulty regulator	Surrounding vicinity with stagnant water from kitchen
Accra Senior High School	Items not properly arranged	Freezer in a good condition but not well cleaned	Surrounding vicinity free of sources of contaminations
Presby Senior School- Legon	Boys High Improper stacking of items	Fridge too small, and does not function properly	Adequate
O'reilly Senior High School	Items not properly arranged	Freezer in a good condition, and faulty regulator	Surrounding vicinity with stagnant water from kitchen

Source: field data (2017)

4.9 Food preparation and eating areas

All schools used the conventional system of food preparation that was discussed earlier. In Most of the school the fuel source is mainly gas the cookers are scattered within the central space of the kitchen.

Table 4.9 Food preparation area

School	General level of sanitation	Cross contamination risk	Management	Ventilation and illumination	Drainage system	Connectivity to water supply
Achimota Senior High School	Surrounding vicinity free of sources of contaminations	Clean, maintained, working surfaces	Periodic spraying of kitchen, use of baits for rodents	Glass louvers windows present.	Adequate drainage system, desilted drains	Potable water available.
St.Marys Senior High School	Inadequate needs improvement	Clean, maintained, and protected working surfaces	Periodic spraying of kitchen, use of baits for rodents	Glass louvers windows present	Adequate, gutters available and well kept.	Potable water available.
Accra Girls Senior High School	Very poor, no proper arrangements of kitchen items	Not quite clean but protecte d working surfaces	Periodic spraying of kitchen, use of baits for rodents	Glass louvers windows present but most are broken	Adequate, gutters available and well kept	Potable water available.
Accra Senior High School	Surrounding vicinity free of sources of contaminations	Clean, maintained, protected kitchen surfaces	Periodic spraying of and working surfaces rodents	Glass louvers windows present	Adequate drainage system with desilted drains	Potable water available.
Presby Boys Senior High School	Inadequate needs improvement	Clean, maintained, protected kitchen surfaces	Periodic spraying of and working surfaces rodents	Windows for ventilation.	Adequate, gutters available and well kept	Potable water available.

O'reilly Senior High School	Very poor, no proper arrangements of kitchen items	Not quite clean surfaces	Periodic but protected spraying of working kitchen, use of baits for rodents	Glass louvers windows but most are broken	Adequate, gutters available	Potable water available.
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Source: field data (2017)

Food preparation areas in all schools lacked hygiene. Cooking utensils were not properly arranged as per good manufacturing practices and there was no proper segregation between the dirty utensils just used to serve food and the clean utensil which were not in use. The windows of the kitchens were not properly cleaned with dust settling on the louvers.

Table 4.10 Eating area

School	Level of hygiene	Congestion	Ventilation	Illumination	Cleaning schedules
Achimota Senior High School	Adequate	Hall is small to accommodate all students at a go, so they eat in batches	Though well ventilated, the nets are torn off and some louver blades missing.	Well illuminated	Regularly cleaned by labourers
St.Marys Senior High School	Adequate	Hall is big enough to accommodate students. No congestion observed	Properly ventilated	Quite illuminated	Regularly cleaned by conservancy labourers
Accra Girls Senior High School	Adequate	No congestion	Adequate ventilation	Well illuminated	Regularly cleaned by Pantry staff.
Accra Senior High School	Adequate	Hall is small to accommodate all students at a go, so they eat in batches	Though well ventilated, the nets are torn off and some louver blades missing.	Well illuminated	Regularly cleaned by labourers

Presby Boys Senior High School-Legon	Adequate	Hall is big enough to accommodate students. No congestion observed	Properly ventilated	Quite illuminated	Regularly cleaned by conservancy labourers
O'reilly Senior High School	Adequate	No congestion	Adequate ventilation	Well illuminated	Regularly cleaned by Pantry staff.

Source: field data (2017)

Table 4.11 Sanitary Facilities

School	State cleanliness	of Adequacy	Cleaning /mode of sanitization	Location
Achimota Senior High School	In a clean state. Regularly cleaned by servers.	Same facility is used by students.	Kept clean by the students	It is located away from the cooking and dining area
St.Marys Senior High School	Inadequate tools for cleaning	None	N/A	N/A
Accra Senior High School	Girls Inadequate tools for cleaning	None	N/A	N/A
Accra Senior High School	In a clean state. Regularly cleaned by servers.	Same facility is used by students.	Kept clean by the kitchen staff	It is located away from the cooking and dining area
Presby Senior High School	Boys Inadequate tools for cleaning	None	Kept clean by the kitchen staff	It is located away from the cooking and dining area

O'reilly Senior High School	Inadequate tools for cleaning	None	Kept clean by the staff	It is located away from the kitchen and dining area
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Source: field data (2017)

4.12 Personnel Issues

Three matrons in the study, Accra Academy, St. Mary's school and Presby Boys –Legon wore no jewelry but the remaining three schools Matrons wore Jewelry of various kinds. Some cooks of these schools were also found to be wearing jewelry. Though all of the six schools indicated that they had uniforms for the cooking staff, it was only three schools that cooks were seen in uniforms. In the rest of the schools, cooks wore no uniforms or other protective clothing. Almost all cooks however had headgears on.

