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STREET–VENDED FOOD: RISK FACTORS AND REGULATIONS' ENFORCEMENT IN SELECTED DISTRICTS OF CENTRAL REGION, GHANA.

ALEXANDER FIIFI GHARTEY

2019

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STREET–VENDED FOOD: RISK FACTORS AND REGULATIONS' ENFORCEMENT IN SELECTED DISTRICTS OF CENTRAL REGION, GHANA

BY

ALEXANDER FIIFI GHARTEY

Thesis submitted to the Department of Population and Health of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the Award of Doctor of Philosophy Degree in Population and Health.

JUNE 2019

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DECLARATION

Candidates' Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in the University of Cape Coast or elsewhere.

Candidate's Signature …… Date: ……

Candidate's Name: Alexander Fiifi Ghartey

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature:…… Date:……

Name: Professor Kwadwo Adu Oppong

Co-Supervisor's Signature …….. …….. Date ……..

Name: Dr. David Teye Doku

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ABSTRACT

The purpose of this study was to research into the street-vended foods risk factors and regulations' enforcement practices in two selected districts of the Central Region of Ghana namely, Komenda Edina Eguafo Abrem Municipality and the Ajumako Enyan Essiam district. This study was posited within the theories of disease causation process, the philosophy of utilitarianism and why people obey the law. The study applied a mixed-methods research design. The analysis was done by gauging the results of this study with the Codex Alimentarius International standards and relevant laws in Ghana. It was found that an overwhelming proportion of street food vendors (97.3%) were mainly illiterate females. On risk factors, almost one-fifth of food vendors did their business under insanitary environmental conditions; while nearly three-quarters of street foods were displayed in an unhygienic manner in either open air or at ground level. About one-half of vendors were observed to handle food with bare hands. Nearly one-fifth of vendors admitted they did not wash their hands with water and soap after using the toilet facility. Enforcement of food regulations in the study area was quite weak resulting in over one-third of food vendors operating without permit and therefore plying their business illegally. Albeit regulation enforcement in the AEE District was found to be better than in the KEEA Municipality, which probably contributes in explaining the differentials in the trend of food borne disease incidence in the two districts. Ironically, consumers placed more premium on the socio-economic attributes of street food rather than on food safety considerations. It is recommended that local authorities strategise to implement a 24-hour food regulations' regime in collaboration with other food safety stakeholders. Local authorities must provide adequate human, budgetary and logistical resource support to ameliorate the challenges that impede successful food regulations' enforcement and compliance in the study area.

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KEY WORDS

Codex Alimentarius

Food-borne diseases

Food hygiene and Safety

Food Regulation Enforcement

Risk Factors

Street-vended food

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DEDICATION

In Loving Memory of my late mum.

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LIST OF ACRONYMS

AAK	Abura Asebu Kwamankese
AEE	Ajumako Enyan Essiam District
CAC	Codex Alimentarius Commission
CFR	Case Fatality Rate
CHPS	Community Health Planning and Services
CWSA	Community Water and Sanitation Agency
EHO	Environmental health officer
EPA	Environmental Protection Agency
ETM	Epidemiological Triad Model
FAO	Food and Agricultural Organization
FBD	Food borne diseases
FDA	Food and Drugs Authority
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GES	Ghana Education Service
GHS	Ghana Health Service
GSS	Ghana Statistical Service
GTCA	Ghana Traditional Caterers Association
HACCP	Hazard Analysis Critical Control Point system
KAP	Knowledge, attitude and practices
KEEA	Komenda Edina Eguafo Abrem Municipality
LGA	Local Government Act
MLGRD	Ministry of Local Government & Rural Development

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MMDAs	Metropolitan/Municipal/ District/ Assemblies
MoFA	Ministry of Food and Agriculture
MoH	Ministry of Health
NCC	National Codex Committee
NADMO	National Disaster Management Organization
PHLR	Logic Model of Public Health Law Research
PSU	Primary Sampling Unit
RCC	Regional Coordinating Council
SDG	Sustainable Development Goals
SFV	Street-Food Vendor
SHEP	School Health Education Programme
SSU	Secondary Sampling Units
SVF	Street-Vended Food
WDC	Web of Disease Causation model
WHO	World Health Organization
WIAD	Women in Agricultural Development

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CHAPTER ONE

INTRODUCTION

Background

Food consumption as source of nutrients is essential for human growth, repair of body tissues, provision of energy, improvement in health status, sustaining life and the social well-being of individuals and societies (WHO 2017). Food is not only for functional purposes, it is also to be enjoyed. Food may be in their raw state such as fruits or cooked meals prepared ready to be consumed. Ready-to- eat food may be variously categorized as home, hotel, restaurant, or street-vended food; the latter includes 'chop bar', hawked food and fast foods (Osaili, et al., 2013; Annor & Baiden, 2011; Annan-Prah et. al., 2011; Donkor et al., 2009). Street- vended foods (SVF) are significant part of affordable urban and to some extent rural food supply for consumption due to a change in peoples's food consumption patterns as a result of rapid urbanization and the frequency of the habit of people eating out of home (WHO 2011).

The term street-vended food (SVF) has been variously defined. The FAO (2012) defined the "street-vended food" as a "wide range of ready-to-eat-food and beverages, sold and sometimes prepared along streets and several other public places such as lorry stations, parks, schools, construction sites and virtually all locations where there is a high number of potential customers." According to the FAO (2010), street-vended foods are "ready-to-eat foods and beverages prepared and/or sold by vendors and handlers especially in streets and other similar places for immediate consumption or consumption at a later stage

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without further processing or preparation." In South Africa, the term *informal sector food* may be inter-changed for street- vended food (Steyn et al., 2011).

Street-vended food may be categorized into cooked dishes or meals, snack, fruits, vegetables and drinks or beverages (FAO 2016). Conversely, a street- food vendor (SFV) is a person who offers foods for sale to the public without a permanent built- up structure but with a temporary static structure such as stall, tables, kiosk, headloads, wheel-barrow/truck (FAO 2016; Nurudeen et al., 2014). Some SFVs may cook at home and send the SVF to the vending site to sell or alternatively prepare it at the vending site. A multiple of street- food vendors usually congregate at any public place (street food centre) which may be authorized by the local authorities to display and sell their foods. Street-vended food business are commonly a family or one-person businesses and the majority work without licensing (Suraiya & Noor, 2012). Street-food vendors often determine their own working periods and hours (Mugampoza, et al., 2013). And in Ghana, Monney et al., (2014) found that about 80 per cent of food vendors have been engaged in the street-vended food trade for the past decade.

Street-vended food business is global in character in the sense that it is not limited to only one geographical zone. According to FAO (2012), about 2.5 billion people patronize street- vended food worldwide on daily basis. In many developing countries including Ghana, SVFs are commonly and widely patronized. They provide an essential food access mainly to workers, students, travellers, commuters and the general public on low incomes (Tortoe et al., 2012). Generally, accounting for high patronization of street-vended food especially in developing countries are the processes of urbanization, high population growth rate and increases in dietary demands (Satterthwaite et al., 2010). The initial

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average investment for establishing a street food vending business according to FAO (2012), ranges from about "CFAF 122 000 (almost US$240) in Abidjan, to approximately GH₵500 (US$ 263) in Accra."

Globally street-vended food has a number of distinct socio-economic importances particularly in low and middle-income countries. Street-vended foods play a major role in access to food and food security strategies of the rural, peri-urban and urban poor. They usually provide affordable and accessible food to millions of consumers, provide employment opportunities to less educated members of the community often offer nutritionally balanced diet especially to urban populations and contribute to the preservation of people's cultural heritage through traditional ways of preparing dishes (FAO/WHO, 2010).

According to the GSS (2010), 50.9 per cent of Ghana's population live in urban localities making street vended food safety of immense epidemiological importance to the Ghanaian populace. Food security is about food availability, food access, food utilization and food stability (FAO, 2009). They offer opportunity to develop business skills and know-how with low capital investment (Lues et al., 2006). Street-vended foods are also noted for their unique flavours, convenience as well as their nutritional value for the population (Tortoe et al., 2012). Additionally, the "seasonality of farm production allows for variation in consumer diets" (FAO, 2012).

Street-food vending business is considered as one of the largest employers in the informal sector in Africa. On average, it employs more than 37 per cent of the labour force, and contributes about 38 per cent to the total Gross Domestic Product (GDP) in Africa (FAO 2012). In Accra, Ghana, the street food sector alone employs over 60,000 people mainly women and has an estimated annual

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turnover of over US$100 million (WHO, Africa Region, 2010). Street-vended food trade also stimulate the use and demand of traditional foods and agricultural produce; and add value to tourism which may otherwise be obscured by the Westernization of local diet (Steyn & Labadarios, 2011).

Street-vended food business is not only an agriculture-related issue but is hugely of public health importance. Food safety is a major public health concern worldwide, because many people take their meals outside their homes and are exposed to the risk of various food borne illnesses (FAO, 2012). Normally, food has to be safe for human consumption. However humans usually acquire infections by eating food contaminated with disease causing microorganisms and toxic chemicals. More than two hundred known diseases ranging from diarrhoea to the cancers are transmitted through food worldwide (WHO 2006). Concerns about street-vended food safety stem from the reality that everyone is at risk of foodborne diseases. Foodborne diseases according to the WHO (2007) are "diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food." They are illnesses associated with the ingestion of food contaminated by hazards such as bacteria, viruses, parasites and chemicals. It is estimated generally that up to 30 per cent of the world's population suffer from some form of FBD each year (WHO, 2007). According to the WHO, (2017) an estimated "600 million – almost 1 in 10 people in the world – fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (DALYs)." Food-borne diseases from unsafe SVFs may affect all demographic cohorts (WHO, 2014). It is estimated that globally 3–5 million cholera cases and 100,000–120,000 deaths due to cholera are reported every year (WHO, 2012). A total of 589,854 cholera cases were notified

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from 58 countries, including 7,816 deaths for 2011 alone. The overall global total number of reported deaths was reported to have increased by 3.5 per cent from 7,543 in 2010 to 7,816 deaths in 2011 with a case fatality rate (CFR) of 1.3 per cent (WHO, 2012). According to the WHO (2017) "diarrhoeal diseases are the most common illnesses resulting from the consumption of contaminated food, causing 550 million people to fall ill and 230 000 deaths every year" and "220 million children contract diarrhoeal diseases and 96 000 die" every year. Mortality due to diarrhoea in children under-five is estimated at 15 per cent and is the second highest cause of under-five mortality both worldwide and in Africa (WHO Africa Region, 2012). Data for diarrhoea in Africa also show that mortality due to contaminated food (and water) is estimated to be around 700,000 persons per year in all ages (WHO Africa, 2007). Contaminated street-vended foods also have the propensity of creating a vicious cycle of disease and malnutrition particularly among children, the elderly and the sick (WHO, 2017). According to the WHO (2015) report on the estimates of the global burden of foodborne diseases the disease burden is caused by "31 foodborne agents (bacteria, viruses, parasites, toxins and chemicals)." Unsafe food may thus be described in the "context of risk of death or personal injury" to the consumer (Morris & Jones, 2007). Street-vended food safety is a major epidemiological challenge as these foods may be prepared and sold under unhygienic conditions, with limited access to safe water, garbage disposal facilities or sanitary services (Donkor et al., 2009). Surveys in Africa, Asia, and Latin America suggest that in developing countries especially, ready-to-eat food sold along the streets and other public places, pose a significant public health burden that need urgent solution to protect consumers (WHO, 2010). A geospatial assessment of cholera incidence in an urban Environment in Nigeria

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for instance revealed that waste dump sites and markets had the highest predisposing factors of cholera epidemic (Olanrewaju, & Adepoju, 2017). The primary aim of food hygiene and safety programme is to avoid food contamination by micro-organisms, prevent their multiplication and cook food thoroughly to destroy any such microorganism. Strengthening food safety helps to ensure consumer protection, reduce the burden of food-borne diseases (FBD), and thereby decrease human poverty. Related to the concept of food safety is food quality. Generally, all food characteristics such as spoilage, discoloration, off-odours, microbiological contamination and variables such as flavour, colour, texture and processing method of the food that influence street-vended food value to the consumer, may be considered under street-vended food quality (FAO/WHO, 2010).

Available literature studied show that there could be numerous epidemiological risk factors to street-vended food safety. Risk factors are conditions or practices which predispose street-vended foods to physical, chemical or microbiological contamination. They are conditions that expose the consumer of street food to the statistical likelihood of falling ill, which may or may not be the direct cause of the morbidity. As a consequence to the risk factors, hazards could be introduced at various entry points to contaminate street-vended. A cause may not be a single component factor, but a minimal set of factors that produce the outcome of disease incidence. According to Alimi, (2016), risk factors to street food safety may be found in the food production-supply-preparation-selling chain from 'farm to fork'. They may be categorised into agricultural practices, transportation, sources of raw foods and ingredients, food preparation, food handling practices, the vending environment, personal hygiene practices,

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knowledge and attitudes of food vendors, attitudes of consumers and the health status of vendors (Kleter & Marvin, 2008). Food vendors may be carriers, who may harbour infective agents of infections such as typhoid without necessarily showing signs of the disease, are capable of transmitting the disease to consumers (Lucas & Gilles, 2003 p.36). According to Bhopal, (2002), a risk factor becomes a *causal factor* only when its component causation role is established through laboratory investigations.

The earliest historical evidence from Assyria, Egypt, Athens and the Roman Empire show that governing authorities were concerned with codifying food regulations, to protect consumers from dishonest and exploitative practices in the sale of food (Food and Agricultural Organization/World Health Organization, 2006). As part of their efforts to help member states build the capacity to prevent, detect and manage foodborne risks, the WHO and the FAO established the *Codex Alimentarius* in the year 1963. Codex Alimentarius is a "Book of Food" which refers to a collection of internationally recognized standards, codes of practice and guidelines relating to foods safety, food production management processes and regulatory systems for food safety and consumer protection. The Codex principles were adopted in a uniform manner by the *Codex Alimentarius Commission* (CAC), to protect public health and safety of consumers, to provide adequate information on food safety to enable consumers to make very informed choices and to prevent the sale of misleading and deceptive food products.

The WHO has developed the WHO *Five Keys to Safer Food*. The associated training materials were developed to provide various countries with the needed training materials that are easy to use and adapt to different target audiences (WHO, 2006). The core messages of the WHO *Five Keys to Safer*

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Food listed are namely: 1) keeping clean, 2) separating raw and cooked food, 3) cooking thoroughly, 4) keeping food at safe temperatures; and 5) using safe water and raw materials to prepare food. Ghana became a member of *Codex* in 1966. Subsequently, a National Codex Committee (NCC) was established with an oversight responsibility for Codex activities, which includes advising the government on issues of food standardization, food quality and safety.

In Ghana, the Local Government Act 462 section 14 confers authority on the MMDAs environmental health department in collaboration with specific agencies and departments such as the Ghana Health Service (GHS) and the Food and Drugs Authority (FDA), to enforce various public health bye-laws, regulations or statutes in their respective district areas of jurisdiction with the aim of protecting and improving public health of all residents. This function may be posited within the broader constitutional framework of decentralization which requires MMDAs to be equipped with the capacity and resources to perform their functions. For purposes of enforcing bye-laws, Ghana's decentralization policy devolves some authority to decentralized sub-district structures within the area of jurisdiction of each MMDA. As part of the decentralized system, the respective Regional Coordinating Councils (RCC) also have the responsibility of coordinating the activities of the MMDAs (Ahwoi, 2010).

As a subset of public health law, food legislation is a prescription of enforcement mechanisms for removing unsafe food from the market and punishing culprits that are found culpable for infringing the law (FAO/WHO 2010). The specific objective of food legislation or regulation is to offer protection to food consumers by ensuring that food is safe for human consumption. It aims at ensuring social control and order by settling disputes

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and seeking remedies in the law court between individuals (food vendors and consumers) and between individuals (food vendors) and the local authorities if it arises. Food-borne hazards and diseases can thus be prevented by ensuring continuing enforcement of the law on food safety.

Statement of Problem

As explained in the previous section, food safety is an important public health challenge for all societies around the world particularly in the developing countries. Various studies reveal a direct relationship between unhygienic and unsafe SVF and the incidence of food-borne diseases (Alimi 2016; Tortoe et al 2013; Annan Prah et al 2011). Globally, food-borne diseases including cholera, typhoid, diarrhoeal diseases and parasitic infestation, are significant causes of morbidity, disability and mortality (WHO 2017). The most common symptoms of FBDs are stomach pains, vomiting and watery stools but could also result in long-lasting health problems such as cancer, arthritis and neurological disorders (WHO, 2014). It is estimated that 3 percent of cases of FBDs can lead to long term health problems (WHO 2006). Though FBDs are mainly preventable, "African and South East Asian Regions have the highest burden of foodborne diseases" (WHO 2015).Developing countries tend to suffer most from the burden of foodborne diseases (WHO 2012). They have adverse effects on the attempt to eradicate poverty and hunger; and to improve child health, maternal health and the general state of wellness.

In this study cholera is used as a proxy for all FBDs for two reasons. It is an internationally notifiable infectious disease. Cholera could affect all age groups in both genders (Olanrewaju & Adepoju, 2017). In Ghana cholera was first reported in Ghana in 1970 and the country has since been experiencing periodic

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cholera outbreaks. Between 1970 and 2012, Ghana recorded as many as 5,498 cholera cases. In 2014, the case fatality rate of cholera infection in Ghana (2.6%) exceeded the WHO recommended maximum limit of 1.0 per cent (WHO 2015). According to the UNICEF factsheet on Ghana the four coastal regions in Ghana, Greater Accra, Central, Western and Volta accounted for over 70 per cent of cholera cases between 1998 and 2013. Specifically, Central Region accounted for 9.6 percent of all reported cases of cholera over the period. The secondary data in Table 1 shows that the overall reported cases of cholera in the Central Region between 2003 and 2014 totalled 6,591 out of which 149 cases died. The CFR was thus as high as 2.26 percent. It is noteworthy that in 2010 the region recorded a CFR as high as 5.2 percent.

Table 2 depicts the reported cholera cases and deaths in Central Region by Districts over the period 2010 to 2012. Whereas the KEEA Municipality reported as many as 83 cholera cases with 7 deaths giving a CFR of 8.4 percent, Ajumako Enyan Essiam district reported no case of cholera over that period. The selection of the two districts was therefore to facilitate comparisons between a cholera prone district (KEEA) and non-prone district (AEE) with respect to the prevailing predisposing risk factors that could account for the differences in the outbreak of cholera in the study area.

Unsafe foods create vicious cycle of morbidity and malnutrition, particularly among infants, young children, pregnant women the elderly and the sick in whom the consequences are usually more severe and fatal (WHO, 2017). The health status of children less than five years fed away from home is also of major public health concern. According to the WHO, (2017) “children under 5 years of age carry 40 per cent of the foodborne disease burden, with 125 000

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deaths every year." In Ghana many mothers working in various markets feed their children with street-vended food and this could have serious implications on the health status of children if the food is contaminated (Tortoe et al., 2013; Annan-Prah, et al., 2011).

Unsafe foods do not only result in ill-health but could also have immense socio-economic consequences including low productivity, absenteeism from school, and the burden of increases in medical expenses. The implications are extremely burdensome in terms of human suffering and increased demands on the inadequately funded health care systems, particularly for developing countries such as Ghana. Other adverse contentions are that street food vendors often cause traffic congestion and often evade taxation (Patel, et al., 2013). There are also issues of congestion of sidewalks by street-food vendors, illegal occupation of public spaces, as well as socio-legal issues such as the practice of child labour in food vending. In most urban areas most food vendors are "continuously on the run due to constant harassment, assault and seizure of goods by metropolitan authorities and other users of the city space" (Asiedu & Agyei-Mensah, 2008).

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Table 1: Reported Cases of Cholera in Central Region,Ghana 2003-2014

Year	No. of Cases	No. of Deaths	Case Fatality Rate%
2014	3,846	60	1.6
2013	0	0	-
2012	156	8	4.3
2011	575	10	1.9
2010	232	12	5.3
2009	0	0	-
2008	0	0	-
2007	0	0	0
2006	1,692	55	3.3
2005	129	4	3.1
2004	5	0	-
2003	85	0	-
Total	6,591	149	2.26

Source: Central Regional Health Directorate DHIMS database, 2003-2014.

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Table 2: Reported Cholera Cases & Deaths in Districts, Central Region, Ghana, 2010-2012

	2012		2011		2010	
District	**Cases**	**Deaths**	**Cases**	**Deaths**	**Cases**	**Deaths**
AAK	6	0	125	3	0	0
Agona East	0	0	76	1	21	1
Agona West	51	1	43	0	2	0
AEE	0	0	0	0	0	0
A.O.B	0	0	1	0	0	0
Assin North	0	0	2	0	0	0
Assin South	0	0	0	0	0	0
Awutu Senya	9	0	138	1	150	3
Cape Coast	9	0	1	0	0	0
Effutu	0	0	92	0	21	3
Gomoa East	0	0	6	2	35	5
Gomoa West	1	0	1	0	0	0
KEEA	32	6	51	1	0	0
Mfantsiman	48	1	36	2	0	0
Twifu H L/Denkyira	0	0	0	0	3	0
Upper Denkyira East	0	0	3	0	0	0
Upper Denkyira West	0	0	0	0	0	0
Total	156	8	575	10	232	12

Source: Central Regional Health Directorate DHIMS database, (2003-2014).

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Purpose/General Objective of Study

The purpose of this study was to study predisposing risk factors to street-vended food; and regulations' enforcement practices in the two selected districts of the Central Region, namely the KEEA municipality and the AEE district. The analysis was conducted by gauging the findings to Codex food safety standards and making appropriate recommendations to stakeholders.

Specific Objectives

The following specific objectives were formulated:

1. Ascertain the socio-demographical characteristics of street food vendors.
2. Assess street-food vendors' knowledge in food safety.
3. Ascertain the risk factors to street food safety.
4. Explore factors that influence consumers' patronage of street food.
5. Ascertain the food regulation enforcement practices in the study area.
6. Assess the regulation enforcement challenges in the study area.

Research Questions

Emanating from the problem statement above are the following six study research questions:

1. What are the socio-demographic features of street- food vendors?
2. How knowledgeable are street- food vendors in food safety?
3. What are the risk factors to street-food safety?
4. Which factors influence consumers' patronage of street –vended food?
5. What is the extent of enforcement of food regulations?
6. What are the challenges to the enforcement street-vended food regulations in the study area?

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Rationale/Significance of the Study

This section explains the rationale for the study. The study was motivated by the epidemiological need for the prevention of incidence of morbidity and mortality resulting from food-borne ill-health. Food-borne diseases not only adversely affect people's health and well-being, they are also of immense adverse socio-economic importance for individuals, families and the larger society. According to the WHO (2017), foodborne diseases "impede socioeconomic development by straining health care systems, and harming national economies, tourism and trade." The loss of income as a result of food-borne illness perpetuates the cycle of poverty in individuals and families.

This study sought to remedy the identifiable knowledge gap in street vended food regulation enforcement practices. Additionally, the findings provide relevant strategic information for District Assemblies and other stakeholders in controlling the frequent outbreaks of FBDs in the study area. It is hoped also that the incidence or outbreaks of FBDs would ultimately be minimised culminating in an improved population health and a potential achievement of the Sustainable Development Goal (SDG) Goal 3 (3.3) of ending epidemics of food and water-borne diseases by 2030.

Limitations of Study

The scope of this study encompassed the demographic characteristics of the food vendor, their socio-economic characterisics, environmental and personal habits and behaviours of the vendor as well as that of the consumer. The study focused on the connection between street- vended food safety and food regulation enforcement practices but experienced some limitations. One important factor was the definitional scope adopted. This research excluded ready-to-eat food

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sold in hotels and restaurants which are usually located in permanent buildings but rather ready-to-eat foods sold along streets and other public places. Street-vended foods have greater economic and access capacity in developing countries in feeding vast populations as compared to food sold in hotels. In the definition of street-vended food, water was considered an ingredient in food preparation and for washing of utensils/crockeries or for drinking (FDA 2011). Although the geographical study area was Central Region, the methodology limited the scope of study to two districts namely one coastal district noted for a relatively higher incidence of cholera cases (KEEA Municipality) and one inland district (AEE District) that had not reported any case of cholera over the period 2010 to 2012. Microbiological laboratory examination of street-vended food samples as well as a study on temperature controls in food safety were excluded from this study.

Organization of the Thesis

The main-body of this thesis is made up of five chapters. *Chapter one* introduces the background of the study which states the theoretical, historical, managerial and the legal context of the study; and the problem statement which expresses existing morbidity and mortality burden in the study area. Other sections in the chapter are the purpose and specific objectives, research questions and the significance of the study. The limitations of the study are also explained. *Chapter two* captioned literature review, consists of theoretical abstractions, conceptual framework and the empirical literature reviewed from almost all regions of the world. Literature in street-vended food safety reviewed in chapter two of this thesis are from three perspectives, namely food vendors', consumers' and key informants' or regulators' standpoints. Describing the strategies of data collection and analysis, *Chapter three* comprises the

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methodology and a focus on the geography of study area. It also includes sampling procedures used, how the vendor sample size was calculated, a statement on the data collection instruments used, the data collection processes applied, the data processing mechanisms and the data analysis procedures used. Additionally, it covers the validity, reliability, limitations and ethical considerations applied in the study. C*hapter four* on the other hand focuses on data analysis, the findings and a discussion of the results. Finally, *Chapter five* has four main sub-sections namely the summary, conclusions, key contributions to knowledge; and recommendations to stakeholders based on the study results. That chapter concludes with suggestions for further research into related food safety issues and challenges.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter critically reviews theoretical and empirical literature in the area of street-vended food safety from published works, textbooks, journals and electronic database sources. The study explores the mediating factors on food safety such as vendor and consumer knowledge and practices as well as food regulation compliance enforcement practices and challenges. The chapter composes of with the conceptual base and the theoretical framework of the study and the literature review.

This chapter hinges on three main terminologies or abstractions namely *theory*, *concept* and *variables*. The term theory refers to a system of assumptions based on abstract generalization that present a systematic and logical explanations about inter-relationships between concepts and variables. The purpose of theory is to make research finding meaningful and generalizable in that they embody principles for explaining, predicting and controlling phenomena. A basic ingredient of theory is *concept*. As building blocks of theories, concepts are abstractions based on certain empirical phenomena such as behaviours or characteristics. For purposes of research investigation, concepts are broken down into *variables* which describe the quality or attribute of a person, group or a situation that may vary or assume different values or attributes.

There are three main theories within which this study was posited. These were disease causation, the philosophy of utilitarianism and the theory of why people obey the law. The philosophical interest in epidemiological study is

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directed towards disease *causality* and *association*. Correlation in itself does not tell whether association is causal or not. Justifying causality therefore requires additional arguments that go beyond quantitative associations (Broadbent, 2014).

The core concern of public health is the prevention of disease incidence and the promotion of good health and well-being among communities and populations through collective and organized societal action (Lucas & Gilles, 2007 p. 1). This implies that authority must be exercised over a person or group of persons such as street- food vendors against their will, if their actions and practices pose a potential risk or harm to consumers. The philosophy of Utilitarianism is therefore the rightness of an action based on its consequence of producing the 'greatest good'. The philosophy was developed by English philosopher Jeremy Bentham (1748—1832). Another English philosopher John Stuart Mill (1806-1873) by his *Harm Principle* expounded the philosophy of *Utilitarianism* in his book *On Liberty*. Mill's harm principle is based on self-protection, whether as individuals or as a society on a whole.

According to Tyler (2006) there are four main theories that explain why people obey the law. These are social control, public choice, group influence and personal values theories. The Social Control theory is built on the assumption that "people's behaviour is motivated by rewards and punishments in the external environment." The Public Choice theory suggests that people have the urge to obey the law when they know or believe that it will be beneficial to obey the law. If there will be no benefit then the law must not be obeyed. The Group Influence theory which is about the influence of peer pressure, suggests that people "exert normative pressure on people because individuals look to other social groups for information about appropriate conduct." Finally, by the Personal Values theory,

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people comply with rules not because of potential reward or punishment nor by group influence but by their sense of what is right or appropriate. Similarly, the effectiveness of mechanisms for inducing compliance with the law contitute critical elements that influence the effects of law on health outcomes such as wellness, morbidity and mortality.

Conceptual Models

The state of existing knowledge or theories influenced how to proceed to develop the research conceptual framework. The purpose of this theoretical section is to give a sense of conceptual direction to the study methodology and to derive the elements and variables of the study based on the study objectives. The research conceptual framework (figure 3) is adapted from three existing models. These are the *Epidemiological triad model*, *the Web of disease cauation model* (Lucas & Gilles, 2003; Giesecke, 2002; Bhopal, 2002; Jekel et. al., 2001) on one hand; and the Logic Model of Public Health Law Research (PHLR) (Burris, Wagenaar, Swanson, Ibrahim, Wood & Mello**.,** 2010). The main purpose of designing models is to "simplify reality and to make it easier for the mind to grasp the essence of the issue" (Bhopal, 2002 p.113).

Epidemiological Triad Model

The *Epidemiological Triad Model* (ETM) (figure 1) is a classical epidemiological model adapted for the study conceptual framework. This model is used to depict the interelationhips of variables and concepts responsible for the causation of foodborne diseases. In the ETM model, the concept of infection transmission is the process of disease *agent* interplay within a given environmental condition with the population at risk of developing a disease (host

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factor) which ultimately determine the health status of individuals and the population (MoH/WHO, 2000; Giesecke, 2002). A fourth element, *vector*, is added to the model to explain the role of vectors such as houseflies in infectious disease causation. The model emphasizes the interplay of the genetic, social, psychological and physical make-up of the individual; the physical, social and chemical environmental factors; and the microbiological, physical and chemical agents of disease causation. From the ETM may be derived the *F-Diagram* (refer Appendix Figure D) which depicts the faecal-oral disease transmission routes. When faeces are not safely disposed or stored, they represent a public health risk, because pathogens in faeces can be transmitted orally through many different mechanisms to humans summarized as five Fs – i.e. fingers, flies, fields, fluids and food.

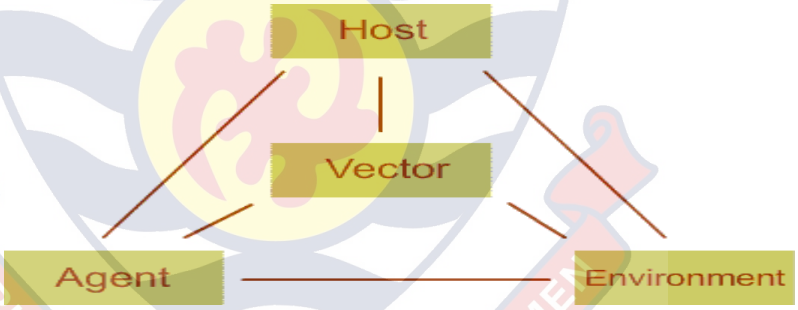

Figure 1: Epidemiological Triad Model

Source:Jekel et al., 2001

The mechanism for infection transmission in food borne diseases emanate from faecal-oral transmission and intestinal localization of the causative microorganism. The 'faeco-oral' transmission of infection results from the passage of contaminated food from human faeces into the mouth of a host into the alimentary canal (Lucas & Gilles, 2003). The causal pathway of the association between a risk factor and the incidence of a disease may be direct or indirect depending on the presence or absence of intermediary (intervening) variables or

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confounders such as environmental or socio-behavioral factors or vectors. Though contamination of street-vended food may occur as a result of contact with excreta-infected hands or/and other parts of the body of food handlers or/and consumers, food contamination may also result from food contact by vectors such as houseflies, cocroaches or even rodents. It may also occur as a result of unhygienic circumstances of transporting street-vended food, unhygienic storage or improper temperature control or unhygienic preservation of food (Lucas & Gilles, 2003; Jekel et al., 2001).

The Web of Disease Causation Model

The second adapted theoritical model is the *Web of Disease Causation* model (WDC) which views disease condition as resulting not from simple individual factors but of complex interactions among multiple factors which produce the synergy for disease causation such as prevalence of behaviour, environment, phenotype, microbes, genetic factors, workplace and social environment. The WDC model which is depicted by the metaphor of the spider's web, seeks to move away from monocausal model of disease, to a 'multiple causation' or multifactorial model of disease causation (Broadbent, 2009). Whereas the agent and any other elements of the triad are deemed 'necessary' conditions for disease to occur, all the elements are deemed 'sufficient' conditions. Risk factors are considered insufficient conditions but contributory factors to disease causation. Invariably however most judgments of cause and effect tend to be tentative, and are prone to change with new evidence (Bhopal, 2002 p.126). According to Krieger (1994) this model "remains a widely accepted but poorly elaborated model, reflecting in part the contemporary stress on

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epidemiologic methods over epidemiologic theories of disease causation"(Appendix D).

Logic Model of Public Health Law Research

The third adapted model for this study is the *Logic Model of Public Health Law Research* (PHLR) (figure 2). It is a logic model of public health law research and the typology of the effects of law on population health (Burris, Wagenaar, Swanson, Ibrahim, Wood & Mello**,** 2010). This model underscores law as a "prominent intervention tool to achieve particular public health goals" at various levels including the local level. The independent variable in PHLR is lawmaking and the enforcement capacity of legal authorities. These are linked in the causal chain to dependent variables or mediators including changes in the environment, health behaviours and ultimately in health outcomes of morbidity and mortality. The term environment on the other hand is broadly used to refer to physical, social and organizational ecology. PHLR involves focusing directly on health outcomes or by using the changes in the mediating environmental and behavioural patterns as proxy outcome variables. This model justifies "regulatory action and supporting normative arguments about what policies are most desirable, effective, or consistent with human rights or other legal standards" (Burris et al., 2010).