Table 4.12 Personnel Issues

School	Staff training programs	Protective clothing	Jewelry, ear rings, watches	Hand washing discipline	Level of personal hygiene	Products used to sanitize
Achimota Senior High School	Matron is trained in food handling course	Adequate, most staff were seen with aprons and headgears.	Most staff had jewelry on.	Cooks follow hand washing guidelines.	Dirty aprons and head gears. They washed hands before and after cooking	Alcohol based sanitizers. Adequate
St.Marys Senior High School	Only the matron is trained, cooks are on the Job.	Adequate, most staff were seen with aprons and headgears.	Some staff had earrings and wristbands on.	Cooks follow hand washing guidelines	Dirty aprons and head gears. Washed hands before and after cooking	Not observed

Accra Girls Senior High School	Matron is trained in food handling course	Inadequate, a few staff were seen with aprons and headgears.	Cooks wearing jewelry.	Cooks follow hand washing guidelines	Dirty aprons and head gears. Washed hands before and after cooking	Soaps and detergent. Inadequate
Accra Senior High School	Matron is trained in food handling course	Adequate, most staff were seen with aprons and headgears	Most staff had jewelry on.	Cooks follow hand washing guidelines.	Dirty aprons and head gears. They washed hands before and after cooking	Alcohol based sanitizers. Adequate
Presby Boys Senior High School-Legon	Only the matron is trained, the cooks said they learn on the Job.	Adequate, most staff were seen with aprons and headgears.	Some staff had earrings and wristbands on.	Cooks follow hand washing guidelines.	Dirty aprons and head gears. Washed hands before g and after cooking	Not observed
O'reilly Senior High School	Matron is trained in food handling course	Inadequate, a few staff were seen with aprons and headgears.	Cooks wearing jewelry	Cooks follow hand washing guidelines.	Dirty aprons and head gears. They washed hands before and after cooking	Soaps and detergent. Inadequate

Source: field data (2017)

4.13 Availability of hand washing facilities

This part seeks to know whether all school hand washing facilities for student and staff are adequate. The results are as shown in table 4.13. The following responses were given 57.9% of the respondents indicated that soap is available at all sinks whilst 42.1% indicated that soap is not available, A study by Mahami and Odonkor, (2012), observed disturbing percentage of inappropriate hand washing with only water and drying with unclean kitchen towel after washing among respondents. Ansari *et al*, (1981), indicate that poor hand washing practices inevitably lead to retention on the hands of bacterial and viral pathogens, which are obtained from handling raw produce or from toilet activities. Consequently, prepared ready-to-eat foods or other members of the household who are in contact may be contaminated by these pathogens. All respondents

indicated the absence of warm water at all sinks as well as paper towel or hand dryers at all sinks and that hand washing sinks are not easily accessible for students in or near the dining hall, 87.9% indicated that everyone has time to wash hands before and after eating whilst 13.1% disagreed to that. Few of the schools had sinks for washing of hands which is unacceptable because we carry millions of microbes on your hands. Most are harmless, but one can pick up some that cause illnesses, such as colds, flu, and diarrhea. According to the guidelines, available at www.foodhaccp.com, proper hand washing procedures include not only water, but the use of water as hot as the hands can comfortably stand. The hands are moistened, soaped thoroughly, and latter to the elbow, scrubbed thoroughly, a brush is used for nails, the hands are then rubbed together using friction for 20 seconds, rinsed thoroughly under running water, and dried using single service towels or hot air dryer.

Table 4.13: Hand washing facilities

Response	Frequency(n)	Percentage (%)
Soap is available at all sinks		
Yes	55	57.9
No	40	42.1
Warm water available at all sinks		
Yes	0	0
No	95	100
Paper towel or hand dryers available at all sinks		
Yes	0	0

No	95	100
Everyone has time to wash hands before and after Eating		
Yes	72	87.9
No	23	13.1
Hand washing sinks are easily accessible for students in or near dining hall		
Yes	0	0
No	95	100
<u>Total</u>	<u>95</u>	<u>100</u>

n = all respondents

4.14 Food service facilities and equipment

The section of the questionnaire was seeking to find out whether the safety and function of the food service facilities are addressed.

The findings shown in table 4.14 indicates that 23.6% said yes that the food service facility includes equipment, kitchen and dining hall area where food is served consumed, this clearly shows food that is to be consumed by students likely to be contaminated during movement (of the food) from the kitchen to the dining hall since there is no link between the dining hall and kitchen.

Table 4.14. Food service facilities and equipment

Response	Frequency (n)	Percentage (%)
Food service facilities includes equipment, kitchen, dining area where food is served and consumed		
Yes	25	26.3
No	70	73.7
The school kitchen and food storage area are inspected twice in a year by the health department		
Yes	21	22.1

No	74	77.9
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The school received no critical or repeat violation from the health department inspection

Yes	16	16.8
No	79	83.2

Equipment for ensuring safety of food is available in all Facilities

Yes	25	26.3
No	70	73.7

The kitchen and food storage facilities are in good working Condition

Yes	32	33.7
No	63	66.3

Funds are available in the school budget for repair of poorly functioning food storage equipment

Yes	29	30.5
No	66	69.5
Total	95	100

n = all food service staff (matrons, cooks, store keepers and dining hall masters)