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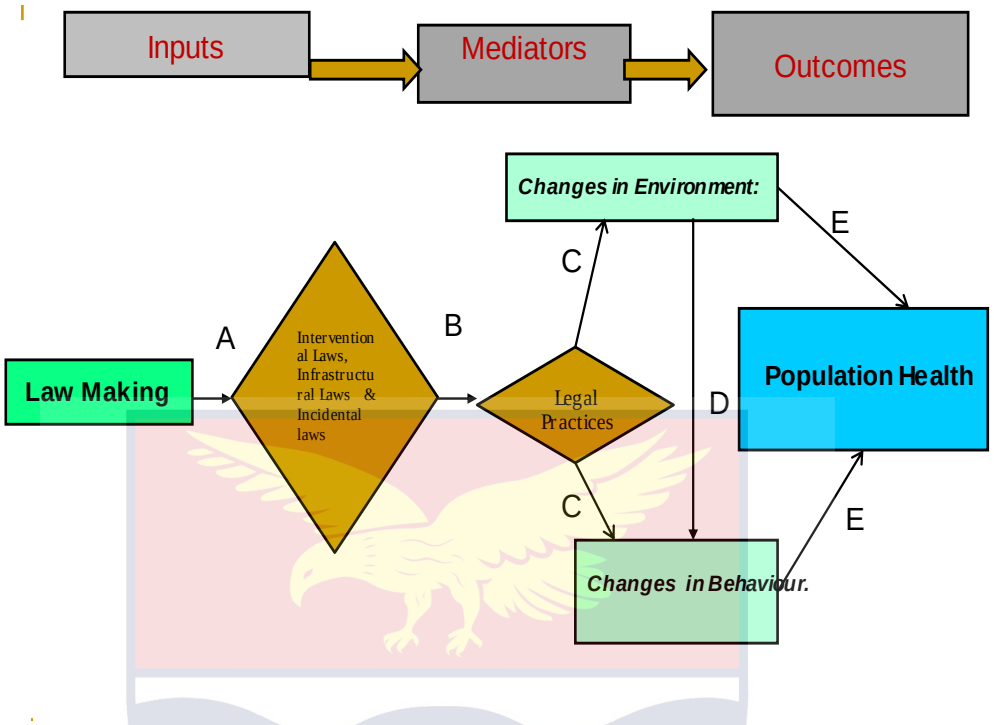

Figure 2: Logic Model of Public Health Law Research
Source: Burris et al., 2010.

Study Conceptual Framework

This section provides a conceptual framework of this study, specifically a presentation of the systematic explanation and relationships between relevant abstract concepts that constitute the building blocks of the study conceptual framework. A conceptual framework provides a schematic description of the relationships between independent, dependent, moderator, control and extraneous variables to enable easy comprehension of the theorized relationships of the concepts. Conceptual framework visually "identifies literature review categories and directs research objectives" and provides "a rationale or base for conducting research" (Radhakrishna et. al, 2007).

All three conceptual models have been integrated into a composite conceptual framework for this study (Figure 3). The study conceptual framework

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is derived from the epidemiological triad model, the web of causation model, and the PHLR model. Comprising the study conceptual framework are three main parts namely independent factors; mediating factors and outcomes. The independent factors refer to enforcement of food regulations as well as resource capacities of enforcement authorities, and the socio-demographic characteristics of food vendors; whereas mediating factors comprise knowledge, attitudes and practices of vendors and consumers and how they synchronize to produce the level of safety of street-vended food and ultimately the population health outcomes of epidemics, morbidity, mortality and wellness respectively (Burris et. al., 2010; Ward et al., 2007). Though the components of the conceptual framework can be described severally, they represent a system of interrelationships with a number of feedback loops among the building blocks. The concepts in this conceptual framework adequately relate to the study specific objectives listed on page 14 of chapter one.

Literature Review

Overview of street-vended foods

This section reviews the concept of street-vended food and their socio-economic importance. The term street-vended food has been defined variously by the FAO, WHO, and many researchers as outlined in the *Background* section of Chapter one. In this study the operational definition of street-

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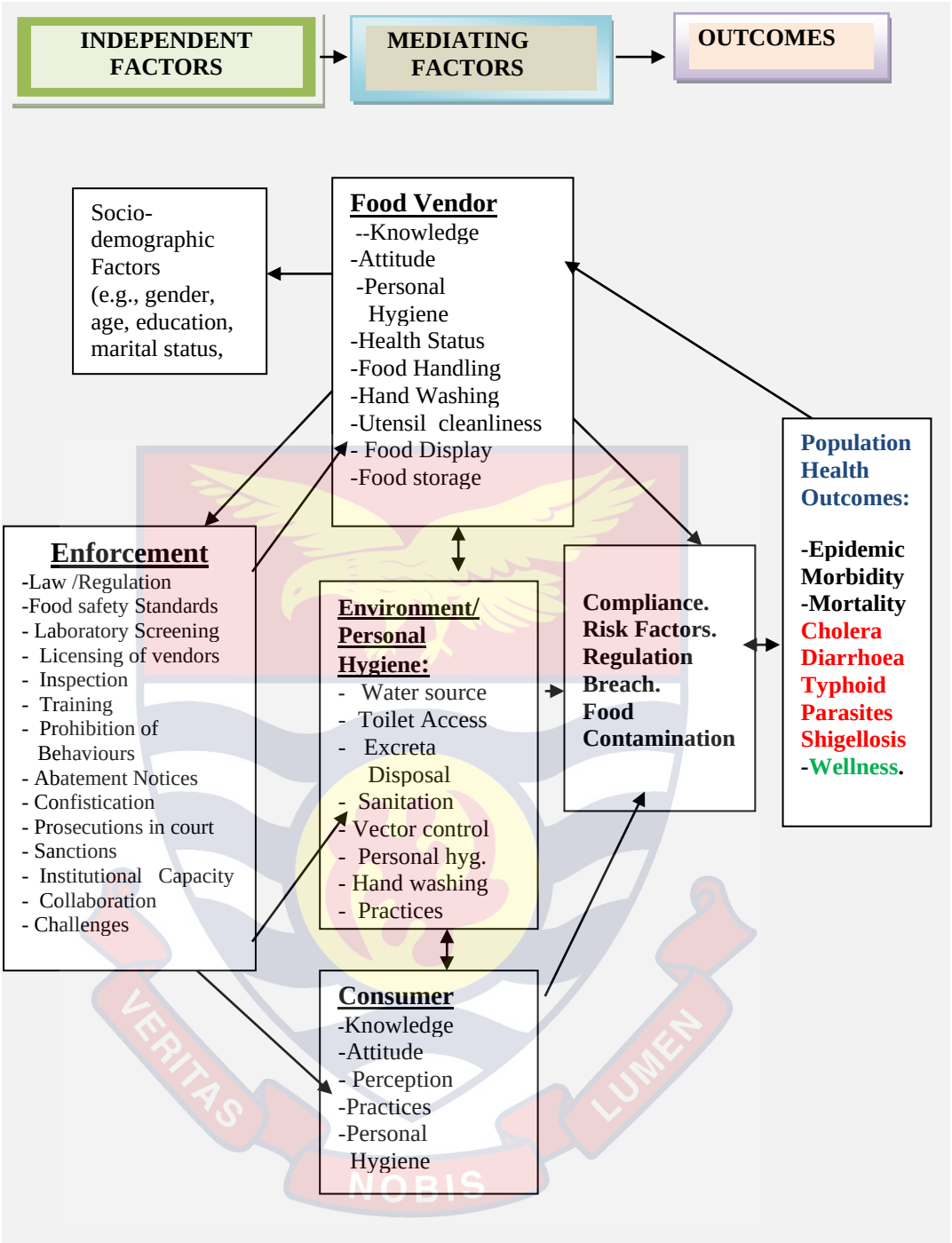

Figure *3:* Study Conceptual Framework

Source: Designed from the Epidemiological Triad Model (Jekel, Katz & Elmore, 2001); Web of Disease Causation (Broadbent, 2009; Krieger 1994); and the PHLR Model (Burris, Wagenaar, Swanson, Ibrahim, Wood & Mello, 2010).

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vended food (or street food) refers to *a wide spectrum of ready-to-eat-food and beverages, prepared and sold by vendors or food handlers along where there are potential customers who patronize them for immediate consumption or consumption at a later time without further processing or preparation.* Generally, street foods are usually bought for either immediate consumption at the location where it is purchased or taken away and eaten at home or elsewhere at a later time. Generally, street-vended food may be classified as meals, fruits, snacks, vegetables and drinks (FAO, 2012). According to WHO (2015), the "Africa Region has the highest burden of foodborne diseases per population.More than 91 million people are estimated to fall ill and 137,000 die each year."

The proliferation of street food vending business is linked to urbanization that is the "the combination of increasing urban population (due to both natural growth and migration from rural to urban areas)" (FAO 2016). Street food vending is a viable way of making a living since it requires little start-up financial capital and no formal education. Generally, the type of street-foods sold in any particular geographical area varies according to the socio-economic status of customers and the food culture of the people including local eating habits. Each area's type of street food may arise from tradition and may also vary with the seasons (Haleegoah et al., 2016; Steyn & Labadarios, 2011). For example studies show that Nigeria has over 83 different types of street food (Nurudeen et. al., 2014). Ghana also has variety of street-vended foods. Among these are *fufu* (pounded cassava with plantain, cocoyam or yam), *banku/akpler,* (fermented maize dough dumplings), *kenkey* (fermented maize dough dumplings), *waakye* (boiled rice and beans), and *gari* (fermented cassava flour). Among the breakfast street-vended foods in Ghana include *koko* (maize porridge), and *koose* (fried bean

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cake) (Yeleliere et al.,2017; Tortoe et al., 2012; Rheinländer et al., 2008; Mensah et al., 2002). *Ga kenkey*, *waakye* and *koko* are ethnic dishes that have been transformed into national cuisines in Ghana (Haleegoah et. al., 2016).

Thus despite the disease risk concerns, street-vended food contribute significantly to food security and nutrition by providing nutritious, comparatively inexpensive and tasty foods to millions of consumers of all socio-demographic cohorts. Consumers particularly workers, school children and travellers are thus helped to cope with long periods of absence from their homes. It is also an important means of generating income in the informal sector since it provides vast employment opportunities particularly in developing countries. The average net income of SFVs in Accra is estimated at GH₵56 with half of vendors earning less than GH₵36 per day (FAO 2016).

Categories of Food Vendors

Street- food vendors may be stationary vendors who may offer food for sale from removable structure such as stalls located on main streets; or mobile vendors on foot or bicycles, or semi-mobile such as using push carts (FAO, 2012). A stationary vendor operates from a defined location usually in a public place either authorized or not authorized by the local authority. A multiple of street–food vendors usually congregate at any public place (street food centre) normally authorized by the local authorities to display and sell their food. Some food vendors may cook at home and send the ready-to-eat food to the vending site to sell. Alternately they may prepare it at the vending site. Literature show that locations for stationary SVF business may include 'street corners, industrial/construction sites, bus or train terminals' public places and school

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compounds" (Alimi 2016). It is estimated that in Ghana about 64 per cent of vendor stalls are adjacent to roads (Dun-Dery & Addo 2016; Rheinländer et al., 2008). Mobile vendors on the other hand, are vendors who move from place to place displaying, distributing or selling any type of street food. Studies in Ghana and Nigeria also show that overwhelming majority of SFVs are stationary vendors (Monney et al. 2014; Nurudeen et al 2014). In Ghana the type of vending sites may include chop bars, food joints or open air vending. In the Accra Metropolis, vendors sell by the road side, in kiosk or store, in front of their house and at other public places such as along streets, at lorry stations, markets, at school premises, construction sites and offices (Tortoe et al., 2013; Odonkor et al., 2011). On the other hand, whereas in Brazil, 57.5 per cent of the vendor locations are stationary (da Silva et al., 2014), only 10 to 14 per cent of street-vended food were prepared on site in South Africa (Lues et al., 2006).

Fixed vending sites may be constructed with varying materials-stalls made of wooden structure, canopy/tent and metal 'container' (Dwumfour-Asare & Agyapong 2014). However, vending stalls may be constructed with polythene bags (Gitahi et al., 2013) or canopies with zinc sheet (Nurudeen et al., 2014). This means that stationary vending have different characteristics in terms of the location and the type of technology used for the structural location depending on the geographical region.

Socio-Demographic Profile of Food Vendors

This section reviews the literature on socio-demographic characteristics of street -food vendors i.e. gender, age, educational status and marital status. A

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review of socio-demographic variables may be necessary because of their potential associations with other study variables.

Many studies in both Southern and Northern Ghana show that overwhelming majority of street- food vendors (at least 95%) are women (FAO, 2016; Dun-Dery & Addo, 2016; Monney et al., 2014; Apanga et al., 2014). This assertion is corroborated by studies in various parts of West Africa where between 89 to 100 per cent of street- food vendors are illiterate women (FAO 2012). Findings in a cosmopolitan Accra Metropolis study by Odonkor et al., (2011) however found that a relatively lower proportion (76%) of vendors were females. Though women are in the majority in the street-food vending business in Ghana, the numbers slightly diminish the more cosmopolitan an area is such as in Accra Central.

In other recent studies in Brazil, the proportion of SFVs was found to be between 50 to 55 per cent women (da Silva et al., 2014). Findings of majority of SFVs being women are however contradicted by studies in Eastern and Southern Africa and parts of Asia (Taranga & Himadri, 2013; Gawande et al., 2013; Mamun et al., 2013; Steyn & Labadarios 2011; Abdalla et al., 2008; Muinde & Kuria, 2005).

In Ghana and in many other West African countries, middle-aged women mostly engage in street food vending (Haleegoah et al., 2015; Sarkodie et al., 2014; Monney et al., 2014; Adjirah, 2013; Annan-Prah et al., 2011; Tan et al. 2013). Similarly, Donkor et al. **(**2009), found that the age range of food vendors was between 16 to 70 years with a mean age of 34 years. A lower age range (26 to 30 years) of food vendors was however found in Accra Metropolis (Odonkor et al., 2011). So in general though the age range of food vendors may be wide,

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majority tend to be middle-aged, an indication of the importance of the street food business as a significant source of employment in the private sector for the youth. However, few studies in Ghana and elsewhere had found that street food business was conducted mainly by women aged above 51 years and not by the middle-aged (Mensah et al., 2002; Cuprasitrut et al., 2011).

In West Africa, majority of street-food vendors are illiterate women or or at best have had primary education (FAO 2012). This assertion is corroborated by many studies in the West African sub-region and other parts of Africa (Haleegoah et al. 2015; Nurudeen et al., 2014; Donkor et al. 2009; Abdalla et al. 2009; Muinde & Kuria 2005). On the contrary, findings of studies in metropolitan areas such as in Hulu Langat district in Malaysia and Accra Central show that majority of food vendors may be of higher educational status (Tan et al. 2013; Odonkor et al., 2011). On the other hand an FAO (2012) report revealed that a relevant proportion of street-food vendors in West Africa have secondary level education which might be a reflection of their difficulty in accessing the formal job market in cities. Generally therefore, most street food vendors in Africa have little or no education though the more cosmopolitan an area is the higher the level of education of street vendors.

According to Taranga & Himadri, (2013), food vendors with secondary level of education put more emphasis on quality and safety of street food as compared to illiterate vendors. And knowledge in the importance of hygienic hand washing was found to be significantly higher among street vendors with secondary education or above (Taranga & Himadri, 2013). Various other researches also found that educational level of food handlers significantly influence level of food safety knowledge (Mamun et al., 2013; Zain & Naing,

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2002). On the other hand, Okojie and Isah (2014) found in Benin City, Nigeria, that there was no statistically significant association between educational status and the hygiene status of food premises. Additionally, the elderly (45 years above) vendors were 17.7 times more likely to have adequate level of knowledge and awareness than the vendors belonging to age group 15–24 years (Zain & Naing, 2002).

Street Food Contaminants and Hazards

Having reviewed the literature on the concept of street food, this section highlights street food safety and the types of hazards or contaminants that could make food unsafe. From'farm to fork', food is safe when it is free from all hazards which may be injurious to the health of the consumer. Unsafe foods not only result in ill-health, but also have adverse economic consequences for the society as a result of absenteeism from productive work. Food safety practices involve preventing "all those hazards… that may make food injurious to the health of the consumer" such as physical hazards (e.g. stones, dust, metal pieces, hair), chemical hazards (e.g. cleaning detergents, insecticides, pesticide, food additives) or biological hazards or microorganisms (e.g. bacteria, viruses, helminthic infections, protozoal infections) (Yeleliere, Cobbina & Abubakari, 2017; Cuprasitrut et al., 2011; FAO/(WHO, 2O10). It is the process of "protecting the food supply from microbial, chemical and physical hazards that may occur during all stages of food production, including growing, harvesting, processing, transporting, retailing, distributing, preparing, storing and consumption, in order to prevent food-borne illnesses" (WHO 2015). Positive food attributes including colour, flavour and texture and negative attributes such as spoilage,

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discolouration, contamination with dirt, or bad odours or tastes are refered to collectively as food quality

Bacteria species in street-vended food may be used as indicators of the levels of hygienic quality or contamination of street-vended food (Yeleliere, Cobbina & Abubari, 2017). Salmonella species that contaminate meat products are also a major bacterial cause of acute gastroenteritis. **(**Gawande et al., 2013). *Escherichia coli (*E. coli) is another type of bacteria which is commonly used as a surrogate indicator of poor basic food hygiene practices associated with faecal contamination, and it may be isolated from various intestinal diseases **(**Tortoe et al. 2012; Vriesekoop et al., 2010). The presence of *E. coli* in food is indicative of direct or indirect faecal contamination resulting from poor hygiene and insanitary conditions during food preparation and handling, improper food storage and temperature control **(**Mugampoza, et al., 2013; Annan-Prah et. al 2011; Tambekar et al., 2011**)**. Another type of bacteria, *Bacillus cereus* (*B. cereus*) in street foods may occur as a result of inadequate temperature control and may also be taken as an indicator of the ability of spore forming bacteria to persist on banknotes (Vriesekoop et. al., 2010). Similarly, street foods that may be associated with *B. cereus* contamination may include cooked rice dishes, other cereal based foods and dairy based deserts, whereas contamination of street foods with *staphylococci aureus* is mainly as a result of poor handling of food **(**Atter et al., 2015**;** WHO, 2007**)**. Contamination could be minimized through hygienic food handling practices of vendors and consumers alike, and the growth of the pathogen is prevented through appropriate or adequate temperature controls (Mensah et al., 2002).

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Food-borne viruses (such as Hepatitis A, Hepatitis E and norovirus) are also transmitted through the oral route via faecal contamination (WHO, 2007**).** Personal and environmental hygiene practices including appropriate hand washing practices are the main control strategies (Lucas & Gilles, 2003). Parasitic infections are generally found to spread via faeco-orally transmissible parasites resulting from the contamination of street-vended food (Danikuu, Azikala & Baguo 2015; Assob et al. 2012; Donkor et al., 2009). In those studies childcare activities, lack of deworming, poor personal hygiene, poor sanitation and inadequate toilet facilities were stated as the risk factors that promote the spread of faecal-oral parasite infections.

Generally, the safety and quality of specific SVFs may vary. Some may be safer than others depending on the processes involved in their preparation, transporting, handling, serving and storage. According to WHO (2006), for food to be safe to be eaten, it must reach a temperature of 70 ºC. Mensah et al. (2002) in Accra [and confirmed by Gitahi et al., 2012] revealed that "breakfast and snack foods, e.g. *koko (*porridge) and *koose* (bean cake), were the least contaminated." This is because porridge was prepared and sold in "the early hours of the morning and sold within 2–3 hours at 50–90ºC, a temperature range over which most vegetative bacteria do not survive." Additionally, "*koose* was prepared on site by frying and served hot at 165–175º C, a temperature range that kills most bacteria." In similar microbial studies of street-vended food in Accra on selected *kenkey*, *waakye* and *fufu* street-food vendors, *Kenkey* was considered low risk (Tortoe et al., 2012 Mensah et al., 2002). Tortoe et al., (2012) also found that all the *waakye* samples studied were generally microbial safe because they "were served warm (33 to 37ºC)". On the other hand, ready-to- eat foods

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such as *fufu*, *akpler* and rice, were heavily contaminated because they were handled excessively after cooking (Tortoe et al 2012; MacArthur, 2007; Mensah et al., 2002).

Research findings also showed that samples of *fufu*, *omo tuo (*rice balls), salads, macaroni, and red pepper sold in *chop bars* had various levels of pathogens(Yeleliere et al., 2017; Feglo & Sakyi, 2012; Rheinländer et al., 2008). According to Yeleliere et al., (2017) and Mensah et al., (2002), soups and sauces/stews were contaminated with *E. coli* and *Salmonella arizonae* because they were prepared the day before consumption with inadequate reheating. Many studies in Nigeria and Uganda, confirmed various levels of microbial contamination of various vended foods indicating poor personal hygiene in food preparation, handling or utensil hygiene (Okareh & Erhahon, 2015; Odu & Ameweiye, 2013; Mugampoza et al., 2013; Falola et al., 2011).

Leafy vegetables and herbs intended to be consumed raw e.g. lettuce, spinach, cabbages and *kontomre* (cocoyam leaves) are implicated as "vehicles for the transmission of microbial food-borne disease worldwide" (FAO/WHO, 2008). Macaroni, salads, lettuce and vegetable samples could carry the greatest risk of transmitting diarrhoeal pathogens because contaminated water are often used to water vegetables (Gitahi et al., 2012; Adjirah, et al., 2013; Andoh et al., 2009**;** Rheinländer et al., 2008). In Nigeria, safety evaluation of street vended ready-to-eat fruits (pineapple, watermelon, apple and fruit salads) showed that all the samples were contaminated with *coliform bacteria* and *fungi* (Oranusi & Olorunfemi, 2011).

On chemical contamination of SVFs, the use of dangerous additives or adulterants such as the use of carbide, formalin, textile colors, artificial sweeteners

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and additives are some chemical hazards discovered in some street-vended foods in a study in Bangladesh (Rahman et al., 2014). Similarly, when hot foods are wrapped with polythene bags, dangerous disease causing chemicals could migrate into the food and the chemical contaminants present in the food are often unaffected by the temperature used for cooking (Ardic et al., 2015).

Physical contaminants can also contaminate street- vended food. In a study in Abeokuta the analysis of physical contaminants in the local 'robo' prepared from melon seeds showed that the samples were contaminated with "mineral matter, tramp metal, extraneous vegetable material and matter of animal origin, as well as lead, cadmium, arsenic and tin" over and above the acceptable limits (Sobukola, Awonorin & Idowu, 2008).

Risk factors of Street Foods

The FAO (2016) classifies risk factors into two broad categories, namely *endogenous* and *exogenous* factors. Whereas endogenous factors refer to factors over which the food vendor has direct responsibility and control (eg. safe handwashing and food handling practices, hygienic transportation of food, hygienic waste disposal, protection of food from flies etc); exogenous factors are outside the responsibility and control of the vendor such as the provision of public sanitation infrastructure and facilities, such as clean water sources, access to hygienic public toilet facilities, unsafe food handling by consumer and provision of hygienic slaughter houses. In a study in the Ga district of Ghana, it was found that 65.6 per cent of chop bars did not obtain their meat supply from approved sources an indication of challenges involved in accessing slaughter house for purchasing meat (King et al., 2000).

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Various studies have identified 'high-risk' endogenous factors to street food. Among these are unhygienic ingredients such as vegetables used to prepare food. The mode of transporting either ingredients or ready-to-eat SVFs could also play a significant role in the contamination of foods (Alimi 2016). Poor personal hygiene of street food vendors, especially with respect to their hand washing practices is considered a major risk factor (FAO, 2012; Muhonja & Kimathi, 2014; Gawande et al., 2013; Muyanja et al., 2011). Even in the Manhattan, New York, USA, Burt et al., (2003) found that over half of all mobile street-food vendors (67%) contact- served foods with bare hands.

The use of soap to wash hands, utensils and crockery reduces the levels of bacteria because most microorganisms die after coming into contact with soap even though their susceptibilities vary. Foods mainly prone to contamination are foods "handled excessively after cooking" such as *fufu* and *Akpler* and that the risk of "contamination was reduced where vendors sold food from the cooking pots" (Mensah et al., 2002). In a study of ice-kenkey sold in Accra and Tema, there was tenfold increase in microbiological agents in the process of preparation of the beverage (Atter et al., 2015).

Another potential health risk factor is banknote handling. There are certain pathogens on banknotes or currencies handled by vendors during the process of sales which are considered potential risk factors (Luure, Asare, Cobbina, Duwiejuah, & Nkoom 2015; Nurudeen et al., 2014; Angelakis et al., 2014; Silva et al., 2014; Ghamdi et. al., 2011; Vriesekoop et al., 2010; Barro et. al., 2006). The presence of pathogens on banknotes is indicative of poor personal hygiene of those who handled the banknotes, or the presence of pathogens on banknotes may be influenced by the manner banknotes are kept or handled. Similarly in a

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study in Egypt, El-Shenawy et al., (2013) found that nasal carriage of *Staphylococcus aureus* by food handlers is a potential food contaminant. The implication is that banknotes handling and picking of noses are potential health risk factors to food safety in not only developing countries but even in the developed world hence the importance of proper hand washing practices by food vendors.

Potentially, a food vendor who is a carrier of infection could be a major source of food contamination. Carriers are apparent healthy persons who run asymptomatic course of an infectious disease and can therefore transmit infection. Findings of respective studies in Kumasi and Accra revealed a high carrier rate of chronic *typhoidal salmonellae* and diarrhoea amongst food vendors (Feglo et al., 2004; Donkor et al. 2009). The implication of the findings is that food handlers constitute a potential risk in the spread of enteric fever and diarrhoea. There is therefore the need to include screening for *Salmonellae* in the regular obligatory examination required of food handlers in the street food business. According to Monney et al., (2014) however, reported illnesses of vendors are usually dominated by headaches, musculoskeletal disorders and malaria fever, though the incidence of coughs and sneezes of food vendors was low. Also undressed wounds of food vendors are similarly found to be a risk factor to food contamination (Nurudeen et al., 2014). On parasitic infections, Assob et al., (2012) revealed that risk factors promoting the spread of faecal-oral parasite infections through food contamination is "childcare activities" by vendors such as changing of baby diaper and "lack of de-worming" (Idowu & Rowland, 2006).

Another major endogenous risk factor to street food is poor environmental hygiene. Insanitary vending sites such as places with poor sanitation and disposal

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of faecal waste that attract insects, rodents or wild birds are also major risk factors (Madueke et al., 2014; Nurudeen et. al., 2014; Muyanja et al., 2011; Oranusi & Olorunfemi, 2011) and the practice of open defecation which is a major risk factor (Idowu & Rowland, 2006)

The form in which food is consumed such as uncooked natural foods, hot or cold foods or practices of storage of food can also be epidemically significant (FAO, 2012). According to WHO (2006), cooking foods such as soups and stew to a temperature of 70ºC makes them safe for consumption. Additionally, leftover foods may be refrigerated promptly and safely at a temperature of below 5ºC. By holding temperatures below 5ºC and above 60ºC, the growth of pathogens are either slowed down or halted completely. Other risk factors include unhygienic conditions associated with utensils and crockeries, recycled dirty water and recycled daily unsold food. (Nurudeen et al., 2014; Muyanja et al., 2011).

The serving stage in food vending is also a critical point in the safety of street-vended food. Studies show that the use of paper and leaves to serve street foods could facilitate the level of food contamination (Mensah et al., 2002). Spoons and plates used to serve street-vended food to consumers could be contaminated with unacceptable levels of various types of bacteria (Barro et al., 2006). Improper and unsafe storage of food for resale could also be a key element of food hygiene practice among vendors (Dun-Dery & Addo, 2016; Muhonja & Kimathi, 2014).

Among exogenous risk factors is lack of improved water sources for the street food business. Contamination of street-vended food could be due to poor quality of water used for food preparation. Invariably, cholera and diarhoeal diseases are contracted through oral passage of food or water contaminated with

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human excreta (Nurudeen et. al., 2014). In India increased dust particles in the evening at vending sites located in crowded places with heavy vehicular traffic, was found to be a risk factor responsible for physical contamination of vended food (Tambekar, et. al., 2009). Generally food inspectors' tend to focus mainly on promoting clean environments and vending premises and not the basic personal hygiene of vendors (Rheinländer et al., 2008). Ultimately gaps or defiencies in food hygiene and safety regulation enforcement are a major risk challenge (Annan-Prah et al. 2011; Muyanja et al., 2011).

Environmental Hygiene

Environmental hygiene is an important part of potential risk factors to food safety. The term *environmental health* refers to the aspect of human health 'that are determined by physical, chemical, biological, social and psychosocial factors in the environment" (Lucas & Gilles, 2003 p.337). Potential sources of contamination of SVF from the environment may include access and usage of toilet facilities, issues of open defeacation, excreta disposal management, drainage and waste disposal systems, and sources and availability of water supply.

Access to Hygienic Toilet Facilities & Excreta Disposal

Human excreta are a major source of pathogenic microorganism which is causative agents of diarrhoeal diseases such as cholera, dysentery, and typhoid. Improper human excreta disposal and management constitute a major potential source of environmental risk resulting in various food-borne diseases. The *Codex* International standard on excreta disposal stipulates that every food vendor or food handler should have access to clean and operational toilet facilities which are approved by the appropriate authorities. The essence of this standard is to prevent food contamination by microorganisms in faeces or on vectors.

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Mainly because of the rapid increases in urbanization, significant numbers of urban populations in developing countries defeacate in the open. The population that practice open defecation in Sub-Saharan Africa in absolute numbers, increased from 188 million in 1990 to 224 million in 2008 (WHO/UNICEF, 2010). In Ghana 19.3 per cent of households are without toilet facilities while only about a quarter (23.8%) dispose of their solid waste into public containers (GSS 2012). In the Central Region of Ghana as a whole 39.5 per cent of households use public toilet and 15.4 percent out of the total 526,763 households have no toilet facility and tend to use the bush, beach and the open field thus contaminating the environment which in turn increases the risk of food and water contamination (GSS, 2012). Research also reveals that 24.4 per cent of Ghana's population do open defeacation along the beaches; bushes and open fields (GSS 2010).

Solid Waste Disposal and Management

Proper waste disposal and management is necessary in food safety. Waste accumulation at food vending and adjoining environment is a potential threat to food safety and where they exist they must be removed timeously. Generally, the standard of environmental hygiene may vary from one vending site or street-food site to the other. Research findings in parts of Accra and Nairobi reveal that the vending environment could be predominantly clean. (FAO 2016; Gitahi et al., 2013; Odonkor et al., 2011). On the contrary, vendors may prepare food in an unhygienic environment infested with houseflies (Nurudeen et al., 2014; Muinde & Kuria, 2005; Cuprasitrut et al., 2011). A recent geospatial assessment of studies in Nigeria also revealed that waste dump sites and market had the highest predisposing attribute for the incidence of cholera (Olanrewaju & Adepoju, 2017).

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In Ghana despite the effort by vendors to keep the vending surroundings clean, the "conditions of the roads make hygiene still precarious" (FAO 2016). Some food items are sold in dusty open-air, or in the open under the shade of trees, near drainage gutters and near garbage bins (Annan-Prah et. al., 2011). Dust and other physical contaminants could adversely affect food safety not only at the vending site, but also during their transportation from home to the vending point and back when there is some unsold food left.

Vector Control

A vector or pest is any insect (eg. housefly, cockroaches) or animal (eg. rats) that could cause nuisance or transmit disease by carrying hazards.Vectors particularly the housefly is a major carrier of infectious pathogens. Many studies found the housefly, cockroaches and rats as intermediary host or potential reservoirs of bacteria and threat to street- food safety (Okojie and Isah, 2014; Muinde and Kuria, 2005). The presence of waste and sewage close to vending sites become breeding sites because they provide food and harbourage for house flies (Barro et al., 2006). Vectors such as houseflies may be attracted to faeces and settle on food thereby spreading the pathogenic microorganism contained in faeces.

According to Mensah et al., (2002), "pathogens can be passed mechanically by flies. *Salmonella typhimurium* and *Shigella* can multiply in the gut of the housefly and can be excreted for weeks or longer. There is consequently a risk of contamination associated with the exposure of food to flies." Specific biochemical tests on bacterial carriage of faeces by housefly proboscises and legs, show that flies are carriers for *Shigella, Salmonella, streptococci, staphylococci positive* and *coliforms* (Barro et. al., 2006). On the other hand, it is possible to

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have vector-free vending sites though no control measure had been applied or used (Gitahi et al., (2013).

Access to Potable Water

Potable water is an essential input or ingredient for street food and for the sustenance of good human health. It is required for purposes of drinking, food preparation, for washing fruits and vegetables; for facilitating personal hygiene including handwashing and crockery washing. According to the GSS (2014 p.60), the main health benefit of clean water supply is a reduction in infectious diseases including diarrhoea, cholera etc."The tendency of street-food vendors to practice hygienic handwashing as required by Codex standards depends on the availability of improved water sources (FAO 2016). According to the FAO (2016), risks of contamination of street food linked to unsafe use of water and poor hand washing practices are higher when vendors are carriers of diseases. By Codex standards untreated water from rivers, streams and ponds are unsafe because they contain parasites and pathogens which could cause various food-borne-diseases. According to GSS (2013 p.393), water sources considered as 'improved' are pipeborne water, boreholes, protected well, protected spring, and rainwater collection whereas 'unimproved' sources of water include unprotected wells and springs. Worldwide, 884 million people do not have access to potable drinking water from improved sources and out of this 37 per cent are in Sub-Saharan Africa. Furthermore, by 2015, 672 million people lacked access to improved drinking water sources (WHO/UNICEF, 2010).

According to the GSS (2012), less than half (46.5%) of households in Ghana use pipe-borne water as their key source of drinking water (as compared to 39.9% in 2000); whereas about one-tenth (10.6%) depended on surface water such

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as streams, rivers and ponds for their drinking water sources. In a study conducted in an urban slum of Ghana, as high as 99 per cent of the water used for food vendor activities was pipe borne (Donkor et al., 2009). This is confirmed by findings by Odonkor et al., (2011). For the Central Region of Ghana as a whole, the commonest source of drinking water is pipeborne outside the household dwelling (GSS, 2013). The implication is that access to improved or potable water sources to food vendors and consumers is quite high in the Central Region.

Knowledge of Street-Food Vendors

This section focuses on food vendor knowledge to food safety. It reviews the knowledge-base of street-food vendors; sources of their information, and the relationship between vendor food hygiene knowledge on one hand and the educational status and socio-demographical characteristics of vendors. Various studies emphasize the importance of the knowledge, attitudes and practices of food vendors and consumers to food safety (Reang & Bhattacharjya, 2013; WHO, 2010; Rheinländer et. al., 2008). Generally, the community's overall knowledge and attitudes may reflect in their behavioural street-food habits (Cuprasitrut et al., 2011).

The term knowledge and the sources of knowledge may be defined in the context of the theory of epistemology. Knowledge is defined as "a complex process of remembering, relating, or judging an idea or abstract phenomenon (cognitive abilities)" (Gotsch et al., 2012). Empiricists such as John Locke and Immanuel Kant held the philosophical theory that whatever we know; we learn through perception, observation and experimentation. On the other hand rationalists like Plato and Rene Descartes postulate that all knowledge require some amount of reasoning.