A few respondents (22.1%) indicated that the school kitchen storage areas are inspected twice in a year by the health department. This indicates that less attention is paid to food service facility in school in terms of monitoring to ensure that safe food is given to students. 16.8% of the respondents indicated that they received critical violation from health departments which shows that less attention is paid to the inspection and monitoring of schools kitchens and food storage areas. According to Fariman and Yapp, (2006), in the United Kingdom, Environmental Health Practitioners (EHPs) inspect food businesses in order to assess food safety compliance. The frequency of these inspections is set out according to criteria contained within Code of Practice 9, issued under section 40 of the Act (Food Standards Agency (FSA), 2000). The majority of non-compliance is identified during the inspection and at this point the enforcement strategy adopted

by the local authority is deployed. Enforcing officers have a raft of enforcement tools available to them. Within food safety these range from educational approaches such as advisory visits, training courses and production of guidance leaflets, through to more formal enforcement approaches such as statutory notices, prosecutions and premises closure. EHPs also react to complaints about food premises made by members of the public and during investigations of food poisoning outbreaks.

The Food and Drugs Board and the Ghana Standard Board are two major regulatory institutions in Ghana responsible for ensuring the safety and quality of the food and other products that we consume.

The Food and Drugs Authority has a Food Inspectorate Division with a mandate of ensuring the safety of food provided to consumers. Inspection of schools to ensure safety of the foods they serve is one of the functions of this division. The mandated frequency of visits to schools was however not established. As has already been established above, it is at these visits that noncompliance to food safety regulations can be identified. If the visits are therefore less as stated in the results (only 22% of schools have been visited twice in one year), the implications are that various acts of non-conformance to food safety regulations will be overlooked and this can result in food borne outbreaks or food safety incidents.

Less than thirty percent (35%) of the respondents indicated that they had equipment available for ensuring the safety of food. This shows that the safety of food in most of the schools cannot be guaranteed since most of the schools had no refrigerators and those who had were not in very good condition which makes it difficult to store food and meat products that need cold chain to be in good condition

From the observations recorded in table 4.14, very few (25%) of the kitchens and food storage areas in the schools were in good condition. Most of the kitchen areas in the various schools had

poor sanitation and stocking discipline in the storage areas were very poor, with signs of pests and dirty environments.

About nineteen percent (25%) of the respondents indicated that funds are available in the school to repair poorly functioning equipment but that it takes time for these funds to be released to meet those needs whereas most (69.5%) of the respondents indicate that they did not know of the availability of such funds. This is not so encouraging since the school authorities should be willing to replace or repair all equipment in the food service facility to ensure the safety of food.

4.15 Documentation

Documentation is very important in helping food service staff to track their activities. However it was realized that the only form of documentation in the cooking process was the documentation of quantities of ingredients that are released to cooks. No documentations were seen on the processes followed in cooking any of the meals. Also there was proper documentation on mandatory health screening that personnel had taken. Staff of the kitchen including the cooks, servers, store keeper, supervisors and team leaders had their health certificate for food handlers expired. All these certificates were kept in the Matrons office and because there is no proper documentation most Matron were unaware that these certificate have expired a needs to be renewed for each of the staffs.

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Table 4.15 Documentation and records

School	Cleaning/chemicals used	Production	Personnel	Training	Pest management
Achimota Senior High School	Store keeper keeps records. Issue vouchers is the only traceable document.	Only documentation is on Menu and its planning.	Matron has records on all personnel especially health certificate.	Only the matron was able to show certificate for a training attended.	Periodic spraying by a contracted agency.
St.Marys Senior High School	Store keeper keeps records. Issue vouchers is the only traceable document.	Documentation on menu planning and daily menu.	There is a record of all kitchen personnel as well as their health certificate at the matron office	No evidence of trainings.	Periodic spraying by the housemasters.
Accra Girls Senior High School	Store keeper keeps records. Issue vouchers is the only traceable document.	Documentation on menu planning and daily menu	Records are kept on each personnel as well as their health certificate.	No evidence of trainings	Periodic spraying by kitchen personnel.

Accra Senior High School	Store keeper keeps records. Issue vouchers is the only traceable document.	Only documentation is on Menu and its planning.	Matron has records on all personnel especially health certificate.	Periodic spraying by a contracted agency.	Only the matron was able to show certificate for a training attended.
Presby Boys Senior High School-Legon	Store keeper keeps records. Issue vouchers is the only traceable document.	Documentation on menu planning and daily menu.	There is a record of all kitchen personnel as well as their health certificate at the matron office	Periodic spraying by the housemasters.	No evidence of trainings.
O'reilly Senior High School	Store keeper keeps records. Issue vouchers is the only traceable document.	Documentation on menu planning and daily menu	Records are kept on each personnel as well as their health certificate.	Periodic spraying by kitchen personnel.	No evidence of trainings

Source: field data (2017)

4.16 Process controls

Observations indicated that none of the schools used any process control. Process controls are intended to monitor the food preparation process so that possible hazards can be detected in time to prevent food-borne illnesses. They are also used to track sources of possible food-borne illnesses. None of the schools however had any system in place to monitor the food preparation process. Matrons, who are supposed to be in supervisory roles, just release food items to cooks and go back to their offices. These cooks too from interviews, have not been trained in food safety management. There are no documented activities for how raw materials are to be handled and stored especially for Perishables and at what temperatures are they supposed to be stored. Activities are done as per long term oral documentation from the long serving kitchen staffs to the new cooks or servers.

Table 4.16. Process controls

School	GMP	HACCP	Self-Audit	In-process Inspections
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Achimota Senior High School	Adequate personnel hygiene. WHO's 5 keys to safer foods observed on the kitchen wall.	Not observed	Internal food safety inspections are done	No system is in place. Matron performs random checks.
St.Marys Senior High School	Adequate personnel hygiene. WHO's 5 keys to safer foods not observed on the kitchen wall.	Not observed	Not observed but Occasional visit from AMA. Internal Audits not done.	No system is in place. Matron performs random checks
Accra Girls Senior High School	Best hygiene practices poster pasted on the kitchen wall. Personnel Hygiene quite ok.	Not observed	Internal food safety Inspections done.	No system is in place. Matron performs random checks
Accra Senior High School	Adequate personnel hygiene. WHO's 5 keys to safer foods observed on the kitchen wall.	Not observed	Internal food safety inspections are done	No system is in place. Matron performs random checks.
Presby Boys Senior High School-Legon	Adequate personnel hygiene. WHO's 5 keys to safer foods not observed on the kitchen wall.	Not observed	Not observed but Occasional visit from AMA. Internal Audits not done.	No system is in place. Matron performs random checks
O'reilly Senior High School	Best hygiene practices poster pasted on the kitchen wall. Personnel Hygiene quite ok	Not observed	Internal food safety Inspections done.	No system is in place. Matron performs random checks

Source: field data (2017)

Table 4.17 ASSESSMENT QUESTIONNAIRE SCORE CARD FOR ALL THE SCHOOLS BASED ON THE FOOD SAFETY SYSTEMS

St. y	Accra Achimota O'reilly Presb Academy Parameters	Accra School	Mary's School	girls Boy's	School	School
		2	1	2	1	2
1. Written Policies or Procedures on Food Safety						
2. Outbreak Crisis Management Plan	2	1	0	1	2	0
3. Staff Development and Food Safety	1	0	0	0	2	2
4. Foodservice Manager Certification	2	0	3	3	2	3
5. Continuing Education for Foodservice Manager	1	2	2	2	1	2
6. Staff Development for All Foodservice Staff	1	0	1	1	1	1
7. Foodservice Facilities and Equipment	2	1	2	1	2	2
8. Hand washing Facilities	2	1	2	1	2	2
9. Safe Food Preparation in the dining hall	1	1	1	1	1	1
10. Assessment of Students and Staff for Potential Foodborne Illness	1	2	2	1	1	1
11. Food Safety and Hand washing Taught by Grade Levels	1	0	0	0	1	0
12. Education for Families about Food Safety and Handwashing	2	1	0	2	1	2
13. Collaboration	2	1	2	2	2	2
14. School-Wide Approach						
Percentage score as per assessment %	64.8	29.6	66.6	53.7	59.2	75.9

Score Rating: 3- Fully in place-0-30% Poor Food safety systems; 2- Partially in place - 31-60% Inadequate Food safety systems; 1- Under development -61-100% Adequate Food safety systems needs improvement; 0-Not in place
Average Score for all Schools: **58.3%**

The table below describes the individual food safety systems assessment for the various schools. From the table it can be clearly seen that a school like Accra Academy have a good food safety systems as compared to Presby Boys- Legon even though most of the food safety measures are not in place. From the ratings above a school with a score between 0-30% has poor food safety system and there is the need for the establishment and implementation of a generic food safety system for the school. A school like Accra Girls has a poor food safety system a needs the establishment of food safety management system.

Also a school like O'reilly senior high with score between 31-60% has inadequate food safety and requires the establishment of food safety policies and procedures as well as improvement in foodservice facilities. Schools with scores between 61-100% have adequate food safety systems and food service facilities but there is the need for continuous improvement and sustainability. From the table above there is the need for the development of a generic food safety management system for the senior high schools based on the fourteen (14) enumerated categories in the study which shall be fully implemented and reviewed for effectiveness.

Schools should collaborate with the necessary authorities to organize trainings on food safety for dining hall masters and other food service staff.

In addition, dining hall masters in the various schools should liaise with the Nutrition unit of the Municipal health directorate to organize health talks on food safety and what to do in cases of food-borne illnesses. This will put students in a better position to identify food-borne ailments and report them appropriately before they get fatal.

Finally, matrons should lobby with heads of the various schools to provide the requisite equipment for food safety practice in the schools. This will greatly reduce the risks of contamination of food through storage to consumption.

CHAPTER FIVE

5.0 SUMMARY AND CONCLUSION

5.1 Conclusion

Overall 66.67% of the schools have poor food safety systems and hygiene practices which is tantamount to the possible outbreak of foodborne incidents or food safety incidents. There is the need for the Government and Academia to collaborate in the implementation of food safety management systems in the second cycle institutions to avert the future outbreaks of foodborne illness and infections e.g., (H1N1) which recently happened in Kumasi Academy (November 2017) where fourteen (14) students lost their lives due to the absence of crisis management plan.