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Various studies conducted in Ghana and many other African countries, reveal that levels of food safety knowledge by vendors are low (Feglo & Sakyi 2012; Sarkodie, Bempong, Tetteh, Saaka and Moses, 2014). Comparatively, vendor knowledge or awareness about microbiological pathogens is the least as compared to physical and chemical hazards (Abdalla et al., 2009; Omemu & Aderoju, 2008). Literature in the West African sub-region on the risk factors of intestinal parasites infection also reveals vendor ignorance generally. Idowu & Rowland (2006) found that eighty-five percent of food vendors, were of the opinion "that worms are part of the human body" and ''everybody was born with them and will die with them. They therefore considered de-worming a fruitless effort." On environmental hygiene, about half of vendors have a poor knowledge of food sanitation (Chukwuocha et al., 2009; Osaili et al., 2013). School premises whether basic, secondary or tertiary, are one of public places where food vending is commonly conducted. All the studies reviewed above reveal low levels of knowledge in food hygiene and safety.On the contrary, some studies in Ghana show high levels of vendor knowledge (Dun-Dery & Addo, 2016; Apanga et al., 2014; Donkor et al., 2009). Various Asian studies reviewed nevertheless show that generally food safety knowledge of food handlers in educational institutions appear to be relatively higher than in other vending sites (Sani & Siow, 2014; Tan et al., 2013).

Any information has its source. Though there may be the absence of continuous education of food vendors, the most common source through which vendors obtain information and education is the electronic media (Mamun et al., 2013; Gaungoo & Jeewon, 2013). Food vendors may receive on-the-job training on food hygiene (Monney et al., 2013; Idowu & Rowland, 2006). The rest were

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either taught by their parents or gained the skills by trial and error **(**Muinde & Kuria, 2005). A cross-section of studies on food vendors reviewed therefore reveal varied sources of information on food hygiene, though in the West African sub-region formal training as source of knowledge and attitude appears to be very minimal.

Practices and Behaviours of Street-Food Vendors

This section reviews literature on the practices of street-food vendors as well as the relationship between vendor practices and other relevant variables. Street-food vendor practices include how they prepare food, their personal hygiene practices, mode of food display, their food handling practices; state of cooking and serving utensils, the environmental hygiene of vending sites and the use of water as an input in food preparation. Other aspects of vendor practices are the storage of unsold food; as well as garbage and liquid waste disposal practices.

Personal Hygiene Practices

Various studies in parts of Africa show varied personal hygiene practices among food vendors. Personal hygiene practices are classified as endogenous because food vendors have direct responsibility to make certain choices of action. According to Codex standards "food handlers should maintain a high degree of personal cleanliness" such as wear "suitable protective clothing", "head covering" and "short fingernails".

Many researches found that there is poor compliance with the use of protective clothing among majority of vendors (Dun-Dery & Addo, 2016; Monney et al., 2014; Gitahi et al., 2013). Vendor aprons may be contaminated with *E. coli* and need to be kept clean (Lues & Van Tonder, 2007). Other studies

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however show that majority of food vendors exercised good personal hygiene (Iwu et. al., 2017). Fingernail hygiene differs from one geographical area to the other. Studies in Accra and Nigeria show that majority of vendors have short and hygienic fingernails (Iwu et. al., 2017; Okojie and Isah, 2014; Odonkor et al., 2011). This however contradicts the findings by Aluko et al., (2014) in Ile Ife, Nigeria; in which 62.5 per cent '*rarely*' kept their finger nails short. On hair covering, Okojie and Isah (2014) found 72.7 per cent of vendors wore head cover unlike in Togo and Kenya where most vendors did not protect their hair (Adjirah et al., 2013; Muinde & Kuria, 2005). Contrary to Codex standards, some food vendors blow air into cellophane or polythene bags meant for serving food to customers (Okojie & Isah 2014; Nurudeen et. al., 2014). Nurudeen et al., (2014) also found that 7.3 percent of food vendors had undressed wounds or skin lesions. Poor personal hygiene practices among food vendors is indicative of the poor sate of food hygiene and safety.

Hand-Washing & Food Handling Practices

Codex standards debar SFVs from handling ready-to-eat food with bare hands. Food vendors are required to wash their hands with running water and soap after using the toilet; to wash the hands with water and soap after handling used baby dippers. The use of bare hands to serve SVF increases the chances of food contamination (Alimi 2016; Mensah et al., 2002). Various studies show that unhygienic food handling (with bare hands) is a major public health concern in most parts of Africa, Asia and in the Americas (Abdalla et. al., 2009; Lues & Van Tonder, 2007; Shojaei et al., 2006). This implies that the continuous human handling of food during the moulding of food such as fufu could result in high levels of contamination. Moreover, food vendors involved in child care activities

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(e.g. changing of diaper) are another risk factor because their hands may be contaminated with faecal matter after handling used child dipers (Idowu & Rowland, 2006).

The hands of food handlers (and consumers) are important vehicle for facilitating cross-contamination of food. Scrupulous vendor hand-washing is necessary for the elimination or control of faeces-to-hand to-mouth spread of pathogenic microorganisms. Hand washing and food handling are therefore key endogenous factors in food safety.

According to FAO (2016), between 70% and 95% of food vendors in Ghana wash their hands regularly in the process of vending. Studies in various parts of Ghana also show hygienic food handling and proper hand washing practices by vendors (Apanga et al., 2014; Monney et al., 2013; Donkor et al., 2009). This is however contradicted by some other studies (Dun-Dery & Addo, 2016; Aluko et al., 2014).

Another principal contamination risk factor of public health concern linked to food handling is the concurrent handling of food and money (Samapundo, Climat, Xhaferi, & Devlieghere, 2015; Dwumfour-Asare and Agyapong, 2014; Silva et al., 2014). In proving the high risks involved in money handling, Luure et al. (2015) isolated microbes such as E-Coli, salmonella species, bacillus species from cedi notes. The tendency of food vendors to properly wash their hands depends not only on knowledge, awareness and attitudes but also on access to improved water sources.

Mode of Food Display

Food display practices which refer to how food is packaged and marketed may vary from one vendor to the other. By Codex standards, food on display shall

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be protected from physical, microbiological and chemical contamination by the use of any effective means such as glass display cases. Unhygienic display of street food has the tendency of exposing food to contamination by food vectors and physical contaminants such as dust. When street food is hygienically displayed at the vending site by using for instance glass containers, it protects the food from environmental contaminants (Ameko et al., 2012).

Various studies in parts of Africa and Asia show that a significant proportion of street vendors do not protect their food but placed them openly on their stalls or at ground level leading to dust contamination and contact by houseflies (Alimi 2016; Monney et. al., 2013). Similarly on ready-to-eat fish vending, Odu & Ameweiye, (2013) and Muinde & Kuria (2005) found that fish vendors resort to unhygienic display of roasted fish. However, some other studies found the contrary (Okojie and Isah 2014; Donkor et al., 2009).

Cleanliness of Utensils, Crockery & Service

The cleanliness and safety of street-vended food utensils and crockery is another important factor in street-vended food safety practices. Research show that cooking utensils and crockery could be sources of chemical contamination of street foods (Nurudeen et al., 2014; Tortoe et al., 2008; Barro et al., 2006). Access to clean, potable water for washing utensils and crockery is an important factor in ensuring food safety (Muyanja et al., 2011; Abdalla et al., 2009). The use of leaves not properly washed for wrapping food is also considered unhygienic (Haleegoah et. al., 2015).

On food service, Nurudeen et al., (2014), revealed that 44.5 per cent of vendors used their mouths to blow air into polythene bags to open, before using it to package vended foods for customers. This practice is considered major risk

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factor for the spread of air-borne infectious diseases such as tuberculosis. Studies also show that many food vendors have the habit of chewing and talking excessively while serving foods, thus potentially introducing harmful pathogens that could cause foodborne infections in consumers especially if the vendor is a carrier (Nurudeen et al., 2014).

Food Storage

Hygienic storage of both ingredients and unsold street foods is an important factor in food safety. The WHO (2006), highlights that ready- to- eat foods must be stored appropriately. When food vendors have leftover unsold food at the end of the day, they may consume it with family members and friends, discard it or sell it the following day. If the unsold food is to be recycled the next day, the food shall be appropriately stored or preserved in a refrigerator.

Ready-to-eat food need to be thoroughly prepared or cooked. Whereas soups and stews should be cooked to up to 70ºC in order to ensure that they are wholesome, all cooked and perishable food ought to be refrigerated below 5 ºC to attain the appropriate temperature control. According to the Codex standards the danger zone for food storage is the temperature range from 5 ºC to 60ºC. Ready-to eat foods they need to be separated from raw food such as raw meat because pathogens in the latter may cross-contaminate the former. Findings by Apanga et al. (2014) showed that 13 per cent reheat left over food for sale the next day without refrigeration. Only 11.5 per cent stored leftovers in refrigerators. Other studies in Ghana and Nigeria confirm low usage of refrigeration facilities for storage of left over street foods (Dwumfour-Asare and Agyapong, 2014; Odonkor et al., 2011; Donkor et al., 2009; Aluko et al., 2014).

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Adequate reheating of leftover food may not be a regular practice (Annan-Prah et al, 2011). Many vendors in Ghana may even lack storage facilities and therefore may not be able to properly preserve unsold food. That notwithstanding, many food vendors in Northern Ghana have over the years mastered the art of cooking the right amounts of food in other to avoid wastage and storage challenges and therefore did not usually have leftovers (Dun-Dery & Addo, 2016; Apanga et al., 2014).This suggests that if vendors are trained on the average quantum of food to sell daily based on their turnover, it could minimise the amount of daily leftover or unsold food which may in turn reduce the chances of vendors selling contaminated food to consumers.

Determinants of Vendor Practices

Having reviewed literature on vendor practices and behaviours, this section reviews literature on variables that influence food vendor practices and behaviour. A review of various studies reveal that there are varying relationships between study variables in vendor practices. A good level of knowledge, and positive attitude on food hygiene, may not necessarily translate into good level of hygienic food vendor practice (Iwu et. al., 2017; Apanga et. al., 2014). Similarly, Dun-Dery & Addo (2016) found that there is statistical relationship between vendors' awareness and their practice of food hygiene ($p<0.21$). According to Denikuu et al. (2015), the variables that reduce infections among food vendors are knowledge of food hygiene practices, formal education and medical screening practices. According to Rahman et al., (2012) food safety knowledge, attitude and age of food vendors influence food safety practices, but duration of food vending has an inverse relationship with food safety practices. In Bangkok, Thailand, the findings of Cuprasitrut et al., (2011) had also showed that there is a

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significant relationship between food safety knowledge and food safety practices and between food safety attitude and food safety practices**.**

A study by Dwumfour-Asare (2015) in two localities in Ashanti Region also established a significant positive correlation between personal hygiene practices and reported field inspections. Training of food vendors is also found to be associated with fingernail hygiene, food protection and proper food handling practices (Monney et. al., 2013). However, studies show no statistically significant correlation between the level of education and the hygienic practices of food vendors. Thus, the formal educational status of food vendors do not necessarily influence food hygiene practices (Monney et al., 2013; Isara & Isah, 2009). Findings of studies reviewed in this section therefore generally show varied vendor practices in street food safety. Overall, food safety knowledge, attitudes, training and medical screening status of vendors are the key variables that influence food safety practices of vendors though high knowledge base alone does not always translate into food hygiene practices. The *farm-plate* chain ends with the consumption of street-vended food by the consumer. Consumers are the ultimate end-users of street foods or stakeholders in food hygiene and safety matters.

Consumer Knowledge, Perceptions, Attitudes and Practices

This section reviews the factors that influence consumer perceptions and attitude to street-food patronage and the associated risk factors. Specifically, it reviews consumer patronage levels, consumer socio-demographic characteristics and segmentation, expenditure patterns, street-food preference criteria, food intake attitude and practices; and access to information on food safety.

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In Ghana, street-vended food represents a major part of daily food consumption, especially in urban areas (Mensah et al., 2013). According to Donkor et al., (2009), an average of 117 people buy food daily from a street food vendor in Accra. And in Takoradi, an average consumer may patronize street foods six times in a week (Hiamey et. el, 2013). In South Africa on the other hand, a national survey showed that only 11.3 per cent of the population buy food from street vendors (Steyn, & Labadarios, 2011).

Socio-Demographics of Consumers

Studies in Ghana show that majority of street-food consumers are males of varying educational background and ages (Haleegoah et al. 2015). In that study consumers' age ranged between 10 and 64 years with most (67.7%) falling between ages 21 and 40 years. That study contradicted earlier findings by Osei Mensah; Aidoo & Appiah (2013) that only 43 per cent of all consumers interviewed were males and 57 per cent females. The later study found that majority of the consumers interviewed were not married.

Many studies show that street-food consumers belong to diverse occupations and socio-economic groups such as salaried workers, traders, market women artisans, students, children and farmers (Haleegoah et al., 2015; Khairuzzaman et al., 2014).

Expenditure Pattern of Households

On consumer expenditure pattern, studies in developing countries have shown that "up to 20-25% of household food expenditure is incurred outside the home, and some segments of the population depend entirely on street foods" (FAO/WHO, 2010). In Bamako, Mali, specific household expenditure on street-vended food accounts for between 19 to 27 per cent of total expenditure (FAO,

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2012). In parts of Asia, street foods are consumed across all income groups, and the proportion of the daily household food budget spent on street-vended foods range from 25 percent to 47 percent (Khairuzzaman et al., 2014). Although poor consumers generally spend less than lower middle class and upper middle class consumers, on average they spend a larger proportion of their income on street foods (Patel et al., 2013; Osei Mensah et. al., 2013). According to Osei Mensah, et al., (2013), among income groups in the Kumasi Metropolis of Ghana, low income groups spent greater proportion of their income on food; and greater portion of their household food expenditure on street–vended foods than other income groups. In affirming the assertion that street foods play a profound role in satisfying consumer access to food and guaranteeing food security particularly in the developing world, Osei Mensah, et al., (2013) stated that the "estimated average monthly household expenditure was GH¢ 476.91, GH¢ 403.3, and GH¢ 390.23 for the high, middle and low income groups respectively."

Consumer Preferences and Choices

Consumer street food expenditure pattern tend to have a relationhip with consumer choices. Street-vended food patronage choices have significant health promotion implications for consumers, depending on the factors that influence consumer choices. According to Haleegoah et al., (2015), consumers of local street foods are important actors in the local street food systems. Through their advice, complaints, or even refusal to patronize some foods, they may communicate these needs to food vendors.

According to FAO, (2016) "sensory appeal" (e.g. better taste) and "nutritional value" (e.g. opportunity to obtain a balanced diet) are important reasons that drive consumers towards street food. In a finding by Osei Mensah et.

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al., (2013), the decision by consumers to buy street-vended food is influenced by factors such as easy access, affordability, convenience, time saving and f food preparation skills by a given consumer. In that study it was also found that the main influencing factors of consumers' decision not to patronize a specific street-vended food were the prevalence of unhygienic environment, poor personal hygiene of vendors and other health risks associated with street-vended food consumption. Consumers may prefer eating at specific vending locations as they perceived products of those food vendors to be better than similar food of other street vendors in terms of quality and nutritional value (Patel et al., 2013). According to Hiamey, Amuquandoh & Boison (2013) most consumers patronize carbohydrate-based street food for reasons of cost-savings, convenience and an opportunity to eat on credit. Similarly, in a recent cross-sectional survey in Johannesburg municipality, South Africa, food taste, affordability and accessibility were the most cited reasons by consumers for purchasing street-vended food (Asiegbu et al., 2016).

On the contrary, Medeiros and Salay, (2013) found that "food quality" and "food taste" are the most important patronage factors by consumers in the choice of street-vended food. That notwithstanding, Behrens, et al., (2010) also found that the "naturalness" of street- vended foods in the "street markets" was the main reason for their patronage as compared to concerns about food additives in supermarkets foods. Similarly, in South Africa, Steyn et al., (2011) found that the most significant influencing street food patronage factors were possession of home gadgets such as fridge, freezer and microwave for storage and heating purposes. Food preferences may also be related to ethnic or racial groupings.

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In an earlier Focus Group Discussion (FGD) study of consumers, Rheinländer et al., (2008) discovered that consumers put more premium on aesthetic appearance of food and the food stand, the appearance of the food vendor, interpersonal trust in the vendor, the price and how proximate and accessible the food may be. Consumers put very little premium on food safety. The findings concluded that consumers trust in vendors is founded on interpersonal factors such as vendor appearance and the trustworthiness of the vendor. Vendors may emphasize more on their appearance and to play down on core food safety practices during food preparation and the vending process. According to findings by Tortoe et. al., (2013) most consumers do not associate unsafe food with foodborne diseases. The implication is that they are less likely to demand accountability of food safety from street-food vendors.

According to Alimi (2016), the perception and attitudes of consumers of street foods are usually driven by their "level of education, income, knowledge of food safety, age and gender." On the statistical relationhips between street food consumption and socio-demographic variables, Osei Mensah, et al., (2013), found that educational status and household size had a negative correlation with street-vended food consumption. Similarly, higher income households buy street-vended food less often than lower income households in studies conducted in the three cities in Ghana (Accra, Takoradi and Tamale) (Meng et al., 2014). In that study, gender type and time spent away from home also had significant positive relationship with street-vended food consumption. Males (especially the unmarried) are less likely to cook at home. Also, females generally were said to be more careful about their dietary habits due to their concerns about self-image and

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physical appearance. And the more the time an individual spent outside the home, the higher the tendency of consuming street-vended food away from home.

Knowledge, Perceptions & Sources of Information

According to Haleegoah et al., (2015), consumers have varied understanding of factors that influence street food safety and the conditions that pre-dispose street food to hazards and contamination. Bektas et al., (2011) found that the factors that influence consumers' knowledge on food safety are education status, income levels as well as the presence of elderly persons in the household. However, this finding was recently contradicted by Samapundo S., et al. (2015) who discovered that gender, level of education, training and location did not have any significant effect on the level of food safety knowledge of street food consumers.

In a Haitian survey to assess the microbial quality of street-vended food, an interesting finding made was that "consumers with primary education showed better food safety attitude than those who went to high school and university" (Climat, R., 2013). It was deduced that Haitians with high education level and high incomes usually hired house-helps or maids for cooking and cleaning and are therefore not involved in any form of food preparation and this explains the source of their ignorance. In terms of consumer sources of information on food safety, increased media activities on food safety is found to raise consumer awareness of food safety hazards and increase food handling vigilance of consumers (Liu et al., 2013; Wu J, et al., 2011; Fein et al., 2011; Bektas, et al., 2011).

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Food Regulation Enforcement and Compliance

This section reviews relevant provisions of food regulations and legislation, regulation enforcement and vendor compliance practices. Enforcement may be posited in the broader context of the law. As a principle of order, law is a system of rules enforceable in the courts with the aim of ensuring legal certainty, regulate human behaviour or conduct and ensure justice in social relationships. Law is therefore a mechanism for social control and its enforcement is a process by which compliance is sought. The principal objective of food law compliance enforcement system is to secure conformity with the law and to penalize violators (Burris 2010).

In Ghana, street-vended food safety are regulated by statutes and local bye-laws made by various District Assemblies (Ahwoi 2010). Many legislations and regulations have been enacted to regulate the production, preparation and sale of food. Operating alongside Chapter 8 Section 286 of the 1960 Criminal Code Act 29 of Ghana is the Public Health Law, Act 851 (2012), which makes selling of food or drink noxious to health as a misdemeanour and punishable by law.The aim is to ensure that consumption of food is useful and not detrimental to the health of consumers. Any unwholesome food sold or offered for sale could be a breach of either civil or criminal law and is punishable under the law. According to Ghana's Public Health Act, 2012, Act 851 Sections 51-53:

> A person commits an offence if that person sells, serves or offers for sale food that is unwholesome or unfit for human or animal consumption and is liable on summary conviction to a fine of not more than one thousand penalty units or to a term of imprisonment of not more than four years or to both.

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> A person shall not sell, prepare, package, convey, store or display for sale, food under insanitary conditions to the public. (2) A person who contravenes subsection (1) commits an offence and is liable on summary conviction to a fine of not more than one thousand penalty units or to a term of imprisonment of not more than four years or to both.

A person shall not:

(1) (a) sell, offer or expose for sale, or have in possession for sale, or (b) deposit with or consign to a person for the purpose of sale, food intended for but unfit for human or animal consumption.

(2) Where an offence is committed by a person under subsection (1)(a), that person as well as a person instructed by that person commit an offence and are liable on summary conviction to a fine of not more than one thousand penalty units or to a term of imprisonment of not more than four years or to both.

Section 286 of Ghana's 1960 Criminal Code Act 29 also states that:

> Whoever sells, or prepares or offers for sale, as being fit for consumption as food or drink, anything which he knows or has reason to believe to be in such condition from putrefaction, adulteration or other cause, as to be likely to be noxious to health is guilty of misdemeanour.

Aside of statutory provisions, the MMDAs regulate environmental and food safety in their areas of jurisdictions under specific gazetted bye-laws as conferred by the Local Government, 1993 Act 462 Section 79 (1).

Regulation enforcement activities may be broadly categorized into two, namely communication/persuasion approach on one hand; and deterrent or punishment approach on the other. According to the WHO, Regional Office for the Western Pacific (2014), persuasive approach emphasizes communication, cooperation, conciation, training and negotiation between the regulator and the

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regulated. A deterrent approach on the other hand is founded on the principle that people can avoid violating a law if they believe that non-compliance would be detected and punished. If legislation is not enforced it is better it does not exist (WHO 2006).

Generally, food legislation enforcement embodies a number of strategies and activities. These begin with the registration of vendors, medical screening and issuance of license or permit to vendors to operate if they are deemed qualified to operate as vendors. Subsequently compliance strategies involve regular inspections by enforcement officers. Street food inspections are official monitoring activities involving investigation or oversight used to verify that a food vendor is complying with specific food rules. Inspection may be in the form of walk-through, detailed assessment or by applying sampling techniques in investigating or examining a product or premises to ascertain their authenticity, quality, or safety condition (Gostin et al. 2010). Other persuasive strategies include continuous education, health promotion activities, counselling and training of food vendors and other stakeholders (FAO/WHO, 2011; Mok, et. al., 2010). Where non-coercive strategies fail, vendors may be cautioned or legal action may be taken against them through the law courts. The course of action may begin with a warning, issuing notices of abatement, fines, confiscation, prosecution of offenders or/and license revocation for non- compliance with the law. If legal prosecution is involved, the enforcement officer would be expected to prepare a case for the prosecution in court and to appear in the case as a prosecution witness. Graphically, Figure 4 depicts a communication/persuasion approach for securing vendor compliance of regulations. Moving up the pyramid, a detterent and more punitive approach are supposed to be applied by enforcement officers.

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Overall, the effectiveness of food legislation may be determined by to what extent its enforcement ultimately results in the reduction of the burden of disease, disability or death (WHO,2012).

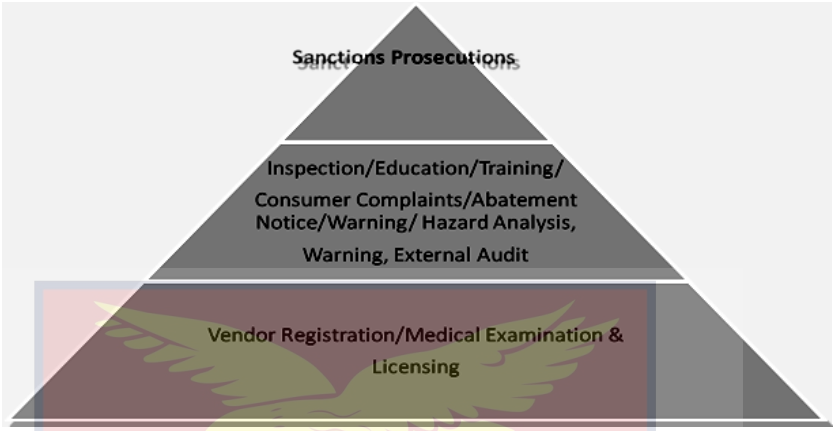

Figure 4: Regulation Enforcement Pyramid

Source: Braithwaite et al., (2006) and WHO, 2006.

According to the Local Government Act 462 (1993), the MMDAs through their environmental health and sanitation department are responsible for the enforcement of food safety at the local level. District Assemblies, by the provisions of Section 10 (2) & (3) of Ghana's LGA Act 462 (1993) are "responsible for the overall development of the district." They are charged by Act 462 to oversee the provision of essential services including public health, and sanitation. As part of their deliberative and legislative functions, Assemblies are legally charged to make and enforce various public health bye-laws including food-related bye-laws.

Findings from studies in various regions of the developing world show that the issue of food hygiene and safety efforts have received only marginal attention by way of regulation enforcement (Dwumfour-Asare, 2015; Monney et al., 2014; Dwumfour-Asare & Agyapong, 2014; Ifenkwe, 2012; Abdalla et al., 2008). On

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the importance of inspections however, Newbold et al., (2008) found that little scientific evidence exists to support the impact of routine inspections on food legislation compliance rates. It may be argued that this may be due some other intruding factors such as inadequate skills of health inspectors in conducting effective inspections.

According to FAO/WHO (2008), education is the "least expensive, yet most effective, way to reduce food-borne illness." And the local health inspectors may be the most important sources of new information concerning food safety legislation (Mari et. al., 2013). Education through training could contribute significantly to the profitability of a street-vended food business by assisting in the preparation of safe and quality food, and by reducing food wastage. Studies also show that knowledge and attitude are significantly improved by training in food hygiene and safety (Mari et al., 2013; Isara & Isah, 2009). It enables food vendors to understand their responsibilities and improve their skills. Training could also help to promote vendor confidence, increase job satisfaction, improve vendor performance and reduce the amount of supervision required as well as reduce consumer complaint (Gaungoo & Jeewon, 2013**).** In educational institutions in Konongo, Ghana, the training of food vendors on food hygiene, rather than the level of formal education had a significant association with food hygiene practices such as medical examination, hand hygiene and protection of food from flies and dust (Monney et al., 2013*).* However, in recent studies in Ghana, majority of street-food vendors (85%) had not attended any form of training workshop on personal, food and kitchen hygiene (Sarkodie et al., 2014). Indeed some researches did not find any significant relationship between training

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on one hand and knowledge, attitude and practices in street food safety (Rahman et al., 2012; Chukwuocha et al., 2009).

Tortoe et al., (2013) recommended the development of nine training modules for the systematic management and control of food safety for the street-food vending sector in Ghana. The nine modules are "partnership, training of street food vendors and regulators, improving consumer awareness, improving street food vendor livelihoods, infrastructure requirements, food safety, food inspection, legal requirements and the supply chain management for the street vending sector."

Literature shows that many street vendors can easily be reached or contacted through their local vendor networks and associations. Social associations and community support networks are important for sustainable action but they are ironically not well developed, especially in developing countries (WHO Regional Office for the Western Pacific, 2007; Rheinländer, et al. 2008; Tortoe et al., 2013). According to FAO, (2012) most associations in Africa if they exist, address mainly welfare issues affecting members, with very few focusing on issues such as condition of vending sites, licensing and advocacy. It is noteworthy that even in Accra only between 3 to 5 per cent of food vendors are members of food associations or unions (Nicolo 2012; Bobodu, 2010). On sanctions, empirical evidence show inadequate sanctioning and deterrent practices. Monney et al., (2014) revealed that only 2 per cent of food vendors in Bibiani and Dormaa Ahenkro in Ghana reported ever being sanctioned by a Health Officer for breaching food regulations.

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Challenges in Regulation Enforcement

The enforcement of food legislation by local authorities is a major challenge especially in the developing world as activities of food vendors may not be adequately monitored nor inspected by the relevant local governmental authority (Apanga et. al., 2014; Adewunmi et al., 2014). The enforcement of food regulations may be bedevilled with various operational challenges which might hamper their effective enforcement. Oftentimes regulators operate with limited resources, leading to a general feeling of bewilderment, abandonment and neglect.

According to Goodman et al., (2006) effective regulation enforcement responses to public health risks and attainment of population health goals require preparedness which includes establishing and sustaining the competencies of public health professionals to apply those regulations, and to provide for the coordination of enforcement efforts to promote public health. Nevertheless there could be barriers to effective communication against food safety risks. Among these barriers may include "personal, infrastructural and message related factors, such as lack of interest, lack of appropriate facilities and conflicting messages" (MacCarthy & Brennan, 2009). Monney et al., (2013) identifies "poor services rendered at the laboratory and high cost of laboratory services" as one of the hindrances to food hygiene and safety regulation enforcement.

Among the capacity challenges in the enforcement of the law may include constraints of "human resource, transportation and funds" (Monney et al., 2013). Similarly, in a recent study Monney et al., (2014) identified the key factors impeding food regulation enforcement as "weak institutional capacities; logistical constraints; overlapping and duplicated institutional responsibilities; inconsistent

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local bye-laws as key features of existing institutions and legislations, and proposes capacity building and harmonisation of institutional roles and legislations."

Haleegoah et al., (2015) underscores that environmental health officers (EHO) and other enforcers are confronted with frustrating challenges including "inadequate logistics, poorly motivated staff, non-compliance of some food vendors and ineffective court system to prosecute recalcitrant vendors among others." Before food vendors can fully comply with the law, they must understand their obligations under the law and the steps they must take to ensure compliance. The enforcement of street-vended food regulation in educational institutions presents another type of challenge because of the usual overlapping and conflicting arrangements in educational institutions often create a parallel system of monitoring and supervision between school management and District Assemblies who are legally charged with enforcing food safety and quality (WHO, 2012).

Harrassment, evictions and equipment confistication by local authorities are among the most serious challenges that street food vendors face (Asiedu and Agyei-Mensah, 2008). As a coping and defence mechanism, regulators in urban Ghana often encourage various forms of harassment of vendors and thus increase tensions between food vendors and regulators (Forkuor et. al., 2017). Evictions from vending locations against unlicensed vendors by local authorities are to a large extent unsustainable because the locations in which they operate are mainly determined by the attraction and demand of customers (Solomon-Ayeh et al., 2011).

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CHAPTER THREE

RESEARCH METHODS

Introduction

This research study sought to assess the risk factors in street-food vending and food regulation enforcement practices and their concomitant challenges in two selected districts of the Central Region of Ghana, namely the Komenda Edina Eguafo Abrem Municipality and the Ajumako Enyan Essiam District. And in this chapter the processes involved in the planning of the data collection, fieldwork data collection and data processing and analysis are described. It covers various sub-sections namely research design, methodologies, the study area profile, the target population, sampling procedures, computation of the sample size and the data collection instruments. Others are data collection procedures, data processing and analysis plan using the Codex Alimentarius International benchmarks as the analytical standards; the ethical considerations and the limitations to the study. The chapter thus defines what data were collected, how and where these data were collected; and how the data were analyzed and presented.

Profile of Study Area

Profile of the KEEA Municipality

The KEEA district was carved out of the Cape Coast Municipal Council in 1988 and elevated to a municipal status by the Legislative Instrument 1857. Its capital Elmina was the first point of contact with the early Europeans (Portuguese) to this country. Elmina Castle or (St Georges Castle) is the oldest European building in Ghana. It was built by the Portuguese in 1482 and together with Fort St Jago attract over 100,000 tourists annually many of whom come from Europe and America (GSS, 2014 p.4).

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The municipality covers an area of 452.5 square kilometers. It is boarded to the north by Twifo Hemang Lower Denkyira, on the south by the Atlantic Ocean (Gulf of Guinea), on the east by the Cape Coast Metropolis and on the west by Mpohor Wassa East District of the Western Region. The municipality is located in the coastal plain geographical area of the Central Region. According to the 2000 population census statistics, the municipality's 2000 population was 112,435. This increased to 144,705 in 2010 (GSS, 2014). The population represented 6.6 per cent of the regional population; out of which 75,040 were females (51.8 %). Ironically, the Municipality is predominantly rural with 64.3 per cent rural population (GSS, 2012).

The Municipal District is divided into six zonal councils areas (Figure 5), four traditional areas and 15 decentralized departments including the GES, GHS and the MoFA. The municipality is noted for two main cultural festivals- Bakatue and Edina Bronya - which attract many visitors and tourists annually. Apart from a vibrant salt industry along the coastal belt, other socio-economic activities in the KEEA are petty trading (including food vending), fishing, farming, agro-processing and tourism. The municipality has two hospitals (Ankaful Psychiatry and Ankaful General/Leprosy Hospital), four health centers, and seven Community Health Planning and Services (CHPS) compounds. According to the GHS Municipal Directorate Report, whereas diarrhoeal diseases were the fourth commonest cause of out-patient attendance in the municipality, it also recorded a total of 83 cholera cases from 2010 to 2013. And in 2014 alone KEEA had a total of 47 cholera cases and three deaths (KEEA Disease Control database, Municipal Health Directorate, 2015). An anecdotal account by the KEEA Municipal Disease Control Officer indicated that the confirmed 32 cases of cholera in the KEEA

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Municipality in 2012 were traced to an outbreak that began with a confirmed case from a street-vended food infection at the Agona Abrem community. The 51 confirmed cholera cases in 2011 with one death were also traced to street-vended food consumption.

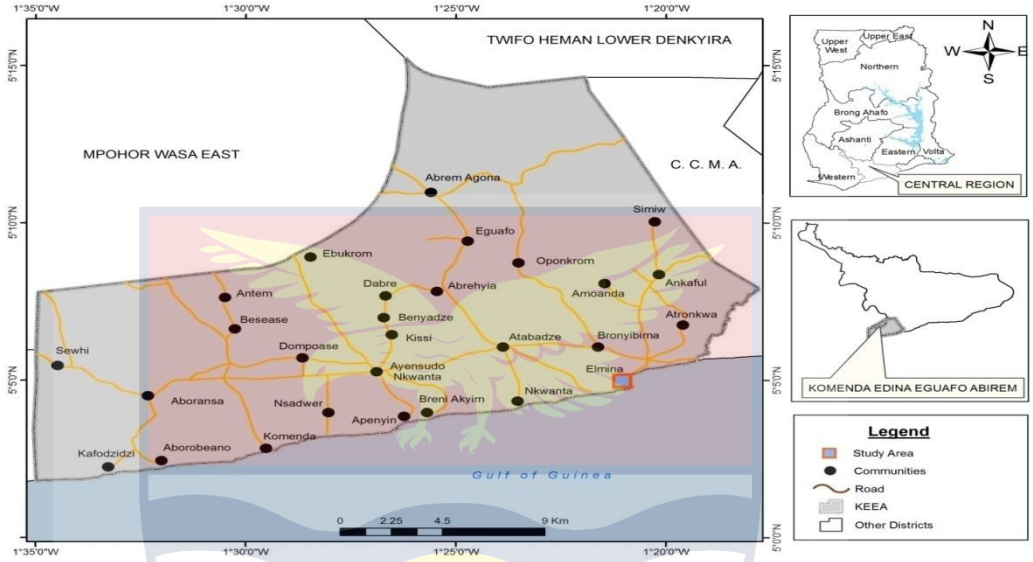

Figure 5: Map of KEEA Municipality

Source: GIS Department of Geography and Regional Planning, UCC, 2015

Profile of Ajumako- Enyan -Essiam District

The second study district, Ajumako-Enyan-Essiam District was established by the Legislative Instrument 1383 of 1988. It covers a land area of about 521.3sq.km which is about 5 per cent of the total land area of the Central Region. It is bounded to the north by the Asikuma-Odoben-Brakwa District, to the west by Mfantseman Municipality, south by Ekumfi district, to the north-west by the Assin South District and to the east by Gomoa West district respectively (GSS, 2014).

In the year 2000, the district population was 91,965. According to the national population and housing census conducted in 2010 the district population

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had increased to 138,046 (comprising of 73,628 females 53.3% and 64,418 males 46.7%) which constituted 6.3 per cent of the regional population. The population growth rate of the AEE district was estimated at 2.5 per cent. Similar to the KEEA, approximately one out of four persons in the district lives in the district capital Ajumako. The district population which is mainly rural (68.1%), has key localities of Ajumako, the district capital; Bisease, Ochiso, Enyan Abaasa, Enyan Denkyira, Ba, Sonkwaa, Enyanmaim and Mando. The District Assembly has nine Town/Area Councils consisting of two Town Councils at Ajumako and Bisease and seven Area Councils (Figure 6). All the twelve decentralized departments are represented to provide specialized and technical services to the District Assembly.

Dominating the district economy is agriculture which employs between 58.5 percent of the active labour force whereas 15.5 per cent are in the service and sales sector consisting of a large number of traders and street-food vendors including chop bars also operate at various market centers and public places (GSS, 2014). Health care delivery in the AEE district is the responsibility of the District Health Directorate and it is supported by churches and facilities at Bisease, Enyan Abaasa and Nkwantanum. The Salvation Army Mission also has a health post at Ba. Other partners in the provision of health care are the Catholic Mission and Plan Ghana. Statistics provided by the regional disease control office of the Regional Health Directorate in Cape Coast show that no case of cholera was reported in the AEE district between 2010 and 2012 (see Table 2). However in 2014 alone 89 cholera cases reported to be food -related (2 laboratories confirmed) with three deaths were recorded (DHIMS, AEE, 2015).

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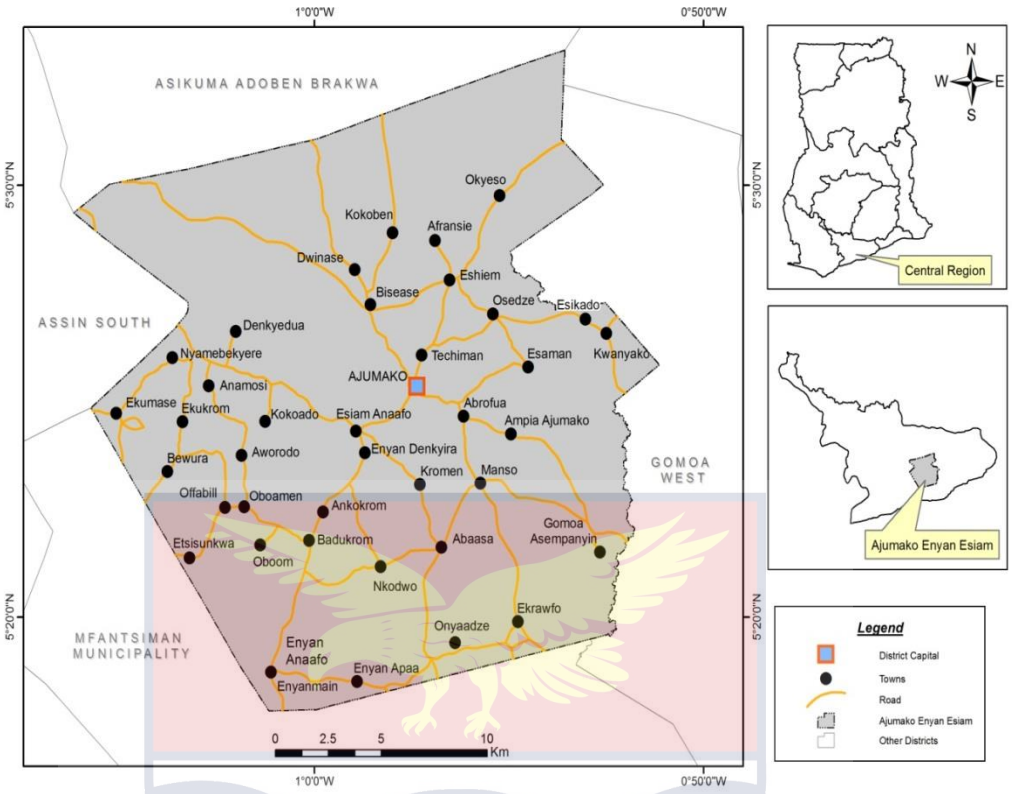

Figure 6*:* Map of Ajumako Enyan Essiam District

Source: GIS Department of Geography and Regional Planning, UCC, 2015

Research Design & Methodology

Research Design

Research designs are the overall plan or paradigms for obtaining answers to study research questions and for testing research hypotheses. Incorporated in a research design is the decision on the methodologies, the sampling plan, data collection plan and analysis plan. A non-experimental design, namely a *mixed-methods research* approach was adopted for this study. The research design involved the use of cross-sectional descriptive survey (with observation) of food vendors, focus group dicussion involving consumers and in-depth interview of purposively selected regulators.

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Mixed-methods research approach is "the combination of quantitative and qualitative approaches in order to provide a better understanding of research problems" (Bowling, 2014 p.419). The philosophical perspective of the design involved the combination of the postulations of *positivism* and *interpretivism.* Auguste Compte's philosophy of positivism underlies quantitative research methods. It refers to scientific observable facts or objective inquiry based on measurable variables and provable hypotheses. According to Bowling (2014 p. 139) "positivism in social science assumes that human behavior is a reaction to external stimuli and that it is possible to measure social phenomena, using the principles of the natural scientist… based on empiricism." However some social scientists consider positivism as encouraging an emphasis on superficial facts hence the need for the qualitative paradigm which is derived from the philosophy of *interpretivism.*

Interpretivism emphasizes people's interpretations of phenomena and situations rather than 'reality' and places emphasis on the meaning of people's narration or words and actions (consumers and key informants) rather than on their statistical significance (Bowling, 2014 p.365). Qualitative research places greater emphasis on the meaning of what people say or do. Whereas the quantitative researcher is confronted with statistics, the qualitative researcher contends with understanding the meaning behind the statistics by finding patterns within words and actions of research participants (Bowling, 2014 p. 363). Interpretivism is a naturalistic approach based on the critique of the philosophy of positivism and is associated with the philosophical position of idealism, social constructivism, phenomenology and hermeneutics. Moreover, interpretivism

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studies may employ multiple methods in order to reflect different aspects of the philosophy such as interviews and observations.

It is for the advantage of complementing each other that Bowling, (2014 p. 364) underscores the greater use of combining "both qualitative and quantitative approaches in the same research study in order to collect more comprehensive data and wider understanding of the research problem." Mixed-method approach maximizes the strengths of each approach while it minimises their inherent weaknesses. It makes the assumption that integrating qualitative and quantitative paradigms within the same study complements each other to optimize their synergy so as to eliminate biases and to generate the best supportive evidence to make valid research conclusions. The philosophical basis of the study satisfy both the ontological assumptions of social reality upon which the study theoretical framework is founded and the epistemological philosophy of knowledge-gathering process in the study of social reality. Whereas the quantitative approach was used in the structured survey of food vendors, the qualitative approach was applied to the focus groups of consumers and in the semi-structured interview of the key study informants. These philosophical postulations therefore justify the application of mixed-methods in this study in providing adequate responses to the study objectives and research questions.

The objective of the quantitative design was to conduct relevant statistical analysis while the qualitative inquiry involved providing narrative explanations and meaning to the social processes of food safety rather than quantify the findings and generalise it to a wider population. The two sets of findings (quantitative and qualitative) are either complementary in terms of their interpretations or when their findings are contradictory, the differences are

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interpreted and explained. The qualitative findings help in providing more opportunities for serendipity of findings to describe the extent to which the quantitative and qualitative findings cohere.

Quantitative Methodologies

The quantitative data was collected using a cross-sectional structured descriptive survey. The method was used in collecting data from a sample of the population of interest (food vendors) and appropriate statistical measures computed and interpreted. Alongside the interview was an observation of vendor food safety practices to assess personal hygiene practices and environmental hygiene conditions of the study vending sites. The observed phenomena were captured on the structured research questionnaire.

Qualitative Methodologies

The qualitative methodologies of the study involved the application of *focus group discussion* (FGD) of street food consumers; and *in-depth interview* of key informants or regulators on food regulation enforcement in the study area. The study FGD involved two sets of street–food clientele (i.e. gender specific) in each of the two study districts in order to capture the gender perspectives in the findings. In social science, FGD is useful in exploring participants' understandings, priorities, cultural values and beliefs about health and disease in ways that a researcher may find more difficult to explore in face-to-face interviews.

This researcher served as the moderator in all FGD sessions. A trained research assistant each assisted in recording the proceedings of each discussion as well as with participants' consent tape-recorded focus group discussions. Due consideration was taken of potential weaknesses of that methodology such as

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potential dominance of some individuals within the group. Selection of groups was carefully balanced in terms of their socio-demographic characteristics such as gender, age and educational status. The other method used to obtain qualitative data was structured in-depth interview of key informants on food safety and regulation enforcement. The aim of the in-depth interviews was for the interviewer to obtain detailed information about their knowledge, experiences, attitudes, behaviours, opinions and feelings on the risk factors to street food trade; challenges in the enforcement of food regulations as well as their prescriptions for improving food hygiene and safety in the study area. A semi-structured in-depth interview guide and audio-tape recorder was used to record the interviews. The process of the interview of respondents began with informing them of the aim of the study and assuring them of confidentiality of their responses.

Sources of Data

The study involved two main sources of data collection namely, primary and secondary data collection sources. Primary source of data are first-hand reports of facts and findings as prepared by this researcher. Secondary sources on the other hand are second-hand account of facts or events which are descriptions of studies written by another person other than the original researcher such as reports and publications. The primary data were obtained through fieldwork interviewing, observation and tape recording of research encounters.

Primary Sources

A key method of data collection used was interviewing. A face–to- face interview of street-food vendors was conducted using a structured questionnaire. The face-to-face interview of the food vendors took place at the vending site of each food vendor. In the qualitative study, In-depth interview of key informants

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from the GHS, Department of Food and Agriculture; FDA; and the environmental health department of the Regional Coordinating Council (RCC) and the District Assemblies were conducted in their respective workplace environments (ie. doorstep interview).

But interviewing street food vendors on specific phenomena such as personal and environmental hygiene could be fraught with bias hence the application of observation as a data collecton method. The observed phenomena were captured on the research questionnaire. Validity and precision of findings were thus increased by combining observation with interviewing. Tape recording was the other source of primary data. A recorder was used to electronically record the FGD proceedings and the in-depth-interviews. It provided a true account of the encounters that were listened to again for purposes of full transcription and subsequent analysis of the narrative data. Though each method or source had its own merits, the four methods were combined to use the synergy of their collective strengths.

Secondary Sources

Documentary sources also played an important part in the collection of data in this study. The secondary sources of data included literature review articles and publications and official documents, reports and legal sources such as reports from the GSS, the GHS, the WHO, the FAO, statutes and other legal documents. These sources complemented the primary data obtained from both the positivist and interpretivism perspectives of the study. Bowling (2014 p. 437) identifies the merits of document research as including their "relative non-reactivity with the investigator, convenience and low cost."

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Research Population

In research, the term target population refers to the entire study units a researcher is interested to study using a selected sample size. This research studied three target populations namely:

- Street food vendors who were selling ready-to-eat food items in public places.
- Street food clientele or consumers who were living in the study area;
- Key Informants or regulators of street food regulations in the study area. Key regional informants were policy makers from the regional environmental health department, the FDA and the Regional Health Directorate in Cape Coast. Informants interviewed at the district level were from the MMDAs environmental health, GHS and the MoFA.

Inclusive and Exclusive Criteria

The inclusive criteria were all street-food vendors whether registered with the environmental health unit or not. All ready-to-eat food handlers in hotels and restaurants were excluded from the study target population. On the other hand, the inclusive criterion for the FGD (consumers) was the status of residing in the respective study districts and having ever patronized street food. This category of consumers excluded visitors or those on transit in the study districts. The selected key informants represented a cohort regulators in the subject matter of the study. This excluded other practitioners in the private sector and in other districts of the region who were not in the study districts selected.

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Sampling Procedures

Appropriate sampling procedures and sample size determination are necessary in research in order to achieve the validity of the findings. Different sampling procedures were adopted for the different study populations. Whereas quantitative approach requires sufficiently large-sized samples for conducting data analyses to prevent bias findings based on chance, qualitative studies typically focus on analysis using small samples of participants. The merits of sampling vis a vis census study are that they are more efficient and ensure better quality of data since there is more time for sorting and checking and more elaborate data could be collected.

Quantitative Sampling Technique

The process of obtaining the study sample in the quantitative aspect of this study was rigorous. There was a sampling frame of localities in each district. A mechanism for drawing a large random sample was adopted. By statistical principles, when a sample size is reasonably large, the distribution of the measures of averages in the sample findings can be approximated by the Normal or Gaussian distribution to the population parameters. In selecting the study units, a *multi-stage stratified sampling* procedure with varing probabilities was used which had the advantage of being economical due to the merit of concentration of fieldwork. It is a procedure conducted in phases.

As a first step in the four stage multi-stage stratified sampling procedure, the region's twenty districts were stratified into coastal and inland strata. The stratification was done on the basis of secondary statistics obtained from the regional health directorate in Cape Coast, in which all coastal districts were categorized as high cholera incidence-prone areas over the period 2010 to 2014 as

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compared to the inland districts (see Table 2). For instance based on secondary data available in CRRHD/GHS reports, the coastal districts together accounted for 79.2 percent of cholera cases recorded between 2010 and 2012 in the Central Region of Ghana. Cholera was used as a proxy for all FBDs because it is an internationally notifiable epidemic and could have a very high fatality rate. Ten districts comprised the coastal stratum and the remaining ten constituted the inland stratum. The *Primary Sampling Unit* (PSU) involved the random selection of one coastal district (KEEA) and one inland district (AEE). By epidemiological theories explained under the *Conceptual Framework* section in Chapter two, variation in the distribution of FBDs is assumed to be indicative that there was variation in certain etiological causative factors in the respective environments.

The *Secondary Sampling Units* (SSUs) were randomly sampled localities from a sampling frame of localities for each district obtained from the respective District Health Directorates. They were each stratified into two strata, namely administrative capital and other localities. The sampling frame for the KEEA municipality had 36 localities while that of the AEE District had 45 localities. One-third of localities in each of the two sampling frames were sampled. Consequently, twelve localities in the KEEA municipality, including Elmina and fifteen localities in the AEE district, (including Ajumako) were sampled at the SSU stage (Moser & Kalton, 1997 p.193). The *sampling units* for the two district capitals (Elmina and Ajumako), were street-food vending centres from which a list of sampled centres were selected and selected food vendors interviewed. The study *sampling unit* was the individual street food vendor. In the two district capitals the interviews at the selected vending centres targeted the next available food vendor willing to participate in the study in the event a selected food vendor

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declined participation until the calculated expected numbers of food vendors in the sample were interviewed. In all 71 vendors were sampled in Elmina and 34 vendors sampled in Ajumako as illustrated in Table 4. Anaecdotal sstimates provided indicated that one out every four food vendors in each of the two study districts, one was doing business in the respective district capital. This explains the proportion of questionnaires administered in each district capital (Elmina and Ajumako). All respondents willing to participate in the study were interviewed given the pre-calculated sample size of each sampled locality.

In the other localities in the study which were predominantly rural or/and smaller towns, the interviews targeted all available food vendors willing to participate in the study until the calculated expected number of food vendors were interviewed. This involved all food vendors either registered or not registered with the respective local authorities; who were present at the time of the interview and availed themselves to be interviewed. All respondents willing to participate in the study were interviewed given the pre-calculated sample size of each sampled locality. These procedures were adopted since the total number of vendors was unknown as there was no list of unregistered vendors available at the Municipal/District Assemblies.

Table 3: Multi-Stage Stratified Sampling Framework

Stage 1	Geographical Region	Coastal & Inland Strata
Stage 2	Primary Sampling	District
Stage 3	Secondary Sampling	Locality
Stage 4	Study Unit	Street food vendor

Source: Compiled by author, 2015.

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Sample Size Determination

The determination of the study sample size of food vendors involved computing the total sample size as well as the expected number of food vendors to be interviewed per district and for each locality. This was based on the respective estimated locality population sizes. The following equation was used in computing the overall total sample size of food vendors to be interviewed:

Equation 1: $n_0 = \frac{z^2pq}{e^2}$ …… (1) (Cochran, 1977; Daly & Bourke, 2000)

Where n_0 is the minimum sample size required,

Z = Standard normal score corresponding to the 95% confidence level at 0.05 statistical significance level = 1.96

p = 0.05 (the proportion of food vendors estimated to have an unknown average knowledge set at 50%);

q = 1- p =1- 0.5= 0.5.

e is the desired level of precision within ± 5% = 0.05

$n_0 = \frac{(1.96)^2 \times 0.5 \times 0.5}{0.05^2} = 385$ street food vendors

An increment of 10% of the minimum sample size was added to make up for potential non-responses

10% of 385 = 39

n_0 = 385 + 39 = 424 total sample size of street food vendors.

A total sample size of 424 street-food vendors were computed for the study area made of the two selected districts. The sample size for each of the study districts was guided by their respective number of registered street- food vendors

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obtained from the two environmental health offices. Registered food vendors were used as a proxy for all food vendors since official statistics of total food vendors including all unregistered vendors were not available. From Table 4, the computed total sample size of study districts were KEEA (276) and AEE (148) street-food vendors. However of questionnaires administered a total of 266 and 147 questionnaires were completely responded to and filled for the KEEA municipality and the AEE district respectively totalling 413 questionnaires (refer Table 5). This represented a 97.4 percent data collection response rate for the study area. Bowling (2014 p.282) recommends a minimum of 75 percent respone rate in sample research in social sciences. In particular, the sample size of each district capital (Elmina and Ajumako) was informed by the approximate ratio that in each of the two study districts, one out of every four food vendors operates in the district capital (Tables 6 & 7).

Table 4: Sample Size Computation per Study District

District	Total Registered Number of Vendors*	Registered Vendors (proportion)	Study Sample Size of SFVs
KEEA Municipality	**928**	**928/ 1,428 x 424**	**276**
AEE District	**500**	**500/ 1428 x 424**	**148**
Overall Total	**1,428**		**424**

Source: Environmental Health Departments, District/Municipal Assemblies, Central Region (2016).

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The sample sizes of the various localities were determined by using their relative population sizes from the 2010 population census figures obtained from the districts. Street-vended food consumers were on the other hand studied under the qualitative facet of the research.

Qualitative Sampling Technique

The quantitative research for the two study districts were complemented with qualitative data from the in-depth interviews of key informants and focus group dicussion of street food consumers. Data on consumer perceptions and practices were transcribed from FGDs of between seven and ten participants per session. The FGDs were organised for two sets of street–food clientele (i.e. gender specific) in each of the study districts totalling four sessions.

Purposive sampling was used in selecting the FGD participants who were willing to participate in the discussion and met the inclusive criteria of gender, residence in the study districts and having admitted ever patronizing street-vended food. A variation sampling strategy was additionally used in each focus group to ensure variability in the age range of the participants to ensure responses from different age perspectives and to facilitate the conditions for free and open discussions. Selected FGD participants were regular consumers of street-vended food from the communities. The number of male participants in the FGD sessions held in the KEEA Municipality was eight while the female participants were ten. The participants in the FGD sessions for the AEE District were seven for both males and females respectively. The ages of FGD males ranged from 18 to 50. They were mechanics, welders, students, teachers, farmers, salt workers by occupation and the unemployed. On the other hand, the female FGD participants composed of hairdressers, seamstresses, students, traders, the unemployed and

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public servants, with ages ranging from fifteen to thirty five years. Generally participants' educational status ranged from 'no education', junior high school to senior high school.

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Table 5: Sampled Localities & Actual Number of Questionnaires Administered

Serial No.	KEEA Municipality	Questionnaires Administered	Serial No.	AEE District	Questionnaires Administered
1)	Elmina	71	1)	Ajumako	34
2)	Bantoma	25	2)	Bisease	15
3)	Komenda	26	3)	Enyan Abaasa	17
4)	Kissi	28	4)	Nkwantanum-Essiam	12
5)	Abrem Agona	25	5)	Enyan Denkyira	15
6)	Bronyibima	20	6)	Ochiso	5
7)	Domenase	20	7)	Enyan-Maim	8
8)	Dutch Komenda	11	8)	Kokoben	4
9)	Abrem Berase	10	9)	Mando	7
10)	Ampenyi	10	10)	Kromaim	4
11)	Ntranoa	10	11)	Baa	14
12)	Abeyee	10	12)	Etsi-Sonkwa	6
			13)	Osadzi	3
			14)	Entumbil	2
			15)	Amia	4
	Total	266		Total	147

Source: Author Compilation (2016)

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Table 6: Vending Centres or Clusters Sampled in Elmina

No.	Elmina	No.	Elmina
1.	Tetelim	15.	Nyanta Hill
2.	SSNIT Junction	16.	Neizers Garden
3.	Zongo	17.	Benya Shrine
4.	Chapel Square	18.	Benya Street
5.	Council Lane	19.	Kobina Cann Square
6.	Nepers Garden	20.	Estate Junction
7.	Liverpool Street	21.	Akotobinsin
8.	Damanbodo	22.	Estates
9.	Java Hill	23.	Old Market
10.	Elmina Junction	24.	New Market
11.	Sybil	25.	Dentildo
12.	CP	26.	Zongo Road
13.	New Market	27.	Elmina Town
14.	Roman Hill	28.	Municipal Assembly

Source: Author Compilation, (2016)

Table 7: Vending Centres or Clusters Sampled in Ajumako

No.	Vending Centres
1.	Ajumako Town centre
2.	Nsutremu

Source: Author Compilation, (2016).

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A purposive sample of the following nine key informants or regulators in the study area, were also interviewed by this researcher using semi-structured in-depth interview guide instruments:

- Municipal Environmental Health Officer (KEEA)
- District Environmental Health Officer(AEE)
- Municipal Director of Health Services (KEEA)
- District Director of Health Services (AEE)
- Municipal Director of Food & Agriculture (KEEA)
- District Coordinator, Women in Agriculture & Development (AEE)
- Central Regional Environmental Health Officer
- Central Regional Director, Food and Drugs Authority.
- Central Regional Disease Control Officer

The sample size of the key informants selected was necessarily small because data obtained from qualitative interviews were not used for purposes of generalization but to enhance insight into the subject matter of study.

Data Collection Instruments

Three types of research instruments were used for data collection in both the quantitative and qualitative facets of the study namely structured questionnaire, In-depth Interview Guide and FGD Guide.

Structured Questionnaire

The research instrument used for the collection of the quantitative data was a 10-page structured questionnaire developed by this researcher and

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administered in the face to face interview of the sampled food vendors. The first step in the construction of the questionnaire involved planning the content of the questionnaire. The construct were guided by the scope of the research objectives and the research questions presented in Chapter one of this thesis and WHO's Training Evaluation Forms for the five keys to safer food manual (2006). The content consisted of pre-coded questions, open-ended questions and attitude measurement scales. The latter involved adopting the Likert scale for measuring food vendor opinions and views.

As shown in the Appendix A of this thesis, the questionnaire was structured under the following sections namely; socio-demographic vendor profile, knowledge- and attitude based constructs in food safety, vendor food hygiene practices/behaviour as well as regulation enforcement practices' constructs. It also included sensory (observation) section for the observation and recording of environmental and vendor food hygiene practices. The introductory part of the questionnaire included the confidential label, the respondent's serial number to preserve anonymity and the title of the study. Each respondent's questionnaire was assigned a three-digit code for purpose of identification. In this study, the status of cleanliness of the vending site, proximity of vending site to environmental risk factors, vendor personal hygiene behaviour and practices, food handling and hand washing practices, mode of street food display, mode of serving food, crockery and utensil cleanliness, waste disposal practices and the risk of vector-food contact were obvserved and documented. In all, quantitative data were collected from fifteen localities in AEE district and twelve in the KEEA Municipality.

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Overall, a 97.4 percent data collection *response rate* was achieved. This consisted 266 and 147 completed questionnaires for the KEEA Municipality and AEE district respectively totalling 413 administered questionnaires. The response rate is considered good and acceptable for purposes of research of this nature (refer Bowling, 2014 p.282). Allowance was made for vendors who either declined or refused to be interviewed by substituting them with other available and willing vendors. This included mobile vendors available in a selected vending area willing to participate.

Qualitative Research Instruments

Additionally, two qualitative research instruments were designed namely; semi-structured In-depth Interview Guide and FGD Guide (refer Appendix A). The former which was used to interview the six key informants in the two study districts and the three regional level key informants, was designed mainly to capture data on interviewees' experiences, activities, opinions, knowledge and factual information on the topic. The questions were mainly open-ended and were designed to obtain all relevant information on the phenomenon under study from the interviewees. This method allowed them to respond to questions in their own words sometimes with prompting and probing from this researcher.

A FGD Guide was also used to conduct discussion among consumers of street-vended food, one session for males and one for females living in selected communities in each district. As most food-vendors and consumers were illiterates, the structured questionnaire and FGD Guide were translated from English to the local language (Fanti) to facilitate the interview and the

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discussion processes respectively. The variables in Table 8 were adapted in constructing the various research instruments.

Pre-testing Research Instruments

The research instruments for this study were pre-tested to assess their validity and reliability. The quantitative research instrument was pre-tested by this researcher at Abura, Cape Coast among twelve similar target populations and revised appropriately. The pre-testing of the questionnaire helped to identify the shortcomings of the pre-coded response choices and to make the appropriate adjustments. Some of the issues considered were the ease of handling the length of the questionnaire, the clarity of the words, the adequacy and clarity of the couching of the questions and the clarity and sequencing of the questionnaire layout. On the other hand the qualitative instruments were tested on friends to assess their content clarity and adequacy.

Protocol and Ethical Considerations

This social research involved action on a number of ethical considerations including informed consent, privacy and confidentiality issues, encouraging voluntary participation, freedom of participants to withdraw from the study and data storage. Appropriate community entry techniques were observed including obtaining consent of collaborating institutions such as the GHS, FDA, Department of Agriculture and appropriate local authorities before the commencement of data collection. An introductory letter from the University of Cape Coast, Department of Population and Health was used to seek permission to conduct the in-depth interviews and the FGDs and to assure participants of confidentiality and anonymity of their responses. Before the administration of the research instruments all participants and respondents

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were informed of the purpose of the research, expected duration and the procedures involved. Participants' and respondents' rights to decline to participate and to withdraw from the research once it had started were also explained by the interviewers and the FGD moderator. This informed consent process ensured that participants and respondents voluntarily participated in the research with full knowledge of potential risks and benefits. The street-food vendors were interviewed at low peak hours (in-between breakfast, lunch and dinner hours) to minimise interruptions by customers. The consent of the interviewees and the discussants were also sought to use audio-tape to record the in-depth interviews and the FGD sessions. Data stored on research instruments, audio-tape recorders and computer database have been preserved. All contributions or support to this research have also been acknowledged. Approval of the Ethics Review Board of the Department of Population and Health of the University of Cape Coast and an ethical clearance from the Ghana Health Service Ethical Review Committee, Accra were sought for the conduct of the study.

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Table 8: Study Variables

Quantitative (Questionnaire):	**Qualitative (In-depth Interviews, FGD)**
• Socio-Demographic Profile, e.g. age, gender, educational status, religion, marital status & duration in trade • Categories of vendors • Types of street food sold • Types of vending site • Categories of consumers • Knowledge of food risk factors • Sources of vendor knowledge • Vendor medical examination status • Vendor licensing status • Training status of vendors • Vendor health status • Apron/ protective garment practices. • Finger nail hygiene • Head(hair) covering practices • Hand washing practices • Food Handling Practices • Mode of Food Display • Cleanliness of utensils • Mode of storage of un-sold food • Excreta disposal practices • Cleanliness status of vendor site • Water sources • Vector- food contact status • Solid waste disposal practices • Availability of vendor associations • Regulation Enforcement Vendor training • Regulation Compliance • Sanction practices.	• Food hygiene standards • Food Regulation enforcement mechanisms • Regulation Enforcement capacity • Rate of Inspections • Enforcement challenges • Consumer knowledge • Consumer practices

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Data Collection Procedures and Challenges

This sub-section also discusses the data collection procedures and challenges encountered in the processes used in the fieldwork data collection. A *work-plan* of data collection was prepared listing the tasks that had to be carried out on daily basis by the researcher and the interviewers, the time needed, the resources required and the period of the day to carry out the data collection. In all, the planning and data collection phase lasted for a period of about five months i.e. January 2015 to May 2015. The quantitative face–to-face interview of street-food- vendors using a questionnaire was conducted mainly in the local Fanti language, involving four trained research assistants i.e. two per district who could speak Fanti. The face-to-face interview of the SFVs took place at the vending site of each food vendor. Interviewers informed respondents of the purpose of the interview and assured them of confidentiality and anonymity of their responses. They also explained the objectives of the study to the food vendors. The latter were mainly interviewed at low peak hours as explained on page 92 of this chapter. Interviewers were trained on how to administer the questionnaires alongside the translated version in order to prevent the fallacy of interviewer bias and to ensure reliability and validity of the results. The training also helped in equipping interviewers with the skills needed in maintaining rapport and trust between them and respondents.

In the qualitative study, In-depth interview of key informants from the GHS, Department of Food and Agriculture; the regional environmental health department and the District Assemblies were conducted in their respective relaxed and conducive workplace environments. The regional informants were

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interviewed by this researcher in their offices in Cape Coast while the key informants for the two study districts were interviewed in their offices in Elmina and Ajumako respectively. The In-depth Interview Guide was administered by this researcher for an average period of 35 minutes per interviewee. Consent of the interviewees was sought using an introductory letter from the Head of Department of the Department of Population and Health, University of Cape Coast. Additionally, their informed consent were sought to use audio-tape to record the interviews. The interview process involved asking structured or probing questions to seek clarification to answers and as follow-up questions.

In the FGD of street-food consumers, small-group discussions moderated by this researcher explored consumer food safety perceptions, underlying factors of street-food patronage, their knowledge, sources of food safety information, food hygiene attitude and practices. All the four FGD sessions were held in quiet and congenial environment at the respective district health directorate offices.

Some challenges were encountered in the fieldwork. Though food vendors were to be interviewed at low peak hours, there were few instances particularly in KEEA where SFVs felt interrupted. In such instances where vendors were not willing to participate in the interview, they were substituted by a nearby food vendor. Secondly, the interviewees for the in-depth interview particularly the regional informants predictably had very busy schedule. It was very challenging getting them to avail themselves for the interviews after many telephone calls and personal contacts. The regional

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environmental health officer delegated his deputy to step in for him to be interviewed.

Data Processing and Analysis

Overall three levels of analysis were conducted namely the street food vendor, the consumer and key informants. Data on SFVs were analyzed quantitatively while data on consumers and key informants were analyzed qualitatively. Quantitative data entry and analysis were conducted using SPSS Version 21 software. Averagely, seven minutes were used in keying each questionnaire data into the SPSS data editor. Analysis of the quantitative data collected on SFVs encompassed univariate analysis. Supported with graphs and charts, the univariate analysis has been used to describe the measures of the individual variables.

The qualitative and quantitative data were analyzed concurrently. Sorting of the 413 completed questionnaires was done using a numerical format of district number/locality number/questionnaire number to distinguish between data collected on each individual vendor. Quality checks were then performed on all the data to ensure consistency and completeness of responses. This was followed by computer coding, data entry, tabulation and analysis. In the qualitative aspect of the study, textual or narrative analysis of data was used to inductively derive the findings.

Basic steps in qualitative analysis involved reviewing all the data (e.g., interview transcripts or focus group notes); organizing and labelling responses into similar themes and identifying and interpreting the meaning that emerged from the data using theoretical concepts in the study conceptual framework. All audio-tapes and relevant documents were organized into

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readable transcripts for analysis. Duplicates of interviews and FGD audio-recorded tapes were made to prevent their loss. The qualitative data analysis was preceded by playing back the audio-recorder for each FGD session and transcribing the discussion a day after each session to enable easy recollection of the non-verbal aspects of the sessions. The same procedure was followed for the in-depth interviews.

The *MS Word* software programme was used for the word processing and analysis using the manual method of preparing data for qualitative data analysis. Data synthesis was used to integrate both the quantitative and qualitative research results, with the aim of enrichening the quality of analysis. Each of the quantitative and quanlitative data of the study may have had their limitations and thus the findings were integrated to give a fuller explanatory narrative.

Validity and Reliability

Validity refers to the degree to which the research instruments measured what they intended to measure. Reliability on the other hand measured the consistency with which an instrument measures the attribute it was designed to measure and it means that responses to the questionnaire were consistent. Bowling, (2014), refers to reliability as "reproducibility and consistency of the instrument" and the degree to which its application is free from random error. The validity and reliability of this study were ensured by a number of measures. In the quantitative research, the measurement procedure consisted of well-defined variables as listed in Table 8. To prevent participants or respondents giving socially desirable answers, research instruments for the study were designed devoid of leading questions. The degree of reliability

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was enhanced by the training conducted for the interviewers before the data collection which expectedly minimised or eliminated any potential bias margin. Validity was also enhanced by adapting the FAO and WHO recommended indicators in the framing of the instruments. Secondly, the questions in the study questionnaire were phrased using both closed-ended questions with appropriate Codex recommended pre-codes; and open-ended-questions. The purpose of the pre-test of the research instrument was to test the draft questionnaire and the definition of its contructs and concepts and revised appropriately. . An aspect of validity is the representativeness of the sample size of 413 food vendors and hence the valididity of the generalization of the results. Appropriate sampling procedures were also adopted.