5.2 Deductive conclusions

Based on the findings of the study, the following deductive conclusions have been made,

5.2.1 Availability of written policies and guidelines on food safety

Overall, 50% of schools lacked any policy on food safety and (50%) however had a written policy on foods that are received from suppliers and how these foods are stored. In addition, only one school, 33.3% had a policy on safety of foods that are brought from home by students;

5.2.2 Qualifications of food service staff

Nine percent (9%) of food service staff have had tertiary education. Out of the total number of food service staff, only matrons (6%) said they had received training on food safety and 82%

(dining hall masters and cooks) said they had not been trained for the work they do and also have received no food safety training;

5.2.3 Availability of food safety equipment

Food service facilities and equipment are inadequate in most schools as indicated by a majority of respondents. A photo of the food service facilities of one of the schools have been displayed in the appendix.

5.2.4 Inspections and Audits

All schools have been visited at least once in the year by an external food hygiene inspectors from FDA or AMA food health center, whilst only 56% of the respondents indicated that they sometimes do internal food safety inspections which is spearheaded by the school matron. 9% of the respondents indicated that none of these actions take place in the various schools. Also Most due to the rare visitation by the AMA to the various schools it was observed that most of the food handlers had their food handlers health certificate expired for more than 3months.

5.3 Limitations of the Study

This study was limited in a number of ways:

The study had a limited sample size due to the fact that the Accra Metropolitan area have almost twenty-two schools but only 6 schools were covered in this study.

The study did not have the objective of measuring knowledge, attitude and practices, but was concerned with assessing the management systems, educational levels and training levels of the various actors in the schools food service chain in food safety as well the predisposing factors affecting the food safety.

The study identifies all the weakness in the food safety management system of the various school but as to whether the findings will be implemented in the various schools there was no budget for such purposes.

5.4 Recommendations

Based on the findings above, the following recommendations are made:

In the case of further work on this topic, the sample size has to be increased to cover the whole of the regions. This study only focused on the Greater Accra region but we have other regions which have to be covered to give a clear picture of the food safety systems and hygiene practices in the country.

Budget allocations must be generated for a project of this nature so as to implement the finding from this research work for better improvement in the food safety situations in the senior high schools by going back to these schools and sharing the research finding with the Heads of these schools and well as organizing trainings and forums on food safety management systems for these senior high school.

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APPENDICES

Appendix A1.

Pictures of the kitchen of some schools



Plate 1. Food preparation area of Presby Boys –Legon.

Appendix A2.



Plate2. Food Storage Area of Presby Boys – Legon

Appendix A3.



Plate 3. Hand washing facilities at Presby Boys- Legon

Appendix B.

QUESTIONNAIRE

Dear Respondent, I am to collect data for my research project topic” Developing a generic food safety management system for senior high schools. The exercise is basically academic and your responses will be treated with the utmost confidentiality.

INSTRUCTION: Please tick ☐ your option.

SECTION A: DEMOGRAPHIC INFORMATION

1.

Gender

Male ☐ Female ☐

2.

Age

20 – 25 years ☐ 26 – 29years ☐ 30 -35years ☐ 35 - 50years ☐ >50years ☐ **any other specify**.....

3. Educational background

Basic education ☐ Secondary/Advanced Catering ☐ Higher National Diploma ☐ First Degree ☐

Master’s Degree ☐

4. How long have you worked in this organization?

Less than 1 ☐ 1- 5years ☐ 5 – 10years ☐ more than 10years ☐ **Indicate exact years**.....

5. What is your staff role in the kitchen?

Cook ☐ Pantry/Servers ☐ Team Leader ☐ Supervisors ☐ Matrons ☐ Any other ☐

6. Have you received any hygiene training in the past 1year?

Yes ☐ No ☐

7. Have you ever received any hygiene training?

Yes ☐ No ☐ **Please specify year of training**

.....

8. Do you have any medical health certificate to indicate that you have received the recommended physical and medical examinations?

Yes ☐ No ☐

SECTION B: FOOD SAFETY SYSTEMS 1. WRITTEN POLICIES OR PROCEDURE ON FOOD SAFETY

Does school have written policies or procedures on food safety that commit the school to each of the following?

- ☐ Ensuring the safety of food received, stored, prepared and served in the dining hall and other foodservice areas (e.g. Temperature and time policies and procedure)
- ☐ Ensuring the safety of food brought from home for individual lunch and supper by parents and friends.
- ☐ Ensuring the safety of food at school events (e.g. PTA meetings, field trips, food served at fund raising events) and school stores.
- ☐ Ensuring the safety of food brought into the school from outside vendors or caterers.
- ☐ Ensuring the safety of food prepared or served in the classroom

3 = Yes, all five of these are addressed

2 = Three or four of these are addressed

1 = One or two of these are addressed

0 = No, none of these are addressed

____ Score

2. OUTBREAK CRISIS MANAGEMENT PLAN

Does the school have a written crisis management plan for a suspected foodborne illness outbreak with each of the following components?

- ☐ A definition of staff roles and responsibilities
- ☐ Procedures for the identification and treatment of students and staff with a suspected foodborne illness and by a school nurse or other school health professional
- ☐ Procedures for accounting for and releasing students.
- ☐ Removing potentially hazardous and suspect food from service and preserving evidence
- ☐ Procedures for when and how to report incidents to the infirmary, principal and local health department. The procedure should include contact names and numbers.
- ☐ Procedures for when and how to communicate with families of students
- ☐ Details on when and how to communicate with the media (i.e. one spokesperson should be designated the school nurse, principal or the food safety team leader)
- ☐ Information on when and how to communicate with the health care providers who are treating ill students and staff.
- ☐ Primary and backup methods for communication within the school, families, community and local health departments
- ☐ Information on how to cooperate with the public health officials.