Limitations and Delimitations

Despite the validity and reliability of the findings, various limitations and delimitations were encountered in conducting the research study. For example the responses to survey questions on whether vendors were licensed or not and their medical-examination status could not be empirically verified. It was not possible to do so because vendors usually do not carry their licences with them at the vending sites. Delimitations in the study involved those constraints this researcher had control over. It included the exclusion of microbiological laboratory analysis of food samples from food vendors surveyed. It followed also that for practical reasons a study of temperature control practices of food vendors was also excluded. The term street-vended food was used to exclude ready-to-eat food sold in hotels and restaurants which were usually located in a permanent building. Although the geographical area of the study was Central Region, the study method of multi-

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stage stratified sampling limited the scope of study to two districts in the region.

Despite these limitation and delimitations, this study had a wider scope. It was conducted in two districts focusing on street food risk factors and regulations' enforcement. Results were obtained from three perspectives namely food vendor, consumer and regulators' perspectives. Hitherto street food safety studies in the Central Region of Ghana had been limited to the regional capital, Cape Coast. Also most food safety studies reviewed focused mainly on microbiological laboratory analysis of food samples as well as knowledge, attitude and practices of vedors. It is to be noted that even Monney et al. (2014) which could to some extent be considered as an exception, focused on compliance of food safety regulations from vendor and regulator perspectives only. Though some of the studies reviewed used mixed methods design, only Haleegoah et al., (2015) combined the methodologies of descriptive surveys, observation, focus group discussion and in-depth interviews in the same study. Haleegoah, J., et al. (2015), also focused on the consumer, the food vendor and the regulator. However the study excluded the perspectives of other key stakeholders.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This Chapter is a descriptive analyses and presentation of the findings of research study based on the methodologies explained in Chapter three above. The results are presented, interpreted and discussed in tandem with the study objectives, and research questions outlined in Chapter one. Quantitative data from the street-food vendor survey are expressed quantitatively in frequency tables and statistical attributes of the data are computed. Additionally, the qualitative results are used to prove the concordance or otherwise of the quantitative results based on specific thematic areas derived from the study objectives involving consumers and key informants.

Socio-Demographic Profile of Vendors

This section focuses on the socio-demographics characteristics of vendors. It seeks to address the specific Objective 1 and the stated research question below:

Ascertain the socio-demographical characteristics of street food vendors.

- What are the socio-demographic features of street- food vendors?

In answering the above research question, the variables applied were categories of vendors, sex, age, educational status and marital status of vendors. The analysis in Table 9 reveals two categories of street-food vendors in the study area namely *stationary* and *mobile* vendors. Table 9 shows that

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344 (83.3%) of vendors and 69 (16.7%) were of the stationary and mobile types respectively.

It was also found that vendors in AEE District were almost wholly stationary 146 (99.3%) as compared to 198 (74.4%) stationary vendors in the KEEA Municipality's. Both types of vending have implications for risk of food contamination if appropriate hygiene practices are not observed by vendors. Stationary vending particularly has an added implications for public space planning, traffic flow and pedeastrian movement whiles mobile vending has greater implication for challenges in regulation enforcement by inspection officers.

There may be various reasons why majority of food vendors sell at fixed locations rather than being mobile. A unique benefit of stationary vending may be that it affords the consumer with the greater opportunity to have easy access to street foods and to exercise their choices and patronize their specific preferences. It is more practical and convenient especially with respect to the types of street food that are 'bulky'; or that which require intermittent preparation and cannot be moved around easily such as *fufu* and *soups*. Unlike mobile vending, fixed vending centres are usually designated by the District/Municipal/Metropolitan Assembly to facilitate easy inspections and regulation enforcement activities. It was observed that designated food vending sites mainly lacked lavatories and handwashing facilities. Stationary vending particularly has an adverse implication for public space planning, traffic flow and pedeastrian movement whiles mobile vending has implications for regulation enforcement challenges because of their mobile and evasive nature (Khairuzzaman et al., 2014; Owusu et al. 2013).

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Street-vended foods surveyed in this study may be categorized into five broad groups namely meals or dishes (e.g. fufu), snacks (e.g.roasted groundnut), fruits (e.g. banana), vegetables (e.g. salad) and beverages (eg iced kenkey). In all, a total of 49 different types of street-vended foods were surveyed. The results portray the diversity of SVFs in the study area.

It was found that 402 (97.3%) of street-food vendors in the study area were females whereas 11 (2.7%) were males. Female are also in the overwhelming majority in the component study districts of KEEA Municipal 257 (96.6%) and the AEE District 145 (98.6%). The findings therefore confirm street-food vending as a business that is mainly plied by females. This suggests also that food vending business is a reliable source of employment for thousands of individuals particularly women in the private sector. In Ghana domestic cooking is mainly dominated by women who may have managed to turn a daily domestic responsibility into a profitable food vending business.

Nevertheless, the more cosmopolitan an area is, the narrower the ratio between female and male vendors becomes, though female vendors are in the majority (da Silva et al., 2014; Odonkor et al., 2011; Barro et. al., 2006). The finding of majority of food vendors being women is however contradicted by studies in other regions of Africa and Asia (Taranga & Himadri, 2013; Gawande et al., 2013; Mamun et al., 2013; Steyn & Labadarios, 2011).

Table 9 also reveals that majority of vendors were illiterates. Overall 84.5 per cent of vendors had had education below the senior high school level. Only 5 (1.2%) had had tertiary education. while 63 (15.3%) had no formal schooling. Table 9 also reveals that though vendors were generally illiterates,

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vendors in the KEEA Municipality were expectedly more educated than vendors in the AEE district, which is mainly a rural district.

Figure 7: Mobile Food Vendors on the streets of Elmina

The finding corroborates results in many studies in both Southern and Northern Ghana and other parts of West Africa that overwhelming majority (over 95%) of street- food vendors are illiterate women (Dun-Dery & Addo, 2016; Haleegoah et al. 2015; Nurudeen et al., 2014; Monney et al., 2014; Apanga et al., 2014; Donkor et al., 2009). Inconsistent with the study findings however is the cosmopolitan Accra Central study results in which the majority (54%) of vendors were senior high school graduates, which might reflect their challenges in accessing formal job market in cities (Odonkor et al., 2011).

On vendor marital status, Table 9 also shows that majority of vendors 277 (67.1%) were married. Married women usually manage their domestic kitchens and are likely to extend that skill to the street food business. The cultural habit of regular cooking by women in marriage could thus impact on vendor skill in preparing and serving street food to customers. The ages of

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vendors ranged from 15 years to 65 years (Table 10). Majority (39.2%) of vendors fell within the age bracket of 30 to 39 years with an arithmetic mean age of 34.98 years. Six (1.5 %) of vendors were teenagers while 8 (2.1%) were minors (i.e. under 18 years). This finding could have implications for legal issues involving child labour. Additionally, five vendors (1.3%) were over 60 years of age. The findings are consistent with findings in other studies in Ghana and other West African countries, that middle-aged women mostly engage in street food vending (Haleegoah et al., 2015; Sarkodie et al., 2014; Monney et al., 2014; Annan-Prah et al., 2011). The findings empirically underscore the importance of street food trade as a major source of employment and livelihood to a significant proportion of the population of the study area, mainly women, who would otherwise be unemployed.

Food Vendor Knowledge in Food Hygiene

The use of the term knowledge in food safety refers to vendor and consumer understanding of the *keys* to street-food safety and the prevention of incidence of food-borne-diseases. Generally, what a community may know about street-vended food safety could translate into their levels of understanding and attitudes. This section analyzes the data for addressing the second specific objective and the stated research question:

Assess street-food vendors' knowledge on food safety standards.

- How knowledgeable are street- food vendors on food safety?

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Table 9: Socio-Demographic Profile of Vendors

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	Freq (413)	%
Types of Vendors						
Stationary	198	74.4	146	99.3	344	83.3
Mobile	68	25.6	1	0.7	69	16.7
Sex						
Male	9	3.4	2	1.4	11	2.7
Female	257	96.6	145	98.6	402	97.3
Total						
Education						
No Schooling	42	15.8	21	14.3	63	15.3
Primary	24	9	35	23.8	59	14.3
JHS Middle	128	48.1	75	51	203	49.2
Voc Tech	11	4.1	5	3.4	16	3.9
SHS	49	18.4	10	6.8	59	14.3
Tertiary	4	1.5	1	0.7	5	1.2
Arabic	8	3	0	0	8	1.9
Marital Status						
Married	166	62.4	111	75.5	277	67.1
Separated	45	16.9	9	6.1	54	13.1
Divorced	5	1.9	3	2	8	1.9
Never Married	48	18	20	13.6	68	16.5
Widowed	2	0.8	4	2.7	6	1.5

Source: Author's Compilation, 2016.

Table 10: Age (Years) Distribution of Street-Food Vendors

	N	Range	Minimum	Maximum	Mean	Std Dev	Variance
Ages	413	50	15	65	34.98	8.958	80.138

Source: Fieldwork, 2016

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Table 11 reveals a high level of vendor knowledge on the WHO *Five Keys to Safer Food* in the study area. Overall, 138 (33.4%) vendors had knowledge in at least one of personal and environmental hygiene standards. Majority of them 226 (54.9%) had knowledge in at least three food safety standards. A remarkable finding is that though knowledge levels were high in both study districts, more vendors in the AEE (which is predominantly rural), had more knowledge in personal or/and environmental hygiene than vendors in KEEA Municipality.This situation may be related to the differences in health education activities and training of food vendors in the respective study districts.

In their response to a question as to whether food can be a source of disease among the population, the responses as shown in Table 11, confirm the high levels of food safety knowledge in the study area. Whereas 397 (96.1%) answered in the affirmative, 16 (3.9%) answered *no*. In KEEA, whereas 257 (96.6%) answered 'yes', 9 (3.4%) were ignorant of the link between unsafe food and disease incidence. Similarly in AEE district, 140 (95.2%) were knowledgeable as against 7 (4.8%) who had no knowledge of the relationship between unhygienic food and the incidence of food-borne-disease. In all, 396 (96.1%) were aware of at least one of the three commonest FBDs namely cholera, diarrhoea and typhoid. Other FBDs mentioned were intestinal worms 8 (1.9%), food poisoning 1 (0.2%) and stomach ulcer 1 (0.2). Strikingly, 16 (3.9%) of vendors showed complete ignorance of types of FBDs. The results confirm findings in recent studies in Ghana which show high levels of vendor knowledge in food hygiene (Dun-Dery & Addo 2016; Apanga et al., 2014) but

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however contradict results in other studies which generally show high vendor ignorance of the key food risk factors (Sarkodie et. al., 2014; Feglo & Sakyi, 2012; Chukwuocha et al., 2009; Abdalla et al., 2009; Omemu & Aderoju, 2008).

Table 11: Vendor Knowledge on Food Safety

	KEEA		AEE			
	Freq (266)	**%**	**Freq (147)**	**%**	**Total Freq (413)**	**%**
Knowledge of Vendors						
Personal hygiene	15	5.6	14	9.5	29	7
Clean environment	5	1.9	14	9.5	19	4.6
Pers. hygiene/clean envir	40	15.0	50	34	90	21.8
Cook food thoroughly	7	2.6	2	1.4	9	2.2
Separate raw/RTE foods	22	0.8	0	0.0	2	0.5
Safe water	4	1.5	15	10.2	19	4.6
Wash hands water/ soap	12	4.5	4	2.7	16	3.9
Safe ingredients	0	0.0	1	0.7	1	0.2
Hygienic food Display	0	0.0	2	1.4	2	0.5
Multiple knowledge 3+	181	68.3	45	30.6	226	54.9
Awareness in FBDs						
Yes	257	96.6	140	95.2	397	96.1
No	9	3.4	7	4.8	16	3.9

Source: Author's Compilation, 2016.

With the high knowledge base of vendors in the study area, it was important to assess the sources of their awareness and knowledge. It was found that there were three major sources of information on food safety knowledge for street-food vendors. These were health workers 168 (40.6%), radio 138 (33.4%) and health inspectors 76 (23.3%). Minor sources were television 26 (3.8%), school 5 (1.1%) and church (i.e. women fellowship) 4 (0.9%). In KEEA Municipality however, the main sources of vendor

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knowledge in order of importance were radio 125 (47.1%), health workers 116 (43.7%) and television 34 (12.9%). Interestingly, only 25 (9.4%) of respondents in KEEA Municipality received their knowledge from health inspectors. The distribution of sources of food safety knowledge of vendors in AEE district was different. Remarkably, 74 (50.3%) of vendors mentioned health inspectors as their main source of information. This is followed by health workers 62 (42.1%) and radio 26 (17.7%). Television was not mentioned.

Risk Factors to Street Food Safety

The analysis of data in thi section focuses on risk factors to street food safety associated vendor behaviours and practices. It also highlights the risk factors from the consumer and regulators perspectives. The section seeks to address the (specific objective 3) and research question as stated below:

Ascertain the risk factors to street food safety.

- What are the risk factors to street food safety?

Mode of Food Display

A major risk factor to food safety found in this study is the mode of food display. Table 12 shows that vendors who were observed to display their street food in hygienic manner (glass case, covered containers) were 113 (27.3%). Overall, 300 (72.7%) of street food in the study area were displayed in an unhygienic manner, either in an open-air exposure or/and at ground level or in an unapproved case such as mosquito-net case/sieve thus exposing vended

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foods to the risk of physical, chemical or microbiological contamination; the latter from vectors particularly houseflies. This finding confirms earlier research results by Odu & Ameweiye, (2013); but contradicts Okojie and Isah (2014) and Donkor et al., (2009).

Comparing the two study districts, 202 (75.9%) of vendors in KEEA Municipality displayed their foods in unhygienic/unapproved manner namely in an open-air exposure, at ground level and in a mosquito-net sieve. This contrasts with 98 (66.6%) in the AEE District. Protective devices shall be designed and constructed in a way so as to prevent contaminants which may for instance be expelled from the customer's mouth or nose from contaminating food. Sliced fruit or other foods ordinaryly consumed in the state in which they are sold, may be set out in an enclosed display case, cabinet or similar type of protective device and should be displayed in a manner which will not affect the wholesomeness of such foods.

Buttressing the quantitative results, FGD discussants (consumers) had the following to say to underscore the mode of food display as a major risk factor in the study area requiring regular inspections of vendors by health inspectors:

> "I think *ballfloat*, bread and fried fish must be well protected. I have personally seen examples of fried fish being sold on flat wooden container and exposed to houseflies in Abaasa. So I will not buy it." [AEE Male Participant 3].

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Figure 8*:* Unprotected Ready-to eat smoked Fish displayed (left) at Kissi

Source: Fieldwork, 2015

Figure 9*:* Ajumako- Koko vendor selling in protected Glass Case

Source: Fieldwork, 2015

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Table 12: Vendor Food Hygiene Practices

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	Freq (413)	%
Food transported						
Yes	176	66.2	82	55.8	258	62.5
No	90	33.8	65	44.2	155	37.5
Mode of Food Display						
Mosquito-net case	43	16.1	51	34.7	94	22.8
Glass case	37	13.9	27	18.4	64	15.5
Open-air exposure	151	56.8	44	29.9	195	47.2
Ground-level exposure	8	3.0	3	2.0	11	2.7
Covered containers	27	10.2	22	15.6	49	11.8
Serving Materials						
Utensils/plates/TAC/Cups	79	29.7	78	53.1	157	37.8
Leaves	1	0.4	1	0.7	2	0.5
Polythene	89	33.5	23	15.7	112	27.1
Newsprint	8	3.0	6	4.1	14	3.4
Calabash	3	1.1	0	0.0	3	0.7
Bottle	3	1.1	0	0.0	3	0.7
Multiple(3+)	83	31.2	39	26.5	122	29.5
Water Source						
Pipeborne	149	82.8	139	97.2	288	89.2
Well/pit	1	0.6	1	0.7	2	0.6
Borehole	29	16.1	2	1.4	31	9.6
Rainwater	1	0.6	0	0.0	1	0.3
Pondwater	0	0.0	1	0.7	1	0.3
Unsold food Disposal						
No leftover	133	50.0	43	29.3	176	42.6
Disposed of	5	1.9	9	6.1	14	3.4
Refrigerated	21	7.9	3	2.0	24	5.8
Resold	48	18.0	41	27.9	89	21.5
Eaten at home/Given out	59	22.2	51	34.7	110	26.6

Source: Author's Compilation 2016

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> "Food may be sold near an open gutter with a lot of filth, and many flies at the vending site. All types of food are sold along open gutters such as *waakye* and *banku*. I know that this situation exists in my hometown Abaasa." [AM Participant 1].

> "In Ajumako, *Ga kenkey*, *waakye* and other street-vended food are sold in sieve and not exposed. The reason is that they are regularly inspected by health inspectors (tankasi). I cannot say so for Abaasa but I know so of Ajumako" [AEE Male Participant 5].

Serving Receptacles

Receptacles used to serve street food to customers could be another source of food contamination. Table 12 shows that there were eight receptacles by which vended food were served. These are plates/utensils; take away containers (TAC), cups, polythene bags, newsprint, leaves, bottles and calabash. The two main receptacles used by respondents were plates/utensils 157 (37.8%) and polythene bags 112 (27.1%). Over one-third of vendors in the KEEA municipality used polythene bags as receptacles. Also 2 (0.5%) of vended food such as *waakye* (boiled rice and beans) were wrapped in plantain leaves among other receptacles. Furthermore, 14 (3.4%) of vended food such as *kelewele* (savoury spiced fried plantain) were wrapped in newsprint for sale to consumers. Albeit, street food may be served `with a combination of those items of receptacles 122 (29.5%). The cleanliness and safety conditions of those receptacles particularly plates/utensils, the implication of the potential risk of chemical contamination of polythene bags and the use of newsprint for wrapping food are of epidemiological concern. This is aside of the environmental impact of polythene bags in particular. The serving stage in

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food vending is a critical point in street vended food safety and that the use of newsprint and leaves to serve food could increase the level of contamination. By Codex food standards all street-vended food utensils should be regularly cleaned.

Unsold Food Management

Daily unsold food may also have implications for food safety when they are recycled. Table 12 shows that 237 (57.4%) of vendors always had left-over vended food daily. Whereas 110 (26.6%) said they (family) ate their left-over food at home or give them out, 14 (3.4%) stated that they disposed off leftovers. Only 24 (5.8%) of vendors said they refrigerated left-over food. Overall, over half 223 (54%) of vended food were left-over either consumed at home or re-sold to the consumer at another time, though 42.6 per cent of vendors said they do not have daily left-overs. There is therefore the potential risk of left-over food being contaminated if not properly stored. Significantly, in Table 11 over one-fifth of vendors (21.5%) stated that left over food were re-sold to consumers subsequently.

Comparing the two study districts, 50 percent of vendors in the KEEA and as high as 70.7 percent of respondents said they had daily unsold food. Not surprisingly only 21 (7.9%) and 3 (2%) of vendors in the KEEA and the AEE district respectively said they refrigerated left-over vended food. Overall, left-over food management was found to be a potential risk factor in both study districts though to a lesser extent in the KEEA municipality. This is not surprising because demand for street-vended food is more likely to be higher in the KEEA because of its relatively urbanized nature. The study findings corroborate earlier findings by Aluko et al., 2014; Odonkor et al., 2011;

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Abdalla et al. 2009; and Donkor et al., 2009. However in two Northern Ghana studies, Dun-Dery & Addo (2016) and Apanga et al., (2014) found that majority of food vendors had no daily left-over foods to re-sell subsequently. This suggests that if vendors are trained on the average quantum of food to sell daily it could minimise the amount of daily leftover food. Left-over food management has important implications for vendor training and education. Vendors could be trained how to refrigerate or store unsold food to prevent contamination or decomposition.

Transporting Street-Foods

By Codex standards, transportation of food either to the vending site or for purposes of mobile vending is considered a potential source of cross-contamination of street food. In Table 12, it is found that 155 (37.5%) of vendors prepare their food at the vending site without transporting the food (except in cases where any possible left-overs may have to be sent home). This implies that 62.5 per cent of vendors had to transport or move their street foods in one way or the other to the usual vending site thus exposing the food to the risk of potential contamination. For the two study districts the KEEA and the AEE, transportation of street food in KEEA Municipality 176 (66.2%) was more likely than in the AEE District 82 (55.8%). This finding is not surprising in view of the relatively more urbanized nature of the KEEA Municipality which has a wider network of roads and transportation services. Food vendors ought to avoid microbiological, physical (eg. dust) or chemical (e.g. fumes) contamination of food by taking appropriate control measures when transporting food. The food must be protected, well covered or sold in clean containers. Street- food must not be transported with raw food, animals

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and any other material that may facilitate contamination. Furthermore, vehicles that are used in transporting food should be manifestly clean and hygienic.

Vendor Personal Hygiene Practices

On vendor personal hygiene practices, Codex principles requires vendors to wear clean clothing or aprons, cover their hair (head), wear trimmed finger nails, practise safe hand washing and food handling practices as well as remain healthy. These are endogeneous factors over which the vendor may be said to have some high level of control. Table 13, shows that 271 (65.6%) of vendors in the study area did not use protective apron during vending. The respective figures for the two study districts are 161 (60.5%) for the KEEA and 110 (74.8%) for the AEE district, which reveals that the latter has a lower usage rate of protective garment than the former.

Personal cleanliness of the vendor also includes head (hair) hygiene practices because uncovered hair could inadvertently drop in foods resulting in its physical or chemical contamination. Table 13 reveals that uncovered hair is a potential risk factor in the study area. Overall, 308 (74.6%) of vendors did not restrain their hair. It was found that 196 (73.7%) of vendors in KEEA did not cover their hair as compared to 112 (76.2%) in the AEE district. The findings of poor use of clean protective garments by food vendors confirmed other research findings in Ghana and Kenya (Dun-Dery & Addo, 2016; Monney et al., 2014; Gitahi et al., 2013).

The survey findings was corroborated by some FGD discussants (consumers) who also identified unrestrained hair as a risk factor because hairs could drop in street foods such as soups sold in chop bars. On hair covering,

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the findings were confirmed by other studies in Togo and Kenya (Adjirah et al., 2013; Muinde & Kuria, 2005). However Okojie and Isah (2014) in a Nigerian study found that majority of vendors covered their hair during vending. This may be religion-related because majority of people in Northern Nigeria are Muslims. All food vendors or handlers are enjoined by Codex standards to wear suitable and clean protective clothing/aprons, head covering nets or other hair restraints for hair including beards.

Length and cleanliness of vendor fingernails is also an important consideration in vendor personal hygiene practices. Fingernails should be clean and trimmed to no longer than the tips of the fingers by the FDA standards. Table 13 suggests that vendor fingernail hygiene was not a major risk factor in the study area. Only 9 (2.2%) of vendors were observed to wear long fingernails which is consistent with earlier Nigerian and Ghanaian research findings (Okojie and Isah; 2014; Odonkor et al., 2011). The corresponding figures for the KEEA municipality and the AEE district were only 2 (0.8%) and 7 (4.8%) respectively. However this finding was contradicted by some consumers (FGD discussant) in the KEEA who identified "dirty fingernails" especially by some *kenkey* sellers and children who assist in kenkey moulding as a risk factor.

Food handling could be underscored as a major risk factor in the study area. Nearly half of vendors 198 (47.9%) were observed to handle food with their bare hands in the vending process. The corresponding figures for the two study districts are the AEE 73 (49.7%) and the KEEA 125 (47%) (Table13). This brings to question the effectiveness of the enforcement of food

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Table 13: Vendor Personal Hygiene Practices

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	Freq (413)	%
Protective Garment Used						
Yes	105	39.5	37	25.2	142	34.4
No	161	60.5	110	74.8	271	65.6
Hair/Head Cover						
Yes	70	26.3	35	23.8	105	25.4
No	196	73.7	112	76.2	308	74.6
Fingernail hygiene						
Long nails	2	0.8	7	4.8	9	2.2
Short nails	264	99.2	140	95.2	404	97.8
Bare food Handling						
Yes	125	47.0	73	49.7	198	47.9
No	141	53.0	74	50.3	215	52.1
Vendor Handwashing						
No handwashing	40	15.0	4	2.7	44	10.7
Only water	35	13.2	79	53.7	114	27.6
Muddy water	0	0	1	0.7	1	0.2
Water and soap	191	71.8	62	42.2	253	61.3
Wiping with cloth/napkin	0	0	1	0.7	1	0.2
Handwashing after Toilet						
Don't wash hands	3	1.1	0	0	3	0.7
Wash hand with water	33	12.4	39	26.5	72	17.4
Wash hands/ water & soap	230	86.5	107	72.8	337	81.6
Bath before vending	0	0	1	0.7	1	0.2
Child care						
Yes	83	31.2	62	42.2	145	35.1
No	183	68.8	85	57.8	268	64.9
Vendor had Illness						
Yes	24	9.0	19	12.9	43	10.4
No	242	91.0	128	87.1	370	89.6
Signs & Symptoms						
Stomach pain	9	36.0	1	5.6	10	23.3
Diarrhoea	6	24.0	3	16.7	9	20.9
Vomitting	2	8.0	1	5.6	3	7.0
Multiple signs & symptoms	8	3.0	13	8.8	21	5.1

Source: Author's Compilation 2016

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regulations particularly in relation to the use of gloves and crockery in food handling practices.

On vendor handwashing practices after visiting the toilet facility, Table 13 shows that 337 (81.6%) of vendors said they washed their hands with water and soap after visiting the toilet. This implies that nearly one-fifth of vendors 76 (18.4%) did not. Comparing the two study districts, whereas 230 (86.5%) of vendors in the KEEA Municipality used water and soap to wash their hands, 107 (72.8%) of vendors in AEE district did so. In other words, 36 (13.5%) of KEEA vendors did not wash their hands with water and soap after visiting the toilet facility as compared to 40 (27.2%) of vendors in the AEE district. Though one vendor (0.2%) indicated that she always took a bath after using the toilet, the study generally reveals poor handwashing practices as a principal risk factor to food safety in the study area.

Majority of vendors in the study area 253 (61.3%) said they washed their hands with water and soap before preparing food and during vending (even though this could not be verified).Whereas 44 (10.7%) admitted to not washing their hands at all, 116 (28%) admitted using various unsafe methods to either wash or wipe their hands e.g. washing solely with water, unclean water or wiping their palm with napkin or piece of cloth. So overall over one-third of vendors 160 (38.7%) conceded to not washing their hands with water and soap during the vending process. The study revealed also that relatively majority of vendors in the KEEA Municipality practised better handwashing practices than in the AEE District.Whereas 191 (71.8%) of vendors in the former used water and soap to wash their hands; only 62 (42.2%) vendors in

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AEE district did so. In other words, whereas 75 (28.2%) of KEEA vendors did not wash their hands with water and soap as high as 85 (57.8%) of AEE vendors did not. The findings therefore reveal poor food handling and handwashing practices during food preparation and vending in the study area particularly in the AEE district. So though majority of vendors said they did hygienic handwashing practices after using the toilet, they did not necessarily practised hygienic handwashing in the course of food preparation and service. The fact that almost half of vendors (47.9%) handle food with their bare hands brings to the fore the importance of vigorously enforcing food handling regulations.

By Codex Standards, food vendors must wash their hands with water and soap regularly after changing a baby's nappy or diaper. Table 13 also reveals that over one-third of food vendors 145 (35.1%) in the study area were caring for children at the time of the study. The corresponding figures for the AEE district and the KEEA Municipality were 62 (42.2%) and 83 (31.2%) respectively. Additionally, on the relationship between child care and food handling, it is shown in Table 14 that of all food vendors, 69 (16.7%) were carers of children who also handled food with their bare hands. These findings suggest that nearly one-fifth of vendors who changed used children nappies, or dipers, handled vended food with bare hands thus making 'child care' an 'indirect' potential risk factor to vended food safety.

The findings therefore reveal a high level of unhygienic food handling and hand washing practices by food vendors in the study area which is consistent with findings with other earlier studies conducted in Africa and

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elsewhere (Muhonja & Kimathi, 2014; Apanga et al., 2014; Nurudeen et al., 2014; Aluko et al., 2014; Gawande et al., 2013; Barro et. al., 2006).

Table 14: Child Care & Food Handling by Food Vendors Crosstabulation

Is vendor caring for a baby/child?	Does Vendor handle food with bare hands		Total
	Yes	No	
Yes	69	76	145
	34.8%	35.3%	35.1%
% of Total	16.7%	18.4%	35.1%
No	129	139	268
	65.2%	64.7%	64.9%
% of Total	31.2%	33.7%	64.9%
Total	198	215	413
% within	100.0%	100.0%	100.0%

Source: Researcher, 2016

Invariably, ready-to-eat foods that are heavily handled excessively after cooking tend to be heavily contaminated with faecal matter (Tortoe et al., 2012; Feglo & Sakyi, 2012; Annan-Prah et al., 2011; Rheinländer et al., 2008). According to Mensah et al., (2002) foods mainly prone to contamination are foods "handled excessively after cooking" and that the risk of "contamination was reduced where vendors sold food from the cooking pots." Therefore it is imperative that food vendors always avoid handling ready-to-eat food with their bare hands during food preparation, before serving, after visiting the toilet, after handling raw food or any contaminated material such as baby diper and after handling banknotes. The use of soap to wash hands, utensils and

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crockery reduces the levels of bacteria because most microorganisms are removed after coming into contact with soap.

As part of vendor personal hygiene, vendors were asked their actual health status over the past one year. By Codex standards, vendors, or food handlers who suffer from jaundice, diarrhoea, vomiting, fever, sore throat with fever, discharge from ear, eye and nose, visibly infected skin lesions (boils, cuts etc) shall not handle food in any capacity and must seek medical attention. To qualify to sell food, a vendor must be free from *Salmonella Typhi*, *Shigella spp.*, *Escherichia coli* or Hepatitis A virus, and must be free from diarrhoea, fever, vomiting, jaundice, sore throat, persistent sneezing, coughing, runny nose, boil, cut or wound on the hands or wrists. From Table 13, about one-tenth of vendors 43 (10.4%) said they had contracted one type of FBD or the other over the past one year. Additionally, vendors who had suffered illness in the past one year, 9 (20.9%) had suffered from only diarrhoea, 10 (23.3%) had only stomach pain and 3 (7.0%) vomiting.Additionally, 21 (5.1%) had any two or more combinations of diarrheoa, stomach pain, headache and vomiting. The corresponding figures for the KEEA Municipality and AEE District were 8 (3.0%) and 13 (8.8%) respectively.

The findings show that the health status of the food vendor is a potential risk factor to food safety. This is because the consumer cannot determine at any point in time the health status of the food vendor. This study finding underscores the importance to invigorate the existing regulation enforcement systems and to vigorously enforce the regulation on medical screening of food vendors and handlers.

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Vendor personal hygiene as a risk factor was confirmed by some FGD participants. Some female discussants identified poor personal hygiene of chop bar keepers and hawkers as one of the key risk factors in KEEA:

> Women tend to scratch their head a lot and often handle such vendor food with the contaminated hands. Some chop bar keepers leave their head uncovered and hairs could drop in vended food such as soup. [KEEA Female Participant 2].

Amidst general laughter, one discussant emphasised that:

> Some vendors lick the ladle or spoon in the course of selling to consumers. If you complain you will be declared a witch. Hawkers who move from place to place sometimes lick their ladle. And flies often settle on such ladles. These contaminated ladles are then used to serve food to consumers. Most consumers feel compelled to buy because it is inexpensive to buy vended food and will buy even if it will cause the death of the consumer. It is the responsibility of the consumer to assess the situation and decide whether to buy or not.
> [KEEA Female Participant 1].

Environmental Hygiene

Environmental hygiene relates to the effect or impact the physical and social environment of food vending could have on food hygiene and safety. This section focuses on the analysis of data on environmental hygiene variables that have implication for food safety such as vending locations, waste disposal practices, excreta disposal practices, water supply and safety and vector harbourage and control. Though some of these factors are exogenous in that they may be outside the control of the vendor such as the

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provision of public infrastructure i.e. public toilet and sanitary vending centres, some are indeed within the control of the vendor such as keeping the vending sites clean.

Vending Site

In deciding where to locate food vending sites, potential sources of contamination of street food ought to be avoided. In principle, vending centres are to be designated by the relevant local government authority. Generally, the study found that in as much as these centres are located mainly in public places, they may or may not necessarily have been authorized by the respective local government authorities. Vending locations tend to target diverse consumer groups. Table 15 reveals the main locations of vending. These are the *street* 198 (48%), *lorry stations* 62 (15%), *market*s 60 (14.5%) and *school premises* 47 (11.4%). The latter underscores the relevance and importance of the school health programme (SHEP). Other locations were *pathways* which target specific groups that ply such routes daily on foot such as farmers 15 (3.6%), *public office premises* **7** (1.7%), *hospital/clinic* premises 4 (1%), *frontage of vendors private dwelling* 4 (1%), *church* premises 2 (0.5%) and *community centres* 1 (0.2%). Whereas 14.3 percent of the KEEA vendors sold on school premises, only 6.1 percent sold on school premises in the AEE district. Also 2 (1.4%) of vendors sell in front of their private houses in AEE district as compared to (0.8%) in the KEEA Municipality.

Solid Waste Disposal

Good environmental hygiene practices and lack of food waste at vending sites could minimise the probability of pest infestation of vending sites. But Table 15 shows that whereas 294 (82.1%) of food vending sites

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were found to be free from the accumulation of solid waste, almost one-fifth of vendors 74 (17.9%) sold in unhygienic environmental conditions with a potential of vended food being contaminated health hazards. These conditions were identified as waste accumulation 65 (15.7%), vending near dirty open gutter 7 (1.7%) and dusty environment 2 (0.5%). The implication is that nearly one-fifth of vending sites do not pass the Codex environmental hygiene standard test and thus exposing consumers to increased risk to infectious diseases including cholera.

In the KEEA Municipality, of the 57 (21.4%) vendors who vended in insanitary conditions, 52 (19.5%) vended in unhygienic waste accumulation area, 4 (1.5%) near dirty open gutter and 1 (0.4%) vended in dusty environment. Comparatively, in the AEE District, of vendors who vended in insanitary conditions, 13 (8.8%) vended in the midst of waste or garbage accumulation, 3 (2%) near a dirty open gutter and 1 (0.7%) vended in dusty environment. The findings suggest that almost one-fifth of individual vending sites are environmentally unhygienic.