3 = Yes to all of the above components

2 = The school has a plan with five to nine of the above components

1 = The school has a plan with one to four of the above components

0 = The school does not have such a plan or the plan does not contain any of the above components
____ Score

3. STAFF DEVELOPMENT AND FOOD SAFETY

Have all staff (e.g., teachers, school nurses, foodservice staff, custodians/facilities managers, secretaries, etc.) received professional development on and been given copies of the food safety policies and procedures, including the crisis management plan, related to their job responsibilities?

3 = Yes

2 = Staff are given copies of policies and procedures but are not trained on them

1 = No, but there are plans to do so within the next academic year

0 = No

____ Score

4. FOODSERVICE MANAGER CERTIFICATION

Does the school have at least one foodservice manager (the person responsible for over- seeing the preparation and service of food) who is certified in food safety and sanitation from an accredited program?

3 = Yes

2 = The foodservice manager is certified in either food safety or sanitation, but not both

1 = No, but he or she plans to receive certification from an accredited program within the next academic year

0 = No

____ Score

5. CONTINUING EDUCATION FOR FOODSERVICE MANAGER

Does the foodservice manager participate in professional development or continuing education on food safety-related topics (e.g., food purchasing and preparation practices, Hazard Analysis and Critical Control Point) at least once a year?

“Professional development/continuing education” includes on-site (school, district) and off-site (city, state, national) training opportunities.

3 = Yes

2 = The manager participates in such professional development or continuing education, but less often than once a year

1 = No, but there are plans to participate in the next academic year

0 = No

____ Score

6. STAFF DEVELOPMENT FOR ALL FOODSERVICE STAFF

Do all foodservice staff receive training on basic sanitation and the school's HACCP- based food safety program?

HACCP, an acronym for Hazard Analysis and Critical Control Points, is a preventive food safety program designed to reduce the risk of foodborne hazards by focusing on each step of the food preparation process from receiving to service.

3 = Yes

2 = Most foodservice staff receive training on basic sanitation and the school's HACCP-based food safety program

1 = Few foodservice staff receive training on basic sanitation and the school's HACCP-based food safety program

0 = No

____ Score

7. EXTENT OF STAFF DEVELOPMENT FOR ALL FOODSERVICE STAFF

Do all foodservice staff receive food safety training at new-hire orientation and periodically through continuing education?

"Continuing education" includes on-site (school, district) and off-site (city, state, national) training opportunities. 3 = Yes

2 = Most foodservice staff receive food safety training at new-hire orientation and periodically through continuing education

1 = Few foodservice staff are trained in food safety at new-hire employment and periodically through continuing education

0 = No

____ Score

8. STAFF DEVELOPMENT FOR CULINARY AND FAMILY AND CONSUMER SCIENCE TEACHERS

Do culinary and family and consumer science teachers receive training in basic sanitation and the school's food safety procedures based on Hazard Analysis and Critical Control Point (HACCP)?

3 = Yes

2 = Most culinary and family and consumer science teachers are trained in basic sanitation and the school's HACCP-based food safety program

1 = Few culinary and family and consumer science teachers are trained in basic sanitation and the school's HACCP-based food safety program

0 = No

____ Score

9. FOODSERVICE FACILITIES AND EQUIPMENT

Is the safety and function of foodservice facilities addressed in the following ways?

- ☐ Foodservice facilities include equipment, kitchen(s), cafeteria(s), and any other room(s) or classroom(s) where food is prepared, served, or consumed.
- ☐ The school kitchen, cafeteria, and food storage areas are inspected twice a year by the health department to ensure that they are safe and sanitary
- ☐ Classroom kitchens and food storage areas are inspected twice a year by the health department to ensure that they are safe and sanitary
- ☐ In the last year, the school received no critical or repeat violations from the health department inspection(s)
- ☐ Equipment for ensuring the safety of food is available in all facilities (e.g., thermometers, gloves, test strips, etc.)
- ☐ The kitchen, cafeteria, classroom kitchens, and food storage facilities are kept in good working condition (e.g., safe and sanitary)
- ☐ Funds are available in the school budget for the repair or replacement of poorly functioning food storage, preparation, holding, or service equipment.

3 = Yes, the school addresses all seven of the ways listed above

2 = The school addresses at least three of the six ways listed above

1 = The school addresses at least one of the six ways listed above

0 = No

____ Score

10. HANDWASHING FACILITIES

Are all school hand washing facilities for students and staff adequate in the following ways?

- ☐ Soap is available at all sinks (e.g. bathrooms, cafeteria, dining Halls etc.)
- ☐ Warm (at least 100° F) water is available at all sinks
- ☐ Paper towels or hand dryers are available at all sinks
- ☐ Enough sinks are available for use
- ☐ Everyone has time to wash his or her hands before eating and after hands are soiled
- ☐ Hand washing sinks are easily accessible for students in or very near the cafeteria

3 = Yes, facilities are adequate for all five of the above

2 = Facilities are adequate for four to five of the above

1 = Facilities are adequate for one to three of the above

0 = No

____ Score

11. SAFE FOOD PREPARATION IN THE PANTRY

Do foodservice staffs follow established FDA Food Code guidelines and other federal, state and local guidelines and regulations on food preparation, handling, storage, and service?