Excreta Disposal

Access to and use of toilet facilities and defeacation practices have immense implications for food safety. Table 15 show that 330 (79.9%) of vendors use either public toilets, personal household toilets at home or toilet at a neighbour's house. However, Table 15 indicates also that nearly one out of every twenty 16 (3.9%) of food vendors engaged in open defeacation at or in proximity to the vending site in the bush or at the beach. Significantly, 2.2 per cent of vendors admitted defeacating at or close to the vending site. It is

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interesting to note that as high as 67 (16.2%) failed to specify where they use as their place of convenience during vending times. This could mean that the

Table 15: Environmental Hygiene Status of Vending Centres

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	Freq (413)	%
Location						
Street	92	34.6	106	72.1	198	48
Market	54	20.3	6	4.1	60	14.5
School	38	14.3	9	6.1	47	11.4
Office Premises	7	2.6	0	0.0	7	1.7
Bush Pathways	12	4.5	3	2.0	15	3.6
Lorry station	44	16.6	18	12.2	62	15.0
Church premises	2	0.8	0	0.0	2	0.5
Hospital/clinic premises	4	1.5	0	0.0	4	1.0
Community centre	1	0.4	0	0.0	1	0.2
Private house frontage	2	0.8	2	1.4	4	1.0
Others	10	3.8	3	2.0	13	3.1
Waste disposal						
No waste	209	78.6	130	88.5	339	82.1
Solid waste	52	19.5	13	8.8	65	15.7
Dirty open gutter	4	1.5	3	2.0	7	1.7
Dusty environment	1	0.4	1	0.7	2	0.5
Excreta Disposal						
Public toilet use	79	29.7	93	63.3	172	41.6
Vending site defeacation.	6	2.3	3	2.0	9	2.2
Household toilet facility	98	36.8	46	31.3	144	34.9
Neighbour's	11	4.1	3	2.0	14	3.4
Bush	5	1.9	1	0.7	6	1.5
Beach	1	0.4	0	0.0	1	0.2
Others	66	24.8	1	0.7	67	16.2
Vector Harbourage						
Yes	40	15.0	47	32.0	87	21.1
No	226	85.0	100	68.0	326	78.9

Source: Author's Compilation 2016

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problem of open defeacation by vendors may be worse than the statistics suggests.

In the KEEA Municipality 4.6 per cent of vendors said they use the bush, the beach or defeacated at or close to the vending sites as compared to 2.7 per cent in the AEE district. Open defeacation is therefore a major risk factor to food safety because it compromises the personal and environmental hygiene of food vendors and and hence street food hygiene. It also raises exogenic issues of access to hygienic toilet facilities in proximity to food vendors and the public at large. Human excreta are a source of pathogenic microorganisms which are causative agents of FBDs such as cholera, typhoid and dysentery. Open defeacation and improper human excreta disposal practices therefore constitute a major public health risk factor to street food hygiene and safety in this study. This finding is corroborated by the GSS (2014 p.62) that "a substantial proportion (almost one out of five houses) of households in KEEA have no toilet facilities and resort to the use of bushes, beaches and open fields." This situation could adversely impact on public health. Similarly, the in-depth interview revealed that most food vendors in the AEE district have no access to toilets facilities in proximate distance from where they sell food. The finding is confirmed by GSS (2014 p. 73) that about 12.9 percent of households in AEE are without toilet facilities and thus use the open fields and bushes.

According to the GSS (2014 p.62), in the KEEA Municipality whereas 52.5 per cent of households use public toilets, about 18.3 per cent of the population have no toilet facility and "resort to the use of bushes, beaches and

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open fields." Similarly, "public toilets are the most used toilet facility (46.2%) in the AEE district. The proportion of households that have no toilet facilities and thus use the open fields are about 12.9 per cent (GSS, 2014 p.73). Other studies in the West African sub-region show that inadequate access to toilet facilities and its attendant open defeacation is a major challenge which has implications for food safety (Idowu & Rowland, 2006).

Vector Harbourage and Control

Human excreta attract the breeding of houseflies and the spread of the pathogens contained therein. The presence of vectors or pests at vending centres is indicative of the insanitary environment and unsafe food hygiene practices. In this study, about one-fifth of vending sites in the study area were environmentally unhygienic. In all, only two main types of vectors were observed at various vending sites mainly houseflies and to a lesser extent wild birds. Table 15 shows that of all the 413 vending sites, houseflies were observed in about one-fifth 88 (21.1%) of them. Table 15 also reveals that nearly one-third 47 (32%) of vending sites in the AEE District as compared to 40 (15%) in the KEEA Municipality were observed to be infested with vectors. Findings in other studies corroborated the findings in this research (Samapundo et al., 2015; Okojie and Isah, 2014).

The findings suggest the need to prioritize the prevention of vector breeding and their elimination at vending sites. This requires hygienic sanitatory practices and regular inspections by the environmental health personnel of the local authorities. Mode of display of street food need to be conducted in vector-proof manner and must be stacked above the floor or ground.

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The findings of unhygienic vending environment confirm findings of other researches in Ghana (Annan-Prah et. al., 2011; Donkor et al., 2009) and elsewhere in Africa and Asia (Nurudeen et al., 2014; Cuprasitrut et al., 2011). On the contrary, findings in Kenya (Gitahi et al., 2013) and Accra (Odonkor et al., 2011) revealed that surroundings of food vending sites could be predominantly clean. The implication for food safety in both study districts is that if the indiscriminately disposed waste is mixed with faecal matter then the safety of vended food is even more compromised.

Most discussants in the KEEA confirmed that such *bolas* which sometimes get mixed up with 'take away' are breeding grounds for houseflies which are the main vectors for food-borne-diseases. It was noted that children who play at such refuse dumping sites risk contracting food-borne-diseases because they stand the risk of handling "take away". The findings therefore suggest the need for the MMDAs to enforce the regulations in respect of the prevention and control/elimination of vector breeding.

Water Sources

Water may be used by vendors for the purpose of processing and as an input in preparing food, for washing utensils and for washing of hands. The study found (Table 12) that the main sources of water for food vending are pipeborne 288 (89.2%) and borehole 31 (9.6%). This reveals that a very high majority of vendors 319 (98.8%) in the study area used potable water for processing and preparing food. A small minority 4 (1.8%) used well or pit water, rainwater or pondwater. Comparing the two study districts, vendors almost equally used improved water sources in preparing food. Specifically, 178 (98.9%) of vendors in the KEEA Municipality and 141 (98.6%) in the

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AEE District said they use either pipeborne or borehole water. Access to potable safe water by vendors is therefore high in the study area and not a major challenge particularly in the KEEA municipality. The finding confirms studies in other parts of Ghana that between 65 per cent to 99 per cent of the water used for food vendor activities was pipeborne (Apanga et al., 2014; Donkor et al., 2009; Odonkor et al., 2011). Specifically, in the AEE district for instance and as high as 82.5 per cent of dwelling units obtain their water sources from pipeborne sources (GSS, 2013 p. 61).

In the qualitative aspect of the study, insanitary vending sites, unsafe water, insanitary public toilets and the role of vectors particularly houseflies were confirmed by some FGD discussants as being the cause of the frequent incidence of food-borne diseases such as cholera, diarrhoea and typhoid in the study area particularly in KEEA:

> I have personally had diarrhoea infection from eating street-vended food before … I know someone in my house that ate from the roadside and had typhoid. When he went to the hospital he was advised not to patronize street-vended food, not to drink satchet water and water from unsafe sources. This is because vendors sometimes use dirty water in preparing their food [KEEA Male Participant 6].

> Last two months there was cholera outbreak in Kissi and it was because of filth at the *bola* containing '*take-away'*. The sad thing is that if anyone makes a mistake and steps on the *take away* it will burst and will get 'sprayed' [KEEA Male Participant 6].

> I also know of an instance involving an individual lady who was infected with cholera germ. I was called at dawn between 12 midnight and 1.00 am and we rushed her to this clinic [Elmina] where she was

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given treatment and discharged. She was told by the staff that she had the cholera infection from contaminated water [KEEA Male Participant 4].

There are six public toilets in Elmina out of which only one is not full. The rest are full to the brim. Around such toilets are street-vended food centres. Most houses do not have toilets. … A vendor may decide to hawk from one place to the other. The unsuspecting consumers will then go and buy food from such a vendor [KEEA Male Participant 2]:

Open defeacation at the beach (also known as *free ranging*) and bush defeacation were also identified by majority of the discussants as common in the study area thus increasing chances of contamination of ready to eat food:

In KEEA our main problem is open defeacation at the beach as a major risk factor to the incidence of food-borne diseases such as diarrhoea and cholera. Flies settle on faeces at the beach and fly to settle on food. Three weeks ago I came to the Elmina Health centre. I saw three cholera patients rushed to the clinic for treatment. I can say with emphasis that cholera is deadly and must be avoided.
[KEEA Male Participant 8].

People defeacate into black polythene bags (called in Fanti as *samanadze yesum*) and also called *take away* and they dump them at the dumping site (*bola*). Meanwhile ready-to-eat food like smoked fish such as salmon are sold in the market. When customers buy such smoked fish and they go home, they grind pepper, buy *kenkey* and they have a meal but they can easily be infected with the cholera or diarrhoea germ.[KEEA Male Participant 6].

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Consumer Perceptions on Risk Factors

The study found various interesting perceptions of consumers on risk factors to food safety. Some demonstrated some awareness of practices that could guarantee food safety:

> I had to buy *banku* and okro stew. It was highly patronized. I ate it but experienced intense diarrhoea in the night from from the food I ate. I think the *banku was not thoroughly cooked*. This happened in Abaasa. I went to toilet four times [AEE Male Participant 3].

However despite the relatively high knowledge base of food vendors, in the study area, many FGD participants (consumers) could not exhibit adequate awareness of food-borne disease risk factors. Some AEE discussants were sceptical about any link between the consumption of street-vended food and cholera or diarrhoea because to them diseases 'just happen'. A consumer associated diarrhoea with food served at funerals and excluded street-vended food:

> I have not heard of food-borne-diseases resulting from the consumption of street-vended-food in Ajumako. What I have seen before is the adverse effect of food eaten at funerals. [AEE Male Participant 2].

Some participants also attributed diarrhoea and vomiting to nature's way of relieving consumers of constipation:

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> As for diseases they just happen. Recently I experienced vomiting. I thank God for it for saving me from my long-lasting constipation. I could not go to toilet even if I took medication. [AEE Male 1].

> I think the constitution of each individual consumer determines whether food is harmful to him or not and not the food itself. So I do not think there is anything like risk factors. [AEE Male Participant 2].

Regulators Perspectives on Risk Factors to Food Safety

The regulators perspectives on the risk factors to street-vended food safety derived from the in-depth interviews of key informants, includes indiscriminate refuse and excreta disposal practices, inadequate facilities for refuse disposal and excreta disposal, indiscriminate defeacation especially in coastal districts and the poor personal hygiene of food vendors and consumers. Another risk factor identified was the phenomenon of rapid urbanization. Densely populated tend to put enormous pressure on the environment and sanitary infrastructure which in turn adversely impact on the safety of street-vended food:

> The risk factors are quite prevalent in most of our districts. The risk factors mainly are about refuse disposal in the districts and the attitude of the food vendors in relation to food hygiene. (Deputy Regional Environmental Health Officer, Cape Coast).

The Deputy Regional Environmental Health Officer singled out the coastal districts of the region and explained the many risk factors associated with those districts a follows:

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> The coastal areas also have their fair share of the problem…You see people doing indiscriminate defeacation by the coastal areas. You see people defeacating into public drains in the open and those are risk factors that have the potential of spreading food-borne-diseases and epidemics in the region… (Deputy Regional Environmental Health Officer, Cape Coast).

According to the KEEA Municipal Environmental Health Officer the attitude of vendors was a major risk factor. He emphasised the food preparation site especially for street food that are brought to the market early in the morning such as *Ga kenkey*, *waakye* and *koko* as key to food safety. Other risk factors he identified were "raw material sources", "sources of water" for preparing food and indiscriminate defeacation:

> Defeacation at the beach and even in drains are a big challenge and we working at it. We have started arresting people defeacating at the beach etc. and prosecuting some of them. Some vendors sell very close to some areas where people have been defeacating. That is another big challenge (KEEA Municipal Environmental Health Officer, Elmina).

According to the KEEA Municipal Director of Health, "changing people's behaviour is difficult" and so is that of the food vendor. He also noted that "we have a lot of indiscriminate defeacation. People will not like to go to the toilet facilities rather most of them prefer to go to the seashore and other places". Corroborated by the MEHO, the Health Director identified "lack of household latrines which results in over-reliance on public latrines" as a major risk factor to food safety:

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> Even public toilets are not supposed to be for inhabitants. Each and every house is supposed to have a household latrine. Public toilets are meant for passer-bys and passengers etc. And people will not provide household toilets in their houses. Is there a justification? (Municipal Director of Health Services, Elmina).

> We have about 67 public toilets in KEEA. Why individuals do not have toilet in their homes is an issue nationwide. In KEEA most houses don't have toilet and most people depend on public toilet system. That is why public toilets are always congested with people something supposed to be for people in transit (Municipal Environmental Health officer, Elmina).

Drying of fish and vegetables on bare ground was said to be common in KEEA. On fish drying, the MEHO said that people patronize fish more than meat and that they were working in collaboration with the Fisheries department to address the challenge holistically. The KEEA Municipal Director of Health lamented that "we [GHS] have little link with the Food and Agriculture Department with the drying of vegetables in the open-space" and that "it has been taking place on our blind side."

> We normally advise against drying of food on bare ground. Driving along the main highway you sometimes see pepper and other foods dried along the street. We advise against that. We see it as one of the major sources of food contamination and major potential sources of food-borne diseases (Municipal Director, Food and Agriculture Department, Elmina).

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Poor quality and safety of some ingredients and the unhygienic processes involved in the milling of vegetables (tomatoes, pepper) and corn used in preparing street-vended-food were also noted as potential risk factors:

> Most of the women go in for 'cheap-side things especially tomatoes. They go in for rotten ones especially those into *waakye.* When you go to the milling places too where they mill their tomatoes, pepper and corn, water is used which may not be hygienic. You see flies hovering around. The sad aspect is that *kenkey* sellers go and mill their corn there before selling to their customers. So such places can pose a problem… (WIAD Coordinator, Food & Agriculture Department Ajumako).

Interestingly, the drying of foodstuffs and vegetables on the bare floor which was found common in KEEA was confirmed by the AEE WIAD Coordinator, Food & Agriculture Department in Ajumako. This finding is similar to the finding by Haleegoah et al., (2015). The practice was uncommon in the AEE District as quoted below:

> When going to my hometown Elmina you do find cassava by the road side being dried. That is not hygienic. I have not seen it done here before. Here they usually dry it on either mat or roofing sheets so it is not common to see pepper and cassava being dried on the ground. It is not common here (WIAD Coordinator, Food & Agriculture Department Ajumako).

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Figure 10: KEEA- Pepper dried on the shoulder of a Road

Source: Fieldwork, 2015

Potential risk factors to food safety in the AEE district were also noted from the interviews. It was found that street-food vendors in the AEE district usually operated in make-shift structures with no access to sanitary convenience such as toilet facilities and hand-washing facilities:

> The food vending business is usually seen as a part-time business. It is not usually seen as a profession. And they usually operate in make-shift structures. So some of the food vendors have no access to sanitary convenience ie. they don't have toilets close to where they sell their food because their activities are not mainly seen as an established job… The food vendor is denied access to toilet facilities and he has to go to toilet without any hand-washing facility close-by because they are seen as makeshift activity (District Environmental Health Officer, Ajumako).

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Another potential risk factor was found to be improper disposal of refuse around food vending sites and where the refuse composition includes human excreta. *Free ranging* in parts of Ajumako was said to be as a result of inadequate (two) public toilets. Indiscriminate defeacation around the Ajumako market circle behind the lorry park was also said to be a potential risk factor:

> Usually people generate a lot of waste from where they sell their food… When they dump the refuse and the refuse composition includes faecal matter in some of the locations where food vending business goes on then there is the likelihood of houseflies settling on the faecal matter and coming to settle on our food. And that is likely to pose a challenge for the potential spread of the diseases which we are trying to control… (District Environmental Health Officer, Ajumako).

Low medical screening coverage of food handlers was also identified as a potential source of contamination of street food and subsequent infection of consumers. In particular, it was noted that it was difficult to identify and exclude food handlers with infectious diseases such as "tuberculosis and whitlowed finger." The processes involved in preparing or serving specific street foods such as *kenkey*, *waakye* and *ballfloat* were identified as potential risk factors. Handling of boiled eggs by vendors in the serving process was also said to be a risk factor because vendors' thumb usually presses on the egg and could easily transmit pathogens to the boiled egg consumer:

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> Those who prepare *kenkey* in bulk, at times during preparation only one person may have gone for medical examination. But because they are preparing it on a large scale, they just invite other people to help in moulding the *kenkey*. And you don't know the type of people invited and that is also a risk factor because you don't know whether she is a TB patient, whether she has a *whitlow* finger. They use all sorts of hands in helping to mould the *kenkey* and that is another risk factor (District Public Health Nurse, Ajumako).

Food vendors with children to care for during vending were another risk factor mentioned because "childcare activities" such as changing of baby dipper was deemed to promote the spread of faecal-oral parasite infections:

> A vendor's child will defeacate and they will take the child somewhere and then they come back to sell the food… But even the people are not looking at those things; they are just interested in buying the food. So we need to intensify education (District Public Health Nurse, Ajumako).

Another potential risk factor in the outbreak of FBDs was irregular supply of potable water for preparing food and for consumption. Additionally, drinking *satchet* water was considered a risk factor because of its unhygienic handling:

> When the tap is not running, they just tend to fetch water from boreholes and other water sources which are not good for consumption. So when there is water problem that is when we get outbreaks. At times the taps may be closed for two weeks to

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> one month and that brings diarrhoeal diseases (District Public Health Nurse, Ajumako).

> Water is a type of food so I can make reference to it. The selling of *satchet* water; the way it is handled if you don't take care you can easily contract a disease from it. When you buy *satchet* water per a seller usually they handle money and so if you collect the *satchet* water and you put it in your mouth you are putting dirt into your mouth. So drinking satchet water is also a risk factor (WIAD Coordinator, Food & Agriculture Department Ajumako).

The WIAD Coordinator for AEE District explained that some consumers influence food vendors' to expose fish to dust and other pollutants in the environment especially at night:

> The attitude of some consumers also influence food vendors' attitude. We want to see the fish exposed that will determine whether it is appealing or have good aesthetic value or something. So because of that, they are tempted and out of ignorance, especially in the night, to bring the fish out of the sieve and expose it to dust and other pollutants in the environment. (District Environmental Health Officer, Ajumako).

Factors Influencing Consumer Patronage of Street Food

The findings reveal how diverse in scope the patronage of street food is. Street food was patronized by all manner of people in the general public. However there are six categories of socio-economic groups who were identified among consumers who patronized street-vended foods. These are

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public/civil servants/workers, school children, travellers/tourists, market women, artisans and hospital patients and their families. Significantly, in the latter, street food was also used to feed hospitalized patients. Street food consumption is therefore shown to be of immense socio-economic and nutritional importance to a wide spectrum of socio-demographic and economic groups in the population of the study area.

All focus group discussants in the study districts said that they regularly patronized street-vended food and mentioned the types of street-vended food that they buy or consume. Among these were *Ga kenkey, Fanti Kenkey, banku, fufu sold in chop bar, ampesi, waakye, gari and beans, kokonte* and fried rice. *Koko* with bread and boiled eggs were the breakfast mostly mentioned. Common snacks mentioned by discussants were *ballfloat*, yam/potato chips, *kelewele*, meat pie and roasted maize while fruits mentioned included banana and watermelon.

This FGD sub-section focuses on the study of specific objective and research question as listed below:

Explore factors that influence consumers' patronage of street –vended food.

- Which factors influence consumers' patronage of street–vended food?

The key reasons for the patronage of street-vended food for most consumers in the study area were convenience, easy access, saving of time and financial access. Taste and aesthetics value of street food were mentioned as important patronage factors in the choice of street-food by consumers. Few

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participants placed premium on personal hygiene of vendors. In the KEEA, workers, students, and notably visitors considered the patronage of vended food most convenient. Some AEE participants noted that street food is convenient for bachelors (unmarried males) and even patients on admission in the hospital. Other factors that were said to influence consumer patronage of vended food were the time it saves and it being inexpensive. FGD Participants in KEEA noted that patronage saves a lot of cooking time both in the morning and night; and frees time for other responsibilities as the following FGD quotations reveals:

> Buying street-vended food in the morning is convenient and saves a lot of cooking time in the morning…It saves time and money and you do not require much money to buy street-vended-food [KEEA Male Participant 7].

Some participants in both study districts however laid premium on personal hygiene of vendors and food safety as the factors that influence their patronage of street-vended food even though taste and the aesthetic factors were also important factors:

> Why people in the community patronize street-vendor food is the good taste of the food and as such passes on the information to other consumers who also then patronize the food. [KEEA Male Participant 7].

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According to [AEE Female Participant 3] her preference was "how clean the vendor is; how she keeps utensils clean and cleans the vending site." Some FGD participants (consumers) put premium on personal hygiene of vendors and "clean environment" of vending site. Some FGD mentioned how hot food is as their reason for patronizing a given street food vendor:

> When I was a pupil I stopped buying from a particular vendor in my school premises who was selling *Ga kenkey*, rice and *banku* and started buying rice from outside because while the food outside the school premises was always hot the street-vended-food sold in the school caused me stomach pains [KEEA Female Participant 5].

> In Ajumako there is a vendor whose *Ga kenkey* is highly patronized. Whatever quantity is left she sends it home and re-heat it together with the new consignment. Many people patronize her *kenkey* because it is always hot [AEE Male Participant 1].

On personal hygiene of vendors, some FGD participants in both KEEA and AEE districts noted that their preference was for chop bar food handlers who cover their head (hair) to prevent hair dropping into the food:

> Good personal hygiene' of vendor is a reason why a particular vendor's food is patronized… The personal hygiene of food handlers in chop bars is important especially if their hairs are covered [KEEA Female Participant 2].

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Equally, participants in the two study district put a lot of premium on loyalty to particular vendors, promptness of service, the process of food preparation and even provision of TV services in chop bars. A participant notably expressed her disgust for vendors with poor oral hygiene('green teeth') as the following quotation illustrates:

> I detest street vendors who have poor personal hygiene including poor oral hygiene (ie. *'green teeth'*) and before I buy from a particular vendor I will assess your personal hygiene from head to toe before deciding whether to buy or not [KEEA Female Participant 9].

In other studies it was found that consumers placed premium on vendor appearance and the trustworthiness of a vendor and played down on core unsafe food practices during food preparation and vending (Rheinländer. et al., 2008).

Some FGD participants expressed their detest for vendors who "talk too much over the food". They considered that as an unhygienic practice. [KEEA Male Participant 6]; [KEEA Female Participant 5]. Childcare activities by vendors was also expressed by majority of participants in KEEA as a factor that will not make them buy from a particular vendor:

> …because such vendors after cleaning their children who defeacate may not properly wash their hands and could contaminate the food [KEEA Female Participant 5].

However, one participant disagreed with the majority view that consumers should not buy from vendors who care for children. She

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confidently stated that "It is better to buy from her and take the opportunity to educate her on what to do" [KEEA Female Participant 3]. Another influencing factors were promptness of customer service and availability of entertainment services (e.g. TV) in the chop bar. This was agreed to by majority of the participants:

> I dislike delays in customer service. I prefer chop bars with some entertainment possibly television for customers to view. I consider all these factors as a matter of priority before patronizing a chop bar [KEEA Male Participant 7].

Some FGD discussants vowed to boycott any vendor from whom they contracted any food-borne disease:

> If I contract a food-borne disease at a particular street-food-vendor, I will boycott that vendor forever [KEEA Male Participant 5].

It is noteworthy that unlike in the KEEA, most discussants in the AEE remarked that there was regular inspection of vendors by health inspectors in the latter.

Enforcement of Food Regulations

This section seeks to reveal and discuss the state of regulation enforcement in the study area from the perspectives of the vendor, consumer and the regulator. It specifically focuses on the study specific objective and research question listed below:

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Ascertain the food regulation enforcement practices in the study area.

- What is the extent of enforcement of food regulations in the study area?

From Table 16, majority of food vendors 335 (81.1%) said they had been medically screened. Conversely 78 (18.9%) had never undergone any medical screening. Interestingly whereas only 6.8 per cent of vendors in AEE District said they had not ever had any medical examination, as high as 68 (25.6%) in the KEEA Municipality had not ever been medically screened. This reveals that as high as one-quarter of food vendors in the KEEA Municipality were not medically screened. It is also found that of the vendors who had had medical screening, only 252 (75.2%) had had a regular annual medical screening (Table 16). The rest had had sporadic medical screening ranging from occasional screening to once in five years. Another finding is that medical screening in the AEE District was more compliant of the Codex standards than in the KEEA Municipality. In the former as high as 131 (94.9%) of vendors said they had had an annual medical screening as compared to a paltry 121 (61.6%) in the KEEA Municipality. Researches elsewhere in Africa came to similar conclusions (Haleegoah et al., 2015; Muyanja et al., 2011; Abdalla et al., 2008; Omemu & Aderoju, 2008).

Medical screening in food safety entails the use of laboratory tests to help diagnose infectious diseases in their earlier phase of their natural history. Its primary purpose is to provide better prognosis for food vendors and to protect the society from the spread of infectious diseases. It is a rapid and economically efficient way of identifying food vendors who have a high

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probability of developing a particular infectious disease such as typhoid so that they can be referred for proper clinical diagnosis and treatment.

Though some vendors may have been medically screened and may have the permit to sell, the processes they use in the preparation of some foods such as *kenkey*, were in the FGD sessions said to be unhygienic, in that not all the food handlers they use (including minors) may have undergone medical screening. Though medical screening of vendors is a necessary requirement in food safety, it was not a sufficient condition to guarantee food hygiene and safety for consumption.

Table 16 also depicts the licensing/permit status of vendors. It shows that 284 (68.8%) of food vendors were licensed to engage in the vending business yet majority 335 (81.1%) said they had been medically screened. This could mean that as high as 12.3 percent of vendors who had ungone screening and had no permit/license to ply the vending business, (probably because their tests proved positive) defied the vending regulation by selling nevertheless. Overall, unlicensed vendors were 129 (31.2%) which is nearly one-third of all vendors. But it is surprising and ironic that of vendors who handled food with bare hands, two-thirds (66.7%) said they were licensed to do vending business. Comparing the two study districts, the risk of buying food from an unlicensed vendor is greater in KEEA Municipality 119 (44.7%) than in the AEE District10 (6.8%). Licensing street-food vendors may have many advantages for local authorities. They enable the identification and registration of individuals and the types of food sold to be employed in the street-vended food sector. This could help raise revenue and to provide an opportunity to give street food handlers training in food safety.

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Nevertheless, majority of vendors 270 (65.4%) admitted that they were inspected in the course of vending (Table 16). Conversely 143 (34.6%) intimated that they were not inspected at all. Lack of inspection of vendors was by far greater in the KEEA Municipality than in the AEE District. Whereas only 8 (5.4%) of vendors in the latter were not inspected, as high as 135 (50.8%) in the KEEA Municipality said they had never been inspected. This implies a higher inspection rate in the AEE district than in the KEEA municipality where about half of vendors had known no inspection. The study reveals that activities of over one-third of food vendors were not inspected at all. Even of those who were inspected, 38.9 per cent said it had no positive influence on their trade. This also explains why on specific effects of inspections on vendors' business only 26.1 per cent noted that inspections had positive effects on their personal hygiene. Indeed 0.6 percent of vendors emphasised that inspection visits by inspectors were a nuisance. The findings on the KEEA Municipality (but not the AEE district) is consistent with findings of MacArthur, (2007) which found that only 4 per cent of the chop bar premises were inspected by the Cape Coast Metropolitan Assembly inspection practitioners.

This finding again reinforces the conclusion that regulation enforcement practices in the study area is generally weak particularly in the KEEA. This finding is fully corroborated by the FGD findings. According to the FAO (2016), the enhancement of a coordinated inspection system is key to building an effective and efficient street-food control management system. The enforcement of food safety regulations require qualified, trained, honest and efficient food inspection service.

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Findings in Table 16 also show that there were three types of officers that conducted vending inspections in the study area namely environmental health officers (health inspectors) 260 (96.3%), health workers particularly

Table 16: Vendor Perspective of Food Regulation Enforcement

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	(413)	%
Medically Screened						
Yes	198	74.4	137	93.2	335	81.1
No	68	25.6	10	6.8	78	18.9
Periodicity of Screening						
Once a year	122	61.6	130	94.9	252	75.2
Once in 2 years	4	2.0	4	2.9	8	2.4
Once in 5 years	1	0.5	0	0.0	1	0.3
Occasionally	71	35.9	3	2.2	74	22.1
Vendor Licensed	147	55.3	137	93.2	284	68.8
Yes						
No	119	44.7	10	6.8	129	31.2
Regular Inspection						
Yes	131	49.2	139	94.6	270	65.4
No	135	50.8	8	5.4	143	34.6
Inspection officer						
Env. Health	121	92.4	139	100	260	96.3
Health worker	9	6.9	0	0	9	3.3
School health staff	1	0.8	0	0	1	0.4
Periodicity of Inspection						
Daily	8	6.1	8	5.8	16	5.9
Weekly	6	4.6	45	32.3	51	18.9
Monthly	4	3.1	8	5.8	12	4.4
Quarterly	50	38.1	1	0.7	51	18.9
Yearly	1	0.8	0	0.0	1	0.4
Occasionally	62	47.3	77	55.4	139	51.5
Inspection useful						
Yes	88	67.2	77	55.4	165	61.1
No	43	32.8	62	44.6	105	38.9
Vendor Trained						
Yes	168	63.2	101	68.7	269	65.1
No	98	36.8	46	31.1	144	34.9
Trainers						
Env. Health officer	33	19.6	75	74.3	108	40.1
Health worker	12	7.2	12	11.9	24	8.9
Voc. School	7	4.2	8	7.8	15	5.6
Church/mosque	13	7.7	2	2.0	15	5.6
Red Cross	1	0.6	0	0.0	1	0.4
Family	102	60.7	4	4.0	106	39.4

Source: Author's Research 2016

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nurses 9 (3.3%) and school health staff 1 (0.4%). Whereas all inspections done in the AEE District were conducted by environmental health personnel of the District Assembly, 121 (92.4%) of inspections in the KEEA Municipality were done by environmental health personnel. Additionally in the latter 9 (6.9%) said they were inspected by health workers and 1 (0.8%) by school health personnel. Though inspection rate in the KEEA municipality was found to be relatively low the municipality had a wider inspector-mix than in the AEE district.

The findings show that inspections were unevenly and irregularly conducted. Of vendors who intimated that they were inspected, Table 16 shows that over half 139 (51.5%) were inspected without any specified periodicity (i.e.occassionally). Whereas 12 (4.4%) of vendors said they were inspected on monthly basis, only 16 (5.9%) were inspected on daily basis and 1 (0.4%) annually. This reveals a major gap in consistency and effectiveness of inspections though comparatively there was greater frequency in the inspections of the activities of vendors in the AEE District than in the KEEA Municipality.

Of vendors who said they were inspected, a majority 165 (61.1%) admitted that inspections had positively influenced their work. Among these effects were increase in food safety knowledge, improvement in vendor personal hygiene, and the fear of their food items being impounded. Conversely 105 (38.9%) did not see any positive influence inspection had on their work. Out of that, 1 (0.6%) vendor intimated strongly that inspection visits by inspectors were a nuisance. On district basis, whereas 88 (67.2%) of vendors in the KEEA Municipality said their work had been influenced

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positively, a lower percentage 77 (55.4%) expressed the same sentiments for the AEE district.

In this study, training is considered an integral component of regulation enforcement. Every vendor or food handler is expected to undergo a basic training in food hygiene and safety prior to licensing and to undergo on-going training. They are to be trained to observe food safety obligations towards the consumer. As shown in Table 16, 265 (65.1%) of vendors said they had received training in food safety and personal hygiene. It was also found that in the two study districts, the rate of training were not significantly different from each other though it was higher in the KEEA Municipality. This implies that overall as high as over one-third of vendors 144 (34.9%) had not undergone any formal food hygiene training. The finding is corroborated by results in recent studies that training rates of food vendors range from 14 percent in Accra (Odonkor et al., 2011), 60 percent in Bibiani, Dormaa Ahenkro, (Monney et al., 2014), 62.7 percent in Tamale (Danikuu et al., 2015) and 90 percent in Kumasi (Ababio et al., 2011). In other studies in Bangladesh and Ghana, it was found that majority of street-food vendors had not attended any form of training workshop on personal, food and kitchen hygiene (Sarkodie et al., 2014; Faruque, et.al. 2010). According to Monney et al., (2013), the training of food vendors on food hygiene, rather than the level of formal education had a significant association with food and environmental hygiene practices by vendors.

Of vendors who said they had been trained in food safety and personal hygiene, majority 108 (40.1%) said they were trained by environmental health personnel. Others 24 (8.9%) were trained by health workers especially

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nurses, by schools (vocational schools) 15 (5.6%), the Red Cross 1 (0.4%), religious organizations such as women groups in churches and mosques 15 (5.6%). On the other hand, as high as 106 (39.4%) said they had received family 'training' at home.

Codex principles encourage the formation of street-food vendor associations. The objective is to provide an internal governance structure and liaison point with the relevant authorities in facilitating the enforcement of food safety control management. Significantly, no vendor mentioned any vendor association as their source of training in the study area. However, it is likely that if the formation of local vendor associations are facilitated they could provide an effective internal governance and liaison point with the relevant authorities for the training of vendors in the study area.

The application of sanctioning of vendors as a deterrent strategy is based on the principle that vendors can avoid violating regulations if they believe that non-compliance would be detected and punished. The study reveals in Table 17 that only 18 (4.4%) of vendors said they had ever been sanctioned. Another major revelation is that no vendor said he/she had ever been sanctioned in the KEEA Municipality as compared to 18 (12.2%) in the AEE District. It could be concluded therefore that the deterrence of food vendors for breaches of food regulations was very insignificant, another indicator of weak regulation enforcement practices in the study area. It must

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Table 17: Sanction Practices

	KEEA		AEE		Total	
	Freq (266)	%	Freq (147)	%	Freq (413)	%
Vendor ever Sanctioned						
Yes	0	0	18	12.2	18	4.4
No	266	100	129	87.8	395	95.6
Vending offences						
Insanitary environm	0	0.0	7	38.8	7	38.8
Exposed food/flies	0	0.0	8	44.4	8	44.4
Poor food handling	0	0.0	1	5.6	1	5.6
Not registered	0	0.0	1	5.6	1	5.6
Unclean utensils	0	0.0	1	5.6	1	5.6
Sanctions						
Fined	0	0.0	12	66.7	12	66.7
Warning/caution	0	0.0	2	11.1	2	11.1
Confiscation	0	0.0	1	5.6	1	5.5
Confiscation/fine	0	0.0	3	16.7	3	16.7

Source: Author's research (2016)

be noted that this result is also corroborated by findings by Monney et al., (2014) in a study in Bibiani and Dormaa Ahenkro in Ghana where only 2 per cent of food vendors reported ever being sanctioned.