3 = Yes, all foodservice staff follow the FDA Food Code and all local guidelines and implement HACCP

2 = All foodservice staff follow the FDA Food Code and all federal, state, and local guidelines, but do not implement HACCP

1 = All foodservice staff follow some of the Food Code and some federal, state, and local guidelines, but do not implement HACCP

0 = No

____ Score

12. ASSESSMENT OF STUDENTS AND STAFF FOR POTENTIAL FOODBORNE ILLNESS

Do school health services or school nurse protocols address each of the following topics?

A school nurse protocol is a procedural statement written and used by school nurses that outlines the standard of practice for assessing and managing a specified clinical problem and authorizes particular activities.

- ☐ Signs and symptoms of foodborne illness
- ☐ In-school management of students and staff suspected of having a foodborne illness
- ☐ Referral of students and staff suspected of having a foodborne illness for further health care
- ☐ Procedure for contacting the local health department if foodborne illness is suspected
- ☐ Review of health records for indications of a foodborne illness outbreak

3 = Yes, address all 5 of the topics listed above

2 = Address three or four of the topics listed above

1 = Address one or two of the topics listed above

0 = No

____ Score

13. COLLABORATION

Do school staff collaborate with each other and with community members (including the local health department, cooperative extension service, and families) to prevent foodborne illness, improve school food safety, and promote hand washing?

“Collaborate” refers to working with one another to prevent foodborne illness, improve food safety, and promote hand washing.

People who should collaborate include:

- ❖ Foodservice staff
- ❖ School health services staff

- ❖ Teachers
- ❖ Administrators
- ❖ Health department staff
- ❖ Cooperative extension specialists
- ❖ Families

3 = Yes, all of the above groups collaborate with each other

2 = Most of the above groups collaborate with each other

1 = A few of the above groups collaborate with each other

0 = No

____ Score

14. SCHOOL-WIDE APPROACH

Are food safety measures taken in each of the following places where food is prepared or consumed in the school?

“Food safety measures” include food safety policies, procedures, programs, and staff development.

- ☐ In the dining hall
- ☐ In the classroom
- ☐ At school events
- ☐ When brought from home

3 = Yes, all of the places listed above

2 = Three of the four places listed above

1 = One or two of the four places listed above

0 = No

____ Score

ASSESSMENT QUESTIONNAIRE SCORE CARD

	3 Fully in	2 Partially in Place	1 - Under Development	0 Not in Place
1. Written Policies or Procedures on Food Safety				
2. Outbreak Crisis Management Plan				
3. Staff Development and Food Safety				
4. Foodservice Manager Certification				
5. Continuing Education for Foodservice Manager				
6. Staff Development for All Foodservice Staff				
7. Foodservice Facilities and Equipment				
8. Hand washing Facilities				
9. Safe Food Preparation in the dining hall				
10. Assessment of Students and Staff for Potential Foodborne Illness				
11. Food Safety and Hand washing Taught by Grade Levels				
12. Education for Families about Food Safety and Handwashing				
13. Collaboration				
14. School-Wide Approach				
Total the number of checks in each column				
Multiply by the point value	x 3	x 2	x 1	x 0
Subtotals				0

Total points earned (add subtotals) Total points			
Total points earned (add subtotals) Total points	54		
Total points earned (add subtotals) Total points possible	%		



Appendix C

SECTION C: FOOD HYGIENE

ITEMS OBSERVED WITH CHECKLIST

N/A: NOT APPLICABLE

NO: NOT OBSERVED

DINNING HALL	YES	NO	N/A	NO
Surrounding vicinity free of sources of contamination				
Clean surfaces and free of personal items				
Adequate lightening in the food preparation area				
Connectivity to water supply				
Proper waste management				
Clean, maintained and protected equipment				
Clean, maintained and protected utensils				
Separate utensils for each food/preparation(raw or cooked and ready to eat)				
Meal Production				
Suitable storage and maintenance of foods				
Foods are stored separately without debris in a clean organized and suitable conservation at point of distribution at the pantry				
Storage of the perishable foods at the cart or holding hot				
Storage of the perishable at the cart or holding cold				
Foods are stored separately from cleaning products				
Food meeting safety standards				
Pre-prepared or ready to eat foods are handled with pertinent utensils, manual contact				
Immediate disposal of left overs				
Clean production surfaces				
Food Handlers				
Appropriate Uniforms				
Not use jewelry				
Protection covering complete hair				
Fingernails clean, short and without varnishes				
Adequate personnel cleanliness				
Wash hands before and after transaction between foods, potential contaminants, and using restrooms				
Does not handle money during the activity, and when handle wash hands before handling food.				
Satisfactory sanitary facilities in outer vicinity.				
Self-Audit				

Visit from external food hygiene inspectors from FDA				
Internal food safety inspections				
Organize internal audits				
Most important attribute in the purchase raw material/ingredients				
Appearance				
Brand				
Price				
Expiration date				
Overall				
Most important attribute for choosing a food supplier				
Cleanliness of the establishment				
Price				
Proximity to the school				
Overall quality				
Visit to the food supplier				
Visit prior to first purchase				
Visit after first purchase				
Purchasing stopped after the first visit				
Raw materials meeting safety standards at the procurement				
Check the expiration date and the conversion status at the moment of purchase				
Proper storage and preservation of the food				
Transportation				
Walking				
Car				
Motorcycle				
Cart of sale				
Water to prepare food				
Spring water				
Boiled or filtered water				
Tap water				