For the paltry number of sanctions reported, the main food vending offences found were insanitary vending environment with waste 7 (38.8%) and exposure of food to flies 8 (44.4%). Other offences found were unhygienic food handling 1 (5.6%), failure to register with the environmental health office 1 (5.6%) and the use of unclean utensils for selling food 1 (5.6%). It was also

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found that of the paltry 18 (4.4%) of vendors who had ever been sanctioned, the form of sanction took the form of fixed penalty fee 12 (66.7%), warning/caution 2 (11.1), confiscation of food 1 (5.5) and confiscation of food/fine 3 (16.7). Significantly, no vendor reported that she had ever been summoned before court for breach of food safety regulation, raising questions about the effectivess of enforcement.

In summary, nearly one out of five vendors (18.9%) had never undergone any medical screening. As high as 12.3 percent of vendors purported to have undergone screening and had no permit/license to ply the vending trade, (probably because their tests proved positive) defied the vending regulation. Overall, almost one-third of sampled vendors were unlicensed (31.2%), though the risk of buying food from an unlicensed vendor was greater in the KEEA Municipality than in the AEE District. Ironically, it was found that licensing of vendors alone is not a sufficient condition for the practice of safe food handling. This brings to question the regularity and effectiveness of inspection. Over one-third of vendors intimated that they were not inspected at all.

Albeit, there was a higher inspection rate in the AEE district than in the KEEA municipality. This reveals a major gap in the regularity of vendor inspection.

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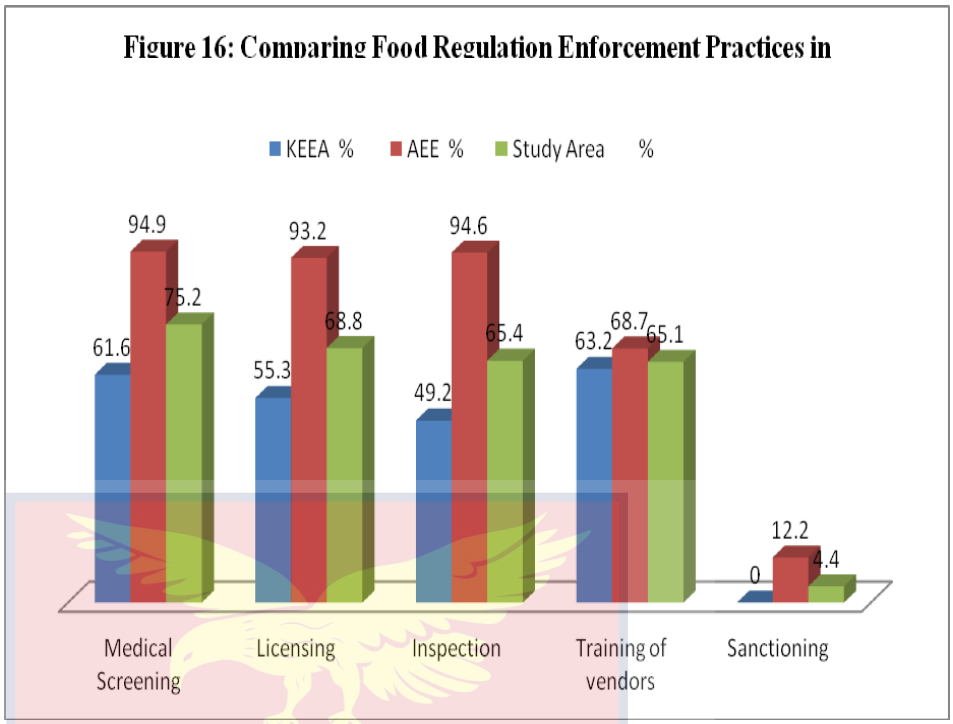

Figure 11: Food Regulation Enforcement Practices– 2016

It was also found (see Figure 11) that in the two study districts, the rate of training was higher in the AEE district than in the KEEA Municipality. Overall, over one-third of vendors (34.9%) had not undergone any formal food hygiene training. The study also revealed that only 4.4 per cent of vendors said they had ever been sanctioned. Another major revelation is that no vendor had ever been sanctioned in the KEEA Municipality whereas 18 (12.2%) in the AEE District said they had ever been sanctioned. Sanctioning of food vendors for breaches of food regulations was very insignificant, another indication of the weak regulation enforcement practices in the study area as a whole, though to a lesser extent in the AEE district. The overall state of food regulation enforcement in the study area was therefore weak and unsatisfactory.

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Consumer Perception of Regulation Enforcement

From FGD discussants perspective street-vended food safety is the responsibility of the individual food vendor, the Assemblyman, health workers and environmental health personnel. They however placed little responsibility on themselves in protecting their own health:

> Food vendors should undergo medical examination before they are given certification to sell street-vended food. If they have some illness they will not be permitted to sell food. Sometimes vendors sell when they have no certification. Once a non-certificated vendor was arrested by health inspectors in Ajumako and was debarred from selling bread [AEE Male Participant 2].

> My advice is that when vendors undergo medical check-up they [District Asembly] should let them receive their certificates. Though I am a consumer, I am also a vendor. It is three years now since my check-up yet I have not received my certificate [AEE Female Participant 4].

> All vendors must go for registration with the Assembly. They must go for medical check-up to establish whether they are healthy enough to sell vended food. And we consumers must also be careful to buy food from vendors who sell safe food. I once bought food from a vendor and noticed after buying that she had '*kakaw*' [whitlow] on her finger. I regretted buying it [AEE Female Participant 2].

Citing free ranging, unsatisfactory human excreta disposal practices as well as poor personal hygiene of vendors, majority of male discussants in

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KEEA were of the opinion that "organizations such as Food and Drugs Authority, the Municipal Assembly and Environmental Protection Agency (EPA) are not effective in ensuring SVF safety" [KEEA Male Participant 4]. While acknowledging the environmental health staff as being responsible for the enforcement of food regulations, AEE discussants happily expressed that vendors who have no certificate to sell in AEE district are usually arrested by health inspectors (*tankasi)*:

> *Tankasi* people will arrest you if you are a *ballfloat* seller who doesn't sell in a protective showcase. *Ga kenkey* and fried fish sellers who do not sell in protective sieve are always arrested by the *tankasi* people… [AEE Female Participant 2].

> I think health inspectors are very useful. Health inspectors don't worry those who comply with the regulations. Things have changed over time. In the past, the public were buying ice water to drink from a common cup. Today things have changed through the enforcement of food regulations by health inspectors. Today people drink *satchet* water. We all need education from health inspectors, health workers, churches… [AEE Male Participant 3].

Whereas consumers in the AEE district appeared to think that enforcement of food regulations was quite satisfactory in their district, consumers in KEEA held a contrary view. This view confirms the findings in the quantitative section of the analysis. FGD discussants in both study districts were asked on their opinion on how to ensure street-vended food safety in their respective districts. There were several views expressed by FGD participants in the KEEA municipality. Discussants identified adequate

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provision of sanitation facilities such as refuse containers, regular inspections of chop bars, the need for vendors to use only wholesome ingredients or input for preparing street food and the need for regular community clean-up exercises as how to ensure street-vended food safety. Other views expressed were the need for the active support of the FDA in food safety programmes, the enforcement of food regulations and bye-laws on indiscriminate defeacation particularly at the beaches and the need to enforce personal hygiene practices of vendors. Discussants expressed the opinion that vendors must desist from selling food at insanitary sites. On the need for regular laboratory screening of food vendors some discussants had the following to say:

> There is the need for the KEEA Municipal Assembly to do periodic screening of food vendors and keep reliable records of vendors. I suspect screening is done sometimes but not all the time [KEEA Male Participant 5].

> Street vendors must be given permission by the *tankasi* before they sell food. The Assembly must revisit the olden days when vendors could only sell food after they were medically examined (blood and stool tests). Health inspectors must be pro- active in inspecting not only food vendors but should also inspect environmental sanitation in various homes and against child defeacation in the open [KEEA Female Participant 3].

Majority of discussants recommended the need for the Municipal Assembly to build more public toilet facilities to prevent open defeacation and to be pro-active in the safe management of liquid waste and intensify

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inspections of food vendors particularly chop bar operators, fried fish vendors and *ballfloat* sellers:

> The Municipal Assembly has not been effective in ensuring street food safety. I advocate for the introduction of the old system of *tankasi* in which regular inspections were the order of the day. Fried fish sellers need to be inspected and monitored. Fried fish sellers must display their fish in protected containers against flies to avoid being prosecuted in court…There was an instance in the past when a health inspector 'caught' a *ballfloat* seller whose food was exposed to the open-air and had a poor oral hygiene as well as unkempt armpit. So her offences were three.[laughter]….These days such inspections are not done and hence the many food-borne diseases we see. Health inspectors must not stay in the office but must be on the field inspecting activities of street food vendors. They are paid to prevent cholera [KEEA Male Participant 7].

Some discussants squarely put the responsibility of ensuring food safety on the doorstep of the food vendor and the KEEA Municipal Assembly. They proposed that sick people particularly vendors with sores on their skin should not be allowed to sell food let alone sell at insanitary sites such as close to open gutters. They also proposed the need for regular inspections of ingredients used by vendors in preparing food:

> I know of an instance where a food vendor with open sore on her feet sells food to the public. What makes it worse is that the vendor often handles her sore while selling food [to drive away flies]. Such vendors could even curse anyone who will point out to her not to sell food to the public. I will not buy from such a vendor [KEEA Female Participant 9].

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On the need for the strict enforcement of food safety regulations by the KEEA Municipal Assembly one discussant had the following to say:

> There is the need for the Municipal Assembly to enforce bye-laws and do regular screening of street food vendors to arrest, sanction or take to court those who flout the rules [KEEA Male Participant 6].

Interestingly one discussant believed that the FDA not only have a major role to play in protecting food safety, they are also responsible for protecting the efficacy of drugs sold in chemical and pharmacy shops which could help effectively treat food-borne diseases:

> The Food and Drugs Board [Authority] must be pro-active in combating unsafe street-vended food. Medications sold at drug stores may be expired so taking first aid before being taken to hospital by buying medication for treating such illnesses could even be made worse [KEEA Male Participant 5].

Some discussants in KEEA also noted the common practice of the use of unsafe water to prepare street food of concern because tap water did not flow regularly. This finding however contradicts the viewpoint of food vendors. They advocated for the habit of selling hot street food always on school premises to protect the health of school children who patronize them. On the need for regular health education for the public on vended food safety, majority of discussants emphasised on the key roles of health inspectors,

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traditional authorities, health workers, the churches and the role of consumers themselves in preventing the outbreak of food -borne diseases.

Regulators Perspectives on Food Regulation Enforcement

This section presents the analysis and discussion of qualitative data from the in-depth interviews conducted with key informants/regulators on street-vended food safety regulation in the study area. The key informants were interviewed from departments at the regional and district levels namely the Central Regional Coordinating Council, Ghana Health Service, Food and Drugs Authority and the Food and Agriculture Department. The themes as analysed below are challenges in enforcing regulation compliance and informants' recommendations.

Food Safety programme may be a product of collaboration between the environmental health department and key collaborative department and agencies at the regional and district level. According to the Deputy Central Regional Environmental Health Officer the main collaborators in the region are FDA, GHS, GES, and the Judicial Service. As explained by the Deputy Regional Environmental Health Officer, the enforcement of food regulations in the region is that…

> When somebody flouts the food safety laws of the land, initially we do *counselling*. We are able to talk to the person to work towards improving whatever he is doing. And by that I mean if it is an unkempt environment, if it exposed food, we try as much as possible to talk to the person because it is an issue that has to do with behaviour…First we issue an *abatement notice* to the person. If for example the person is selling exposed fried fish, we issue an abatement notice to the person

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> for the person to construct or make a showcase or a sieve. A 'sieve' is usually prescriptive, a glass sieve for that matter. Because a glass sieve will not allow for dust from the environment. It will not allow for houseflies perching on the sieve and making the food unwholesome. So we prescribe for them to make glass sieve for the fried fish. If that is done then we have no problem with you. If you don't do it then a *court summon* is sought for you to come and explain to the court why you should be allowed to continue to sell unwholesome food. And when we go to the court, the court fines them based on the prosecution. They are either fined or made to comply with the order (Deputy Regional Environmental Health Officer, Cape Coast).

On collaboration, the interviewee stated as follows:

> The key organizations that we collaborate with is the Food and Drugs Authority, the GHS, and at times because of vendors in schools, we collaborate with the Ghana Education Service's School Health Education Programme (SHEP). We collaborate with them at this [regional] level. And occasionally as and when it becomes necessary we collaborate with the Judicial Service ie. State Attorney's office on issues of law enforcement...(Deputy Regional Environmental Health Officer, Cape Coast).

Modes of collaboration at the regional and district levels for the purpose of achieving school food hygiene were usually actualized by the operations of an Inter-Agency Coordinating Committee on Sanitation and a Regional Epidemic Committee for coordinating a regional action in the event of epidemics such as cholera outbreak:

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> At the regional level we have the *Regional Inter-Agency Coordinating Committee on Sanitation* that involves the regional School SHEP Coordinator, the regional environmental health officer, the Community Water and Sanitation Agency, Community Development Office and the main Regional Coordinating Council. So by extension that structure is also at the district level we have a programme called WASH in Schools (ie. water, sanitation and hygiene in schools). There is one critical component that has to do with environmental sanitation and that is where we collaborate with the school health educators. We organize training for school-based health teachers. We work with the SHEP school health education coordinators to make sure that the school environment is also a healthy environment. So there is a very strong collaboration with Ghana Education Service, district health services and Environmental Health departments of the various districts, municipal and metropolitan Assemblies (Deputy Central Regional Environmental Health Officer).
>
> The membership of the Regional Epidemic Committee is the Deputy Director of Public Health, Disease Control, SHEP (school health) from GES, the RCC, the media, environmental health, NADMO, Red Cross, Even at a point, the Police and the Prisons were represented. We have the religious bodies also and so depending on the situation a core group will be constituted to take action on behalf of the bigger committee (Regional Disease Control Officer, Cape Coast).

It was noted that public laboratories were usually used for screening food vendors but in some cases private laboratories may be granted the

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certification or authorisation to do so. As captured in the quotation below, though medical certification is important, it is not necessarily a sufficient condition to ensure total food safety. Rather, environmental hygiene of the vending sites was considered most critical to ensuring food safety. During screening of vendors, they were given education on personal hygiene, food hygiene and environmental hygiene after which stool samples were taken for *Widal* test for prevalence of typhoid or otherwise:

> For the registered food vendors, we continue to embark on inspections as environmental health officers in the Metropolitan, Municipal and District Assemblies. We always keep an eye on the food safety and whoever is not registered that means that person cannot undergo medical certification. And for sometime now we are trying to find a way of having a medical certification that we can visibly display or when called upon to do so in the region. So if you don't have the medical certification that means you are not a registered food vendor and that the food that you may be selling may be unwholesome (Deputy Central Regional Environmental Health Officer).

> As a department we have realized that medical certification does not necessarily account for total food safety. The vending sites are critical to food safety. There are usually two approaches that are used depending on what is feasible in the district, municipal or metropolitan Assembly area. One is the fix point or stationary screening. In that one the person comes to the office and he gives us his or her bio-data. We fill the form for her… Then we send the form to the hospital, run the test and they bring us back the results. And based on the findings from the laboratory, a certificate is either issued or not issued. If the certificate is to be issued then we need to go and

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> do the vending site inspection to make sure that where the vendor sells the food is also tidy before the certificate is issued to the person. Then there is what we call mass screening. In the mass screening, we take the laboratory to the door step of the people. We send laboratory Officers to the field. Then we make announcements for the people to come to us in a screening centre. When they come to the screening centre, they are given education on personal hygiene, food hygiene and environmental sanitation. After their education their samples are taken at times for *Widal* test for prevalence of typhoid or otherwise. People do other things like wanting to know their blood pressure and some vendors do TB sputum, and all kinds of things but usually the focus is on the *widal* test for the prevalence of typhoid in the stool ie. *Salmonella typhi* in the stool of the food vendor. So when those samples are collected the tests are either run on the field using any available technology or they take it to the laboratory. After taking it to the laboratory the result is brought back to the environmental health officer. So based on the results we either go for the vending site inspection to make sure the vending site is clean and by that at the end of the day, certificates are issued or we disallow the issuance of the certificates. Periodic inspections still goes on to make sure that the food vendor practises sound environmental sanitation practices (Deputy Central Regional Environmental Health Officer).

On the procedures involved in screening and certificating street-food vendors' business at the district level, the following quotation from the District Environmental Health Officer, Ajumako (and corroborated by the KEEA Environmental Health Officer in another in-depth intervew) explained that:

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> Before a person starts street-food vending business in the district, he makes his intention known either through formal application or just tells any of the officers and we do vending site inspection. There is a checklist that is developed by the Food and Drugs Authority for our use and it is that checklist that we use to inspect the vending site. If we realize that the vending site has so many risk factors that is likely to make the food unwholesome, those risk factors are corrected. If on the other hand, there are no risk factors then we go through the next stage which is the medical certification of the food vendor. So tests of potential food-borne diseases are run on the food vendor and when the person passes through the test as been fit to sell and will not pose as a threat to the consuming public, the person is certified and given the health certificate before he starts selling food. That is what is done in this district(District Environmental Health Officer, Ajumako).

After a person has been certified and begins selling street food there is a "continuous monitoring" of the activities of the vendor. According to the District Environmental Health Officer, Ajumako, ensuring street-vended food safety is a "shared responsibility between the food vendor, the consumer and the District Assembly" and that health education and training of food vendors are considered a *sine qua non* for food safety:

> …So education, education, education. It is very important. And when I talk of education and advocacy, you have to use radio programmes because that can reach a lot of people. So educating our people through the mass media ie. radio. And at the community level we can organize groups like churches and go and educate them. Women in our churches we can contact them on any of their meeting days and we can go and chip in one or two advice on food safety. Then there should be funds available for these trainings. The best thing is to train. Most of our women do things out of ignorance. So if you train them they will change from their old ways of doing things. We have Breezy FM Station at Bisease"(WIAD Coordinator, Department of Food and Agriculture, Ajumako).

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Another major constraint was the ill-structured system of laboratory services for the screening of vendors. In the AEE district the Ajumako District Hospital was said to be responsible for the laboratory screening while in the KEEA Municipality it was the TOPP Medical Laboratory and Adom Broso medical laboratory at Kakumdo in Cape Coast that was reported to be responsible for the screening. In the KEEA Municipality, there was no consistency in the source of laboratory services used. They usually sought in Cape Coast outside the jurisdiction of the municipality:

> If we get to know that some districts plan to use any other laboratory apart from the public health system, you must produce evidence to the effect that you have the technical capacity and you have the logistics to be able to deliver medical screening. So we look at your business registration certificate, your certificate incorporation, we look at whether you belong to any association or not then we look at your proposal. In your proposal you tell us where your labs are located, the logistics that are available, the number of personnel you have, their qualifications and everything. When that is brought and we are satisfied with it, then we recommend you to the district for them to work with you.For Ajumako the District hospital does it. But in KEEA, Cape Coast and other places, they use the TOPP Medical Lab., Adom Broso medical laboratory around Kakumdo to screen food vendors in Cape Coast and KEEA (Deputy Central Regional Environmental Health Officer).

The KEEA Municipal Environmental Health Officer explained that it is not professionally acceptable to use private laboratories since KEEA Municipality has public laboratory facilities at Elmina urban health centre, and

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the two hospitals in Ankaful and that they intend to use these for the laboratory medical screening of vendors. According to the Deputy Central Regional Environmental Health Officer, *management information system* on food vendors across the region consisted of diaries in which medical laboratory reports of vendors are kept:

> In every district office we expect that we have food vendors' diary. In that diary there is medical laboratory reports. There is a form that is completed on bio-data on vendors that enable us maintain a register of food vendors. That is what districts are supposed to keep as management information system of food vendors across the region. That is the standard practice in the region (Deputy Central Regional Environmental Health Officer).

It was also noted that there were challenges regarding the gathering of reliable evidence to produce in court to prosecute recalcitrant food vendors. Lack of food sample storage facilities for refrigeration was a contributory factor that hampered enforcement efforts. When any vended food is confiscated, it must be kept at a given temperature and produced in court as evidence when necessary. But facilities for food storage were hardly available in the study districts thus making sanctioning of vendors who breach regulations extremely difficult. This probably could partly account for the finding that no vendor had ever been summoned before court.

On case management in the event of the death of a person through food-borne diseases such as cholera, the following is what the District

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Environmental Health Officer, Ajumako, had to say on the role of the District Epidemic Committee:

> The case management is handled by the *District Epidemic Committee* of which I am a member…When a person dies of cholera, we do *contact tracing* with the district disease control office. We go together and trace the contacts of the people who really came in with the deceased and those who brought the person. Those who brought the person are usually given prophylaxis and drugs so that they will not contract the disease. Then we visit their homes to do terminal disinfection of the premises. We spray the premises against any potential microorganisms and we evacuate those who are staying in that house and make sure they go through the process of disinfection. To disinfect, we spray the house and the dresses the person wore, that is what we technically call the *formites*, the things the person came into contact with and the beddings. If there are also discharges such as faecal matter or any other bodily fluids we make sure that the body is well disinfected and disposedof in a high concentration of potassium hydrochlorides that are used as disinfectants so that we will be able to break the chain of spread in those communities where those diseases rear their ugly heads. After that we allow the people to come back to stay in the house. So that is our role (District Environmental Health Officer, Ajumako).

At the district level collaboration between the District Assembly and the FDA was very minimal because the FDA was physically located only at the regional level and certain functions of the FDA were carried out by the EHOs at the district level:

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> There is a checklist developed by the FDA and that provides for some elements of benchmarks. So when you look at that *checklist* that is what we basically use for our inspection activities. Then there are also from experience food hygiene practices that we enforce but documentarily there is the FDA Guidelines for street-food vending for food hygiene compliance (District Environmental Health Officer, Ajumako).

> On benchmarks or standards, the authority is the Food and Drugs Authority. They provide a vending site checklist that is straightforward when it comes to its use. That is what we use prior to the food vendor undergoing medical certification. And After the medical certification, we continue to use it to ensure that the vendor complies with the essential provisions of the checklist (Deputy Environmental Health Officer, RCC, Cape Coast)

> The environmental health officer, by the Food and Drugs Act is an authorised officer for the enforcement of the Food and Drugs law. So at the district level we implement all our activities with them [FDA] and on their behalf. Because they are only located at the regional level, the activities of the FDA are carried out by us at the district level. Occasionally they also come and we combine together into a team for inspection especially of *satchet* water producers or establishments in the district (District Environmental Health Officer, Ajumako).

The core mandate of the GHS are three main functions namely providing health care to FBD patients, educating of the population on food safety as well as disease surveillance.

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> The MoH/GHS are in charge of public health. So usually the environmental health office which used to be part of the GHS and the MoH until the late 1990's when we moved from the MoH to the Ministry of Local Government. So we still see ourselves as collaborators. So we coordinate at the regional level and at all levels in our implementation (Deputy Central Regional Environmental Health Officer, Cape Coast).

According to the Regional Disease Control Officer of the Central Regional Health Directorate:

> From our end, we are able to supply logistics. Based on the data that we have we are able to request logistics from the national level and distribute to the affected areas to ensure that those diseases are taken care of. We also do education. We support the districts to educate the public on these diseases. We also liaise with the environmental health and there was a time we had programmes on radio. So it has been very effective and it is through these interventions that the recent cholera outbreak has ended in the middle of December [2014] [Regional Disease Control Officer of the Central Regional Health Directorate, Cape Coast].

> I have assigned community health nurses to all electoral areas in KEEA. And they go round everyday in addition to their core mandate of giving health services, to educate the populace for which I monitor with my team. Quarterly we meet with the environmental health officers and we discuss issues that come about as we go round (Municipal Director of Health Services, Elmina).

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> In the event of cholera outbreak what we normally do is that we treat the cases and each facility has been mandated to set an isolation ward for which we have done and we treat the patients. Alongside the treatment we also give chemoprophylaxis to contacts and we give education. Our nurses are in the communities to educate people. And in collaboration with the environmental health officers of the Municipal Assembly we form task forces, and using the local FM stations (*Ahomka*, *Asafo*) and other local public address systems in the communities we educate people to keep personal hygiene. Again we also hammer on the need to clean our environment (Municipal Director of Health, Elmina).

> We collect data on all diseases including food-borne diseases. Our role actually is to collect the information, collate, analyse and we give the report to those who matter [including environmental health unit] to ensure that measures are taken to control the occurrence of those diseases…And we normally send these reports to the national level and send feedback to the districts where we collect the data and to tell them to act on the situation…And so we also liaise with the environmental health unit to identify food vendors whom they screen and give certificate so that we are sure that the foods that they sell are safe. So at all levels the environmental health staff liaise with the health staff to ensure that those identified are screened and if there is the need for any treatment they are given (Regional Disease Control Officer of the Central Regional Health Directorate, Cape Coast).

It was also found that the MoFA at the district level played three main roles namely ensuring the safety of primary produce which served as input for preparing food, education of farmers on the need to use safe water for their

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crops particularly vegetables and safe usage of agro-chemicals to prevent vegetable contamination. It is also mandated with monitoring meat hygiene at the slaughter houses involving ante-mortem inspection before the slaughter of animals and subsequently post-mortem inspection of the meat:

> We collaborate with them [Food and Agriculture Department] in two key areas. One is ensuring that vegetables that are used on the field are not watered with water from the gutter. So we continuously work with them in the sensitization of the farmers to be able to use clean water for irrigation. The other aspect of collaboration is meat inspection. One of our duties has to do with carrying out meat hygiene. And meat ultimately ends up in street-vended food because people will do *khebab*, people will do all kinds of package with the meat. So at the slaughter house we collaborate with the veterinary services of the Ministry of Food and Agriculture at the slaughter house. In which case they do *ante-mortem inspection* that is done before the animal is slaughtered and then we also collaborate with them to carry out the *post-mortem inspection* (Deputy Central Regional Environmental Health Officer, Cape Coast).

Raw meat and fish hygiene are also of immense importance to street-food safety because they ultimately end up as or in street-food. Meat hygiene at the slaughter houses may involve ante-mortem inspection before the slaughter of animals and subsequently post-mortem inspection of the meat through collaboration between health inspectors with the veterinary services of the Ministry of Food and Agriculture at the slaughter house. According to the Deputy Environmental health Officer even a place like Cape Coast the regional capital has no sanitized slaughter houses let alone less urbanized

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areas such as the KEEA and the AEE district. Similarly, indiscriminate defeacation along the beach have the potential of contaminating fishes landed at the beach.

According to the KEEA Municipal Director of Food and Agriculture Department, the main focus of his department was the rendering of services to "extension farmers". They also have a unit called Women in Agricultural Development (WIAD) that handles food safety issues. According to him, when their officers or agricultural agents interact with food vendors they advise them on "how to handle the food they sell to the public." The director noted however that the level of collaboration between departments and agencies in KEEA regarding food safety was "low."

Similarly, the Coordinator of WIAD in the AEE district noted that at the point that ready-to–eat food is sold by the vendor, the Food and Agriculture department has no enforcement role to play though they have some role in health education for vendors. On the quality and safety of ingredients used in preparing street-vended food, the Food and Agriculture department in AEE district had a role to play:

> We do a lot of education in vegetable farming. They [farmers] use a lot of chemicals especially in the Enyan Maim enclave, around Kwesi Gyan 2 along the Mankessim road. They grow a lot of garden eggs, pepper, okro and tomatoes. So we do a lot of education in safe handling of agro-chemicals so as to ensure the safety of these vegetables [WIAD Coordinator, AEE].

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> The law enforcement agencies must step up their game especially when it comes to ladies who sell fried fish. Most of the time you see their containers containing the fish opened to expose the fish to people to see how attractive the fish is without knowing that they are attracting flies unto the fish. So when it comes to the District Assembly, the department that enforces these bye laws regarding food safety have to be very strict on fried fish and other types of prepared food which are exposed to the atmosphere (WIAD Coordinator, Department of Food and Agriculture, Ajumako).

According to the Deputy Central Regional Environmental Health Officer, all schools in the region usually have a school-based health teacher who carries out, in collaboration with the environmental health officers, food-hygiene inspection on their school compounds and to ensure that food vendors who sell in schools comply with the food hygiene benchmarks:

> For the school health education programme of the GES, usually every school has a school-based health teacher who ensures that the foods that are sold to the children are wholesome. So the school-based health teachers routinely carry out food hygiene inspection on their school compounds and make sure that the food vendors sell comply with the food hygiene standards in whatever location they find themselves (Deputy Central Regional Environmental Health Officer).

> We collaborate with the school health educators. We organize training for school-based health teachers. We work with the - School Health Education Programme (SHEP) coordinators to make sure that the school environment is also a healthy environment. So there is a very strong collaboration with Ghana Education Service, district health services and

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> environmental health departments of the various districts, municipal and metropolitan Assemblies (Deputy Central Regional Environmental Health Officer, Cape Coast).

The Judicial Service of Ghana was said to be a key stakeholder and a collaborator in the enforcement of regulation though it was found that none of the study vendors said they had ever been summoned by the court for breach of food regulations. According to the District Environmental Health Officer, Ajumako, "prosecution in court is usually the last resort" and that the:

> Judicial Service helps in the enforcement of our laws, the prosecution we do as environmental health officers is on behalf of the Attorney General. So we collaborate with them in case we want to seek some clarity on some of the laws and in case they are contested we go to court (Deputy Central Regional Environmental Health Officer).

As a potential collaborator, the Ghana Traditional Caterers Association existed mainly at the national level, though some limited training workshops were sometimes organized for food vendors in the region by the association:

> Generally we do training [of vendors] with the Traditional Caterers Association when they come around [from Accra]. And when they come, we mobilize the street-food-vendors and we have a session with them. They usually come once a year and in some other times during the medical screening process. Before the food vendors go through the medical screening we take them though some basic training in food hygiene, personal hygiene and environmental sanitation (District Environmental Health Officer, Ajumako).

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> They [Traditional Caterers Association] have been around for over ten years. So they have national executives and district executives. They are not so vibrant in a sense but usually the executives come from Accra to support the local executives to take food vendors through hygiene education and they are ultimately given certificates for participating in the training workshop (District Environmental Health Officer, Ajumako).

> We also need to see to how we can do peer compliance. Food vendors must be given adequate knowledge of food hygiene so that at least they can monitor their peers and if possible reward or provide some reward schemes annually or whatever for the best performing vendor for compliance (District Environmental Health Officer, Ajumako).

Finally, the EPA is not directly involved in the food safety programme but rather responsible for setting of standards usually for the bigger environmental management issues such as pollution or flooding which may have indirect or long-term impact on food safety. For instance human excreta pollution of water sources could result in food contamination when such sources are used either for drinking purposes or for food preparation:

> EPA is responsible for setting of standards usually for the bigger environmental management issues such as pollution of surface water, *galamsey* i.e. small-scale surface mining, dumping chemicals into the environment. For the smaller ones of this nature, we (EHOs) have the mandate and we share these with other institutions ie. GHS, FDA, GHS etc. And so EPA does not come in when it comes to issues of street food vending unless there is a bigger issue that has implications for street food vending(Deputy Central Regional Environmental Health Officer).

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Challenges in Enforcing Food Regulation Compliance

The enforcement of food legislation by local authorities in the study area is weak and bedevilled with various challenges. This section focuses on the study's specific objective and the research question from the regulator perspective stated below:

Assess the regulation enforcement challenges in the study area.

- What are the challenges to street-vended food regulations enforcement *in the study area*?

The principal challenges in the compliance enforcement of food regulations in the study area were identified as emanating from either the vendor, the consumer or the local enforcement authorities. They are attitudinal challenges, financial resource constraints, and inspectorate human resource challenges. Others are infrastructural limitations and logistical challenges. On the poor attitude of vendors and consumers, key informants had the following to say:

> The attitude of food vendors and the attitude of the consuming public usually make enforcement of the procedures extremely difficult. As we take action with exposed food…'Can you cover it a bit?'… then somebody who is passing by will say…well, is it your business? Why don't you mind your business? We have been hearing this over the years. At times we call it inadequate education on the part of the people (Deputy Regional Environmental Health Officer, Cape Coast).

> …The main challenge is attitudinal, people's attitude (ie. vendors' and consumers attitude). The consumer would

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> want to see the fish or whatever exposed. So when you see something that is in a glass showcase, the thinking is that it will not be expensive to buy and that the food that is exposed is cheaper than what is in the glass sieve. So it drives them in a way away. Then the mentality that when you are selling food in the night you can flout the food safety laws. It is also a challenge and because of inadequate logistics, our challenge is working through the night. Unless we are aware of some potential occurrence of epidemics then we activate our night patrols as it were to food vending sites to make sure that they go through best food hygiene practices. So I think it is attitude and people's unwillingness to comply with the order that we give, that results that results in some court cases (District Environmental Health Officer, Ajumako).

In concurring to the attitudinal challenge, the district public health nurse of the AEE district emphasized the point that "it is only when they (vendors) see you that that they try to cover things [street food] as if they have been doing what they have been taught to do." On training challenges, the Deputy Regional Environmental Health Officer disclosed that the region had no training plan for food vendors in the region:

> We don't have a stand-in plan for capacity building for food-vendors but they are all integrated part of hygiene, education and enforcement compliance. Usually when the traditional caterers come they pass through the region before going to the districts. You know the region is also part of a district. This being the regional office is under the Cape Coast Metropolitan Assembly. So if there is training in the Cape Coast Metropolis it will be anchored in the CCMA. So as a region at our level we

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> don't do training for food vendors (Deputy Regional Environmental Health Officer, Cape Coast).