Place to store the water to prepare food				
Tanks				
Container (closed)				
Other (pan with lid)				
Frequency of sanitizing at the pantry				
Opening				
Closing				
Opening and closing				
Other (e.g. Many times during work times)				
Products used to sanitize				
Chlorine solution				
Alcohol				
All-purpose cleaner product				
Saponaceous				
Detergent				
Soap bar				
Other				
Hand washing during work				
Frequency of hand washing				
Location of hand washing				
At the pantry				
At dining hall				
store close to pantry				
Other				
Product used for hand washing				
Just water				
Liquid hand soap				
Liquid soap				
Detergent				
Other				
Hand-drying				
Paper towel				
Towel				
Hand dryer				
I do not dry				
Supplementary hand- washing				
Alcohol				
Alcohol gel for hands				
Other				
Use of rest rooms				
Did not use the rest room during the work hours				

Stores close to the dining/pantry				
Other				
Food handling				
Length of time passed since taking the food handling course				

Section D. Observational Guide.

AREA	OBSERVATION	TRAIL
1.Raw material Supply and Reception <ul style="list-style-type: none"> • Audit of suppliers • Certificate of conformance • Receiving/sorting area • traceability 		

<p>2.Storage facilities/Cold storage</p> <ul style="list-style-type: none"> • stacking discipline • temperature • general sanitation level 		
<p>3. Food preparation area</p> <ul style="list-style-type: none"> • general level of sanitation • control of workers and equipment traffic • cross contamination risk • pest management • ventilation and illumination • drainage system 		
<p><input type="checkbox"/> presence of free flowing portable water</p>		

<p>5. Personnel Issues</p> <ul style="list-style-type: none"> • staff training programs • protective clothing • jewelry, ear rings, watches • hand washing discipline • level of personal hygiene • habits and level of responsibility in term of hygiene • food-borne pathogen status 		
<p>6.Sanitary Facilities</p> <ul style="list-style-type: none"> • state of cleanliness • adequacy • cleaning /mode of sanitization • location 		
<p>7.Eating area</p> <ul style="list-style-type: none"> • level of hygiene • congestion 		

<ul style="list-style-type: none"> • ventilation • illumination • cleaning schedules 		
<p>8.Documentation and records</p> <ul style="list-style-type: none"> • cleaning/chemicals used • production • personnel • pest management • training <p>9.Process controls</p> <ul style="list-style-type: none"> • GMP • HACCP • Self Audit • No system 		

Appendix D

Definition of Terms

For the purpose of this document, the following expressions have the meaning stated:

Cleaning: The removal of soil, food residues, dirt, grease or other objectionable matter

Contaminant: Any biological or chemical agent, foreign matter or other substances not intentionally added to food which may compromise food safety or suitability.

Contamination: the introduction or occurrences of a contaminant in food or food environment.

Disinfection: the reduction of by means of chemical agent and/or physical methods of the number of micro-organism in the environment to a level that does not compromise food safety or suitability.

Establishment: Any building or area which food is handled and the surroundings under the control of the same management.

Food hygiene: All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

Hazard: a biological, chemical or physical agent in, or control hazard which are significant for food safety.

Food handler: any person who directly handles packaged or unpackaged food, food equipment and utensils or food contact surfaces and is therefore expected to comply with food hygiene requirements.

Central kitchen: A food production facility in which food is produced for service off site in receiving (satellites), often a large production facility; also known as a commissary (Unklesbay et al., 1977).

Contract feeding: Foodservice provided through an outside firm; may include outside management, personnel, and food purchasing (Silberberg, 1997).

Conventional food service system: A foodservice system in which ingredients are assembled and food is produced on site, held either heated or chilled, and served to customers; some foods are purchased fully prepared and require only portioning and service, whereas other products require full preparation; it is very labor intense (Unklesbay et al., 1977).

Flow of food: A path, from receiving through storing, preparation, serving, cooling, and reheating, that food follows in a foodservice system (Berry & Litchford, 1998).

Food production center: A facility in which food is prepared to be served at another location (Berry & Litchford, 1998; Silberberg, 1997).

Food-borne disease or illness: Infection or intoxication caused by microbial or chemical contaminants in food (USFDA, 2010).

Hazard Analysis Critical Control Point (HACCP): A food safety system that focuses on the flow of food in a foodservice operation in order to reduce the risk of food-borne illness (Berry

&Litchford, 1998); a systematic approach to construct a food safety program designed to reduce the risk of food-borne hazards by focusing on each step of the food preparation process—from receiving to service (USDA-FNS, 2005a).

Kiosk: A small, free-standing structure with open sides (Berry & Litchford, 1998) and a decentralized dispensing or serving area that is sometimes mobile (Silberberg, 1997).

Personal hygiene: Habits of the food handler, which include clean clothes/uniform, hand washing practices, good health, and neat and clean body (NRAEF, 2008).

On-site kitchen: A kitchen that prepares and serves food at the same location (Berry &Litchford, 1998; Silberberg, 1997).

Transportation: In the event food is prepared in one place and served in another, transportation activities include moving food and nonfood products, can storage and cleaning, return of soiled ware for sanitizing or disposal, and the collection and disposal of plate waste (Berry &Litchford, 1998).