Human resource constraint was identified as a major challenge. It was found that the environmental health officer/population ratio was about 1 personnel to 8,000 population which is operating below the acceptable standard of 500 citizenry to one environmental health officer in the region. The distribution was also said to be inequitable:

> We don't have enough numbers in the distribution of the staff that we have. We are around 300 now for the technical core environmental health officers, assistants and sanitation guards. The latter form a large number of our personnel and we are supposed to be in charge of 2.4 million people in the Central Region. So in terms of ratio we are operating below the acceptable environmental health officer/population ratio which is around 500 citizenry to one environmental health officer. Generally the main problem districts are Upper Denkyira West and Diaso area. People are usually hesitant in accepting postings to that northern part of the Central Region. The one with the least number [of environmental health officers] is Diaso. They are about five or six compared to Kasoa where the staff are more than fifty. So those are the comparisons (Deputy Regional Environmental Health Officer, Cape Coast).

> Currently we have 16 health inspectors assisted by 12 sanitation guards. For every Zonal Council we have posted people (KEEA Environmental Health Officer).

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Consequently, monitoring and inspection activities particularly in the night are hampered. For instance by patronizing unhygienic foods, consumers condone vendor breaches of food regulations. There was also the vendor attitude of flouting with impunity food safety regulations under the cloak of darkness in the night, which is aggravated by the constraint of the practical resource and logistical limitation for enforcing regulation. Most vendors who evade normal certification were said to easily ply their trade in the night. This is a period one is not likely to get any environmental health staff monitoring and inspecting, though in few cases particularly in the AEE district, night inspections was said to be conducted in the wake of a potential outbreak of epidemics:

> Most of the vendors who dodge normal certification are those who sell in the night. This is a period you wouldn't get government officials to be monitoring vendors. So we are trying to put in place a task force that will involve security personnel to check night sales within the Municipality…That is a big challenge because it has to do with a lot of logistics and manpower (KEEA Municipal Environmental Health Officer).

It was revealed that fifteen environmental health officers and assistants in the AEE district was inadequate for the task of enforcing compliance of food safety in the district. However, collaboration with other stakeholders had to some extent made up for the shortfall in the numbers of environmental health officers and assistants in the district:

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> Generally, the total number of staff we have is about fifteen environmental health officers and assistants. And we have ten sanitation guards who are not trained as environmental health officers who work as our assistants. So by and large, though we try to do our best you can see that the numbers are inadequate for the task ahead but we have been managing with what we have to achieve the results we want in collaboration with our partners the GHS, the public health unit of the district directorate of health services… In terms of human resource when we pull all resources together it is adequate. Management of epidemics is not one agency responsibility. So when we bring in NADMO, district directorate of health services, public health nurses, disease control and health education and we put our resources together, I think that is what has helped us to be able to manage what we have (District Environmental Health Officer, Ajumako).

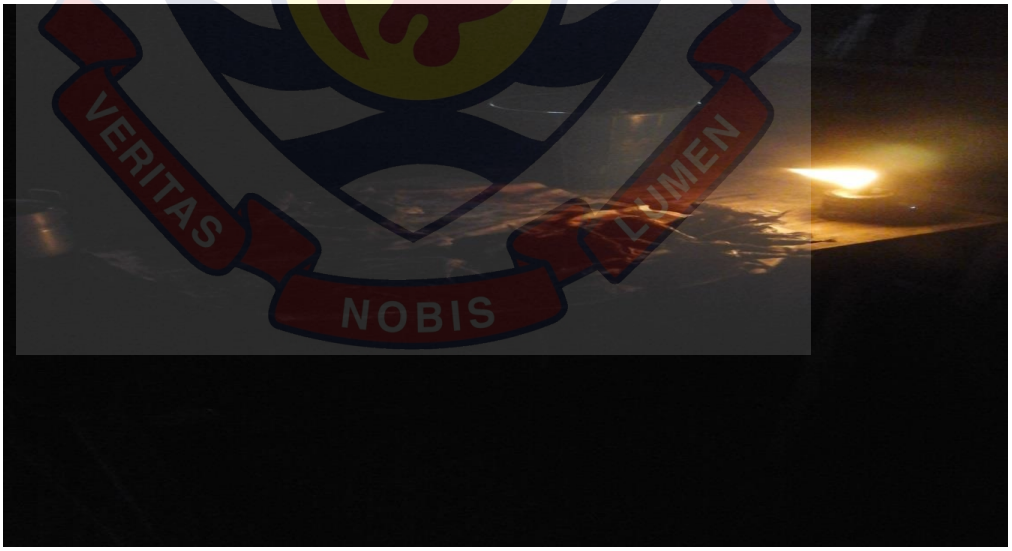

Fig 12: Ready –to-eat fish displayed unprotected at night in KEEA

Source: Fieldwork, 2015.

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Figure 13: A Ga Kenkey and fried fish vendor at work at night in KEEA

Source: Fieldwork, 2015.

Meat serves as input in the preparation of some street food such as chop bar soups. Conflict of roles as a challenge particularly in the area of meat hygiene was also emphasized. It was reported that sometimes friction erupts between the veterinary services of Ghana personnel and health inspectors in the slaughter houses as to who had the primary mandate of ensuring meat safety:

> Usually the unavailability of a clean structure for food hygiene is one of the major challenges when it comes to food safety. Places like Cape Coast and Twifo Praso have no sanitized slaughter houses. So that alone has implication for food safety…Currently there is always confusion, friction in the

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> slaughter houses because in the current Public Health Act 851, the mandate of ensuring meat safety has been given to the veterinary services of Ghana. The veterinary services department has the mandate to make sure that meat that are marketed and sold are wholesome. But the other side is the hygienic conveyance of the meat from the slaughter house. Conflict yes, but it is usually conflict of roles and responsibilities (Deputy Regional Environmental Health Officer, Cape Coast).

Another major enforcement challenge is in the area of infrastructural engineering. Inadequate infrastructure including lack of sanitary facilities for vending centres; or where they exist were usually not located in proximity of food vending centres, inadequate infrastructure for meat hygiene (un-sanitized slaughter houses) and inadequate household toilets were underscored. Yet raw meat from slaughter houses often end up as vended *khebab* or in soups sold in *chop bars* or elsewhere.

> About the provision or engineering of facilities for street food vending, when you go to Kotokuraba [in Cape Coast] for example, the temporary make-shift facilities that have been made for the market women, the closest toilet you can have is over 100 metres away from the facility, so that is likely to compromise the safety of vended food. Permanent structures construction for ensuring food safety is critical (Deputy Regional Environmental Health Officer, Cape Coast).

> One of the proposals we have been thinking about is to have a situation where we have a specific area demarcated for food vendors and if that is provided then adequate facilities can be provided in those areas. So if you know that this is the

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> community canteen or station canteen that is more of a permanent structure then obviously sanitary convenience will be there, hand washing facilities will be there…But as it stands now because we don't have those permanent status for the food vendors, people hawk around with the food and usually hygiene standards are compromised because they don't have access to toilet facility, they may not have access to soap and water for hand-washing if the need be and may not have adequate water to wash bowls…(District Environmental Health Officer, Ajumako).

> The household latrine system must be pursued vigorously. Now the Assembly must make it mandatory that anybody who is putting up a new structure to live in they must ensure that household toilet is included. And again people who sell food must be frequently screened and educated. I mean frequently not once. If it will be monthly, or quarterly or something, that will be better. And the education must be ongoing as our nurses are doing. People should not take it as business as usual. They should listen to the nurses that come around to educate them and to observe good personal hygiene so that they can package the same values (Municipal Director of Health Services, Elmina).

Additionally, it was said that there were challenges regarding the gathering of reliable evidence to produce in court to prosecute recalcitrant food vendors. It was noted that lack of food sample storage facilities hamper enforcement efforts by environmental Health officers:

> In the enforcement processes, if you go and confiscate somebody's food that is expired, you need to keep it at some temperature and produce it at court. But the facility for storage

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> may not be available in most districts and that at times makes the enforcement very difficult (Deputy Regional Environmental Health Officer, Cape Coast).

The district public health nurse for the AEE ditrict emphasized the point that the system of laboratory medical screening of food vendors is not well structured:

> I think the district has to do something about it and allow the laboratory [in Ajumako] to do the examination and they have to give the results that they are fit before they go for the certificates for them…But with the administration of the new environmental health officer I think it is better now but I can't confirm that they are using the laboratory (District Public Health Nurse, Ajumako).

Overall, in the KEEA Municipality, the in-depth interviews revealed seven main challenges to the enforcement of compliance of food safety regulations. These were public attitude to safe environmental hygiene, challenges in excreta disposal, and issues related to monitoring and inspection of food hygiene especially in the night. The AEE District local bye-laws on food safety was yet to be gazetted at the time of data collection. Though the Assembly's bye-law on street food safety had not been gazetted, there were enough laws on the statute books to be applied in enforcing food safety compliance. Main challenges were the attitude of consumers that encouraged the exposure of street food to the environment, the tendency to flout food safety regulations in the night, inadequate environmental health inspection human resource, inadequate logistics including challenges involved in laboratory analysis of food samples:

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> The Assembly's bye-law on street food has not been gazetted. The bye-law is just a local law that works within the jurisdiction of the district assemblies. So the Assembly [AEE] is yet to gazette its bye-law on all activities and not only food safety. But there are other laws that are used and can be used to enforce food safety ie. Public Health Act 851 of 2012, the Criminal Code Act 29 of 1960. All these laws and even Act 462, the Local Government Act also provide for some public health protection and that by extension food safety. Those are the laws we currently apply. And we have the Town's Act of 1892. All those laws have some section that deal with food that is unwholesome. So that is what we use in the absence of a gazetted bye-law."(District Environmental Health Officer, Ajumako).

The KEEA Municipal Director of Health Services, Elmina then recommended:

> I think we should engage the fishermen to form task force and they should be the watchdog on people who come here [beach] to defeacate and anybody who comes here to do that we have to arrest that person and prosecute that person. And then there should be frequent cleaning of the beaches along the coast. Assemblymen have a role to play. They have, they have. I mean you cannot do anything in any community without the Assemblyman and the local traditional persons. They are key. However the fishermen and the chief fisherman and others along the beaches are the people who are there already so they can keep watch and collaborate with us to arrest anybody who do not comply.

Results in other studies in the developing world (Apanga et. al., 2014; Adewunmi et al., 2014; Adewunmi et al., 2014) corroborate the results that the enforcement of food legislation by local authorities in the study area is weak and bedevilled with challenges.

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Food-borne Disease Burden in the Study Area

This sub-section identifies the FBD burden of the study area as related by the in-depth interview key informants in the context of the prevailing risk factors. The incidence of FBDs constitutes a threat to the health of humans, especially vulnerable groups such as children, the elderly and people with other underlying diseases. The Regional Disease Control Officer mentioned "clinically diagnosed typhoid, cholera, diarrhoeal diseases and shigella as the main FGDs that are reported in the Central Region of Ghana." According to him the 2014 cholera outbreak in the region mainly affected the coastal districts of the region. These were Awutu-Senya East, Cape Coast Metropolis, KEEA Municipality and the Abura Asebu Kwamankese district:

> It [cholera] affected 16 districts out of the 20. And it started from Awutu-Senya East (Kasoa area) from Accra towards Central Region. A total of 3,846 cases were reported for the region with 60 deaths. Out of these laboratory samples were taken and 105 were laboratory-confirmed. This is not to say that the rest were not cholera but they had epidemiological linkages so they were taken as cholera. And we had a case-fatality [CFR] of 1.6 per cent and this compared with the standard is not good enough because we are supposed to have a CFR of below 1 per cent (Regional Disease Control Officer, Cape Coast).

Available secondary data provided by the Regional Disease Control Officer showed that the KEEA Municipality had been one of the districts that usually reported one of the highest numbers of cases of cholera in the region. As the following quotation shows the KEEA Municipality reported relatively fewer confirmed cases (47 cases) in 2014 with two fatalities:

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> In KEEA we can talk of cholera, typhoid and other diarrhoeal diseases, dysentery and others. The recent cholera outbreak in KEEA was not as serious as the past years simply because of the education we have been embarking on. So even though it was not serious, we had about 47 confirmed cases and unfortunately two of them lost their lives. The cholera outbreak was both food and water related (Municipal Director of Health, Elmina).

Generally the AEE District was noted for being one of the districts in the region that rarely reported cholera cases, even though it reported cases of diarrhoea and typhoid. However in 2014 it was said to have recorded over 80 sporadic cases with two deaths in the cholera epidemic which hit the Central Region:

> In the last cholera outbreak, AEE had over 80 cases of cholera with two deaths. The two deaths were actually imported cases from Accra. They were brought in virtually dead… the worst hit areas were Etsi Sonkwaa in the District and in that community it was identified that most of the cases were also imported from nearby Mfantsiman Municipality and Abura Asebu Kwamankese district. We share common boundary with those two districts. But the case management was good. Apart from the two cases that we lost the others were able to survive (District Environmental Health Officer, Ajumako).

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter seeks to provide an overview, summary and conclusions of the findings of the thesis. The study sought to answer the research questions related to the knowledge and practices of food vendors and consumers. Others are the risk factors to street-vended food safety and the challenges in street- food regulation compliance enforcement in the study area with the aim of making recommendations to stakeholders for implementation. The conclusion emphasises new insights the study has revealed and how it has contributed to a better understanding of the problem studied. Some unexpected findings are also outlined and suggestions made for further researches envisaged and emanating from the study.

Street food hygiene is an important public health challenge for most societies around the world particularly in the developing countries because of its potential for food- borne-disease outbreaks. Food safety is a major public health concern worldwide, because many people take their meals outside their homes and are exposed to the risk of various food borne diseases. Food-borne diseases not only pose adverse effect on people's health status and well-being. They could have adverse socio- economic implications for individuals, families and the larger society. Furthermore, the loss of income as a result of food-borne illness perpetuates the cycle of poverty in individuals and families. Besides, eating unwholesome food can be wasteful, unhealthy and fatal. Access to safe and hygienic food is therefore the right of the consumer.

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The use of the mixed-method approach in this study made the assumption that combining qualitative and quantitative paradigms within the same study, complements each other to generate the best supportive evidence to make valid research conclusions. the validity and reliability of the study findings was subject to a number of limitations and delimitations. For example the responses to survey questions on whether vendors were licensed or not and their medical-examination status could not be verified on site. The study also excluded microbiological laboratory testing of food samples surveyed.

Summary of Key Findings

This section summarizes the results of the study by research questions. The following are the key findings:

What are the socio-demographic features of street- food vendors?

- Majority of food vendors (83.3%) were stationary vendors whiles 16.7 per cent were mobile vendors.
- Street-food vending is a business plied mainly by females (97.3%).
- Overwhelming majority (84.5%) of vendors had education below the senior high school level. Overall, 15.3 per cent of food vendors had had no formal schooling.
- Street food vending is mainly by the middle-aged within the age bracket of 30 to 39 years with an arithmetic mean age of 34.98 years.

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How knowledgeable are street- food vendors in food safety?

- Overwhelming majority of vendors (96.1%) knew of at least one of the three commonest FBDs namely cholera, diarrhoea and typhoid.
- There were three major sources of food safety information and knowledge for street-food vendors namely health workers, radio and health inspectors.

What are the risk factors to street-food safety in the study area?

- Overall, majority (72.7%) of vended food in the study area were displayed in an unsafe and unhygienic manner mainly through open-air and ground level exposure.
- Comparing the two study districts, KEEA Municipality was more at risk (75.9%) than the AEE District (66.6%) in the practices of unsafe and unapproved display of vended food.
- Unhygienic food handling is a principal risk factor in the study area. Nearly half of vendors (47.9%) were observed to handle food with their bare hands to serve consumers. The corresponding figures for the two study districts are AEE (49.7%) and the KEEA (47%).
- Overall, nearly one-fifth of vendors (18.4%) never wash their hands with water and soap after visiting the toilet. Comparing the two study districts, over one in ten (13.5%) of KEEA vendors did not wash their hands with water and soap after visiting the toilet as compared to over one quarter (27.2%) of vendors in the AEE district.
- And of all vendors who were carers of children, nearly half (47.6%) handled food with their bare hands thus making 'child care' an indirect risk factor to vended food safety.

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- About one-tenth of vendors (10.4%) said they had suffered one type of FBD or the other over the past one year (diarrhoea, stomach pain and vomiting).
- Almost one-fifth of vendors (17.9%) sold in unhygienic environmental conditions consisting of waste or garbage accumulation, vending close to dirty open gutter and vending in dusty environment; thus exposing consumers to increased risk to contracting infectious diseases.
- Nearly one out of every twenty (3.9%) of food vendors' engaged in open defeacation at or in close proximity to the vending site, in the bush or at the beach. Respective figures for the study districts are KEEA Municipality (4.6%) and the AEE district (2.7%). As high as 16.2 percent failed to specify where they use as their place of convenience during the vending process. Hence the problem of open defeacation by vendors may be worse than the statistics suggests.
- Vectors mainly houseflies were observed in about one-fifth (21.1%) of vending sites.
- Consumers cited crude dumping of refuse as another risk factor especially in the KEEA. Most discussants confirmed that such *bolas* get mixed up with human excreta locally known as 'take away'. These are breeding grounds for houseflies, the main vectors responsible for food-borne-disease outbreaks.

Which factors influence consumer patronage of street –vended food?

- The main categories of consumers who patronized street foods were diverse. It includes public/civil servants, school children,

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travellers/tourists, market women, artisans and families of hospital patients.

- Consumers put a greater premium on street-vended food taste, affordability, geographical access, loyalty to particular vendors, and the aesthetic value of food rather than safety issues.
- Consumers have the attitude of influencing food vendors in displaying food in the open especially in the night.

What is the extent of enforcement of food regulations?

- Nearly one–fifth (18.9%) of food vendors said they had not been medically screened.
- Whereas only 6.8 per cent of vendors in AEE District said they had not had any medical screening, as high as one-quarter of food vendors (25.6%) in the KEEA Municipality had not ever been medically screened.
- Over one-third (31.2%) of all food vendors were found to be unlicensed and therefore selling illegally.
- Comparatively there was greater inspection coverage of the activities of vendors in the AEE District than in the KEEA Municipality.
- Over one-third (34.9%) of study vendors had not undergone any food hygiene training.
- Only 4.4 per cent of food vendors said they had ever been sanctioned. No vendor said she had ever been sanctioned in the KEEA Municipality whereas 12.2 per cent in the AEE District said they had ever been sanctioned.

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- The main food vending offences were exposure of food to flies, insanitary vending sites with solid waste accumulation, unhygienic food handling, failure to register with the environmental health office and the use of unclean utensils for selling food.
- No vendor reported that she/he had ever been summoned before court for any breach of food safety regulation.
- Comparing the two study districts, enforcement of food regulations was better in the AEE District than the KEEA Municipality.

What are the challenges to street-vended food regulations enforcement?

- The environmental health officer/population ratio in the study region was one to about 8,000 population, which falls short of the acceptable level of 500 citizenry to one environmental health officer.
- Lack of food sample storage facilities makes it impossible for the refrigeration of food samples and their subsequent adducement in court as evidence to prosecute recalcitrant food vendors.
- There was an ill-structured system of laboratory services access for the screening of vendors.
- Vendors tend to have the attitude of flouting food safety regulations under the cloak of darkness in the night.

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Conclusions

This section identifies the theoretical, methodological and policy implications of the findings. Unexpected findings and any new insights that contribute to a better understanding of the research problem are outlined by articulating study contributions to knowledge. To this end, the main themes for drawing research conclusions are socio-demographics of vendors, risk factors to food safety, environmental hygiene, consumer patronage factors and food regulation enforcement and challenges.

The study findings confirmed the socio-economic importance of the food vending business in providing easy access to ready-to-eat food by the populace and provides inexpensive source of ready-to-eat foods to low-income populations particularly in urban settings. It is particularly remarkable to note that street-foods were also patronized by families of in-patients who accompanied their sick relatives to the hospital and stayed within the precincts of the health facilities. Most consumers patronized street–vended food for subjective reasons mainly socio-economic and minimally health-related.

Street- food vending business also provides employment and a means of livelihood for a large number of middle-aged women in the informal sector, mainly illiterates who would otherwise be unemployed. The problem of unemployment is a principal developmental challenge in Ghana hence the socio-economic importance of the role of street food trade in the study area. Cooking is dominated by women in households and street food vendors have managed to surrogate a daily domestic responsibility of women in Ghana into a useful business venture.

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There is no doubt that the problem of unemployment would have been more colossal without the role of street food vending business in providing employment opportunities in the private sector. Indeed, countries are obliged under the Sustainable Development Goals Agenda 2030 (Goal 8) to provide decent work to their populations to help eliminate poverty in families and communities. Article 36 (6) of the Directive Principles of State Policy of Ghana's 1992 Republican Constitution provides that the state shall take the necessary steps to integrate women into the mainstream of the economic development of the country. The street food vending business as a strategy fits into this agenda.

This study found that overwhelming majority of vendors were of the stationary category rather than the mobile, and were usually located at a specific public place with or without the approval of the appropriate local authority. Both stationary and mobile vending have implication for town and urban planning and the budgeting provision of basic and sanitation infrastructure and facilities by the respective local authorities.

The study also found unhygienic food display practices, food handling, and hand washing practices; open defeacation, insanitary vending sites, unsafe unsold food storage practices and poor personal hygiene practices of vendors as the main risk factors to food safety. The safety of ready-to-eat food requires that the food chain from primary production to the mouth of the consumer is protected from microbiological, physical or/and chemical contaminants These may be classified as endogenous factors in which the food vendor (and the consumer) has a responsibility to prevent these risk factors.

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The unhygienic vendor food handling practices in the respective study districts were almost similar. Proper handwashing practices by vendors before handling food with protected hands; or during food preparation or after visiting the toilet are important steps that impact positively on food hygiene and safety. The findings therefore have implications for a more structured and well-resourced 24-hour enforcement regime of food regulations by the local authorities. Not only does these findings have implication for focused health inspections practices, they also have implication for the Ghana Health Service strategy on health education for food vendors in the context of child care.

The phenomenon of open defeacation and improper human excreta disposal is a major environmental risk factor in the study area. According to the UN Sustainable Development Goal 6, countries including Ghana are by 2030 to "achieve access to adequate and equitable sanitation and hygiene for all and end open defecation." It is alarming that nearly one out of every twenty of food vendors engaged in open defeacation at or close to the vending site in the bush or at the beach. Unhygienic and unapproved display of vended food has implications for not only public health but also for the tourism industry that the KEEA Municipality is particularly noted for. The findings also suggest the need to prioritize the control or elimination of vectors at vending sites.

The poor health status of food handlers is a potential risk factor to the consumption of street food. It is difficult to identify and exclude food handlers with infectious diseases such as tuberculosis or whitlowed fingers. The danger is that the consumer cannot determine at any point in time the health status of the food vendor and thus become susceptible to infections. This also has

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enormous policy implications for a structured health promotion strategy in food hygiene and safety.

Nearly half of left-over vended food was sold again to the consumer at another time without any guarantee that it was safely stored or thoroughly heated. Left-over food storage as a major risk factor to food safety requires the mastery of the art of cooking the right amounts of food and refrigeration and storage skills by vendors in other to avoid wastage and storage challenges. Left-over food management also has important implications for vendor training and education.

The qualitative results brings to the front burner the impact of rapid urbanization and population growth. Rapid urbanization in the study area with its attendant population expansions tend to put pressure on the environmental and social infrastructure including provision of sanitized public toilets and facilities for human excreta disposal and management, which in turn may adversely impact on the safety of street food. It is refreshing to note that access to water from improved sources as input for street food vending was not a major risk factor in the study area.

The findings that one-third of SFVs plied their trade illegally yet only 4.4 per cent of vendors said they had ever been sanctioned for regulation breaches raises very serious concerns about the need for better attitudes of inspectors towards food regulations' enforcement at the local level. That no vendor had ever been summoned before court for the breach of any food safety regulation may be attributable to lack of commitment to enforcement of regulations compliance either due to social pressures or/and lack of food sample storage

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facilities at the disposal of health inspectors to enable them produce admissible evidence in court.

It is ironic that there are numerous unregistered and unlicensed food vendors who still ply their trade not only in the night but also during the day. The revelation that over one-third of vendors were not inspected at all; and over one-third of study vendors had not undergone any food hygiene training must be a big concern to all stakeholders. It is remarkable that the AEE District had better scores in all compliance enforcement activities. This perhaps explains why the AEE district experienced a pattern of fewer FBDs especially cholera cases over the years under study than the KEEA Municipality.

The study unearthed the urgent need to train and equitably allocate environmental health inspectors to the districts thereby improving inspection rate and the compliance of enforcement of regulations particularly at night. There is the need for a corresponding budgetary and logistical support to ameliorate the challenges that impede food regulation enforcement and promotion of public awareness in food hygiene and safety standards.

Information and education on food hygiene and safety is imperative for both the vendor and the consumer. The study found three major sources of food safety information and knowledge for street-food vendors namely health workers, radio and health inspectors. Minor sources were television, school and women groups in religious organizations. The findings emphasises the importance of inter-agency collaboration particularly the complementary roles of Ghana Health Service, local FM stations and women groups in churches and mosques and the school health programme.

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Major obstacle in the compliance enforcement equation relate to inspection personnel, logistics, infrastructural and budgetary constraints. The environmental health officer/population ratio in the study area fell short of the acceptable level of 500 citizenry to one environmental health officer. There was a deficiency in the availability of food sample storage facilities making it impossible for the refrigeration of food samples and their subsequent submission in court as evidence to prosecute recalcitrant food vendors. Sanitary facilities and equipment were inadequate to help improve the state of sanitation in the vending areas. There was an ill-structured system of laboratory services for the medical screening of vendors. Inadequate infrastructure such as sanitised slaughter houses for ensuring the provision of safe meat which is a key ingredient in the preparation of *khebab* and soups particularly sold in *chop bar* was also reported lacking. There was vendor attitude of flouting food safety regulations and particularly under the cloak of darkness in the night. Not surprisingly, the main FBDs in the study area were typhoid, cholera, other diarrhoeal diseases and shigellosis (dysentery). Unsafe foods do not only result in ill-health but could also have immense socio-economic consequences. This section has thus identified various conclusions and their relevance to policy. The results and discussions in Chapter 4 resonated with the theoretical aspects of the study. These are theories of disease causation, the philosophy of utilitarianism and the theory of why people obey the law.

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Contribution to Knowledge

Overall the study made a number of conceptual, empirical and methodological contributions to knowledge.Interestingly, though by definition street-vended food are sold at public places, this study found that some vending was done at private locations such as in the frontage of private residences of vendors. Empirical contributions were made in the areas of socio-demographic features of street-food vendors, the personal and environmental risk factors to street-food safety, determinants of consumer patronage of street food and their perceptions, practices of enforcement of food regulations and key challenges to regulation compliance enforcement.

A number of key methodological contributions were also made. The study demonstrated how both quantitative and qualitatine designs can be integrated in a study to achieve the objectives of a study. The quantitative findings of this study was supported by the qualitative outcomes thus enhancing the validity and reliability attributes of the study. In contrast with all published studies on street-vended food safety in the Central Region which focused exclusively on the regional capital Cape Coast, this study focused on two districts in the Central Region of Ghana. Ultimately, the contribution to knowledge is aimed at achieving SDG3 (3.3) of ending the epidemics of food and water-borne diseases by 2030.

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Recommendations

Based on the key findings of the study, this section focuses on recommendations to the various stakeholders in the food safety programme with the aim of addressing the risk factors and challenges associated with street food hygiene and safety in the study area. Primarily street-vended food safety is a shared responsibility between the food vendor, the consumer and the local authorities. Whereas the vendor is enjoined to provide hygienic and safe services to the consumer, the latter has a personal responsibility to himself/herself to patronize only hygienic and safe street food. And to achieve that end, the MMDAs in collaboration with other agencies and organizations have a responsibility to enforce the existing food regulations. Based on the research findings the following recommendations are made to key stakeholders:

Metropolitan/Municipal/District Assemblies

It is recommended that a vigorous regulations enforcement regime relating to processes involved in preparing, displaying, handling, serving and storing street food be seriously pursued by district assemblies. Enforcement strategies that need scaling up include inspections, licensing and training of food vendors. Training funds could be solicited from Asssemblies' internally-generated funds or from companies in the food industry such as Nestle and Unilever. Training materials should be developed using the WHO Keys to Safer Foods. The licensing procedures should be simplified, and the information about it must be made easily available. Education must focus on

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clear messages including why sick vendors diagnosed with diseases such as typhoid, shigellosis, sores and whitlow are prohibited from selling street food.

It is recommended to the MMDAs Environmental Health Inspectorate (including their sub-district units) that bye laws that prohibit the usage of unhygienic ingredients intended for human consumption be vigorously enforced in collaboration with the District Directorate of Food and Agriculture department. Meat inspection at abattoirs must be more coordinated and scaled up since raw meat end up as street-vended food. It is suggested that the respective MMDAs work in collaboration with local transportation unions or agencies such as the Ghana Private Road Transport Union (GPRTU) to ensure the safe and hygienic transportation of street food to vending sites; as well as use various local media to educate both vendors and the general public. This calls for prudent utilization of financial resources available to the MMDAs to address public health-related challenges confronting the districts.

The number and location of laboratories at the district level should be pre-determined in relation to the objectives of the laboratory service in the food safety programme. Mass screening which involves taking the laboratory services to the door step of the people is greatly recommended. The merit in mass screening is that it provides the opportunity to give vendors education on personal hygiene, food hygiene and environmental sanitation after which their samples shall be taken for *Widal* test. But medical screening of vendors can be a reality only when practising vendors are identified and registered by the MMDAs. Inspection and regulation enforcement would be more facilitated if more innovative ways such as the adoption of snowballing procedures and the

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use of local Assemblymembers to locate and register all food vendors at the local level.

The MMDAs should consider the provision of adequate sanitary public toilets while at the same time enforcing the legal provision that compels house owners to provide household toilet facilities. The Assemblies must make it mandatory that anybody putting up a new building ensures that there are household toilet facilities included in the design of buildings. Bye laws on open defeacation and the requirement relating to household toilet facilities must be rigorously enforced. It is recommended also that in communities, the ditrict assemblies shall ensure that unit committees and the local traditional authorities collaborate to form task forces or community watchdogs to police the beaches and the communities against open defeacation.

The food safety programme and the management of epidemics require inter-agency resources to be pooled together. With the necessary policy and legislative reforms, allied health workforce such as registered community health nurses, social workers and disease prevention personnel could be cloaked with legal enforcement authority to help increase inspection coverage and promote safer street foods. It is recommended that enforcement officers are put on day, night and weekend shift duties particularly in the urban centres. This has the policy implication of increasing the numbers of food enforcement officers and designating specific officers exclusively for food safety regulation enforcement. The enforcement agencies must then be provided with a 24 hour opportunity to attend to food hygiene complaints from the general public. This arrangement must be publicized enough in the media and in the churches and mosques to create the necessary awareness.

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It is also recommended that the public space needs of street food traders must be factored in urban spatial planning. Assemblies in conjunction with the urban and town planning departments must designate and demarcate specific safe locations as food vending centres. Such locations should be provided with well managed sanitation facilities or receptacles. This also means that vending structures operating in existing clusters of vending sites whose locations compromise food safety must be relocated by the Assemblies as far as practicable.

There is the need for regular and more pro-active health inspections including periodic random sampling of street food for laboratory analyis. This also requires that the health inspectorate must be equipped to have the capacity to refrigerate sampled food at safe temperatures (below 5º C) when necessary prior to laboratory investigation.

The Assemblies are also engendered to institute a scheme of peer compliance to ensure that vendors serve as monitors and checks on their peers. This must involve providing some reward schemes for the best performing vendors. The "dos" and "don'ts" of street food preparation and vending ought to be "widely and prominently displayed in relevant public places for the benefit of both vendors and consumers. The bye-law that prohibits hawking by minors under thirteen years in the study area must also be enforced. All these functions will require well-structured collaboration between the environmental health department and other stakeholders. In the medium to long-term it is necessary to decouple food inspectorate functions from environmental health inspectorate especially in the more urbanized localities.

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District/Municipal Health Directorates/Ghana Health Service

At the regional and the district levels, the GHS has a major clinical role in treating patients with FBDs, providing food health education and instituting effective FBD surveillance systems. The GHS has a responsibility in instituting and implementing health promotion and educational programmes for food vendors either directly or through their associations where they exist, and through the media to achieve appropriate food vendor and consumer attitudinal and behaviour change. Food vendors, food handlers and consumers must be educated or conscientized in a collaborated manner, to prepare and handle food safely by practising the tenets of the WHO Five Keys to Safer Food. It is also recommended that the GHS prioritise food safety issues in child health programme. Periodic meetings with the environmental health office and other stakeholders could go a long way to identify food safety challenges in the districts. It is advocated that health facilities including sub-district health centres should have the logistical capacity all year round to treat cases of foodborne diseases such as cholera.

It is important for local authorities to strengthen FBD surveillance systems to serve as early warning systems. A well–structured and timeous FBD surveillance system is advocated. Staff of the disease control unit of the GHS must be adequately trained and equipped to carry out their FBD surveillance and investigative role in a more pro-active manner.

Laboratory services are indispensable to effective FBD disease control programme. It is recommended, that as much as possible, districts must use public laboratories rather than private ones for screening food vendors. It is

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imperative that the MoH/GHS strengthens laboratory services to support the food safety programme. However, where there is the need to use private laboratory services, the technical capacity and competence of such facilities must be properly assessed including their business registration certificate, certificate of incorporation, their membership of an association, their logistical capacity, the number and qualifications of personnel and type of services they provide.

Food and Drugs Authority

The statutory functions of the Food and Drugs Authority include putting in place adequate and effective standards or benchmarks for food safety, as well as monitor compliance of provisions in the Public Health Act, 2012 on food safety. The FDA not only has a major role to play in protecting food safety. They are also responsible for protecting the efficacy and safety of medications sold in chemical and pharmacy shops which could help effectively treat food-borne diseases such as diarrhoea and typhoid fever when they occur. But it is difficult to expect an effective monitoring role in circumstances where the FDA does not have a physical presence at the district level. It is therefore recommended that the FDA fully decentralize to the district level to make it fully responsive to its food safety responsibilities.

Food and Agricultural Department/ Ministry of Fisheries

The main focus of the food and agricultural and the fishing departments is the rendering of services to "extension farmers" and fishermen. Primary production activities impact on the safety and suitability of food

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ingredients which also have potential adverse effects on street-vended food. The drying of ingredients in open-spaces particularly on highways and the use of poor quality ingredients such as "rotten tomatoes" must be monitored and checked through collaborative efforts. Since meat could ultimately end up in stews, soups and as *khebab*, protecting meat hygiene at the slaughter houses and in the communities requires the enforcement of environmental and food safety hygiene regulations.

It is recommended that the role of the Women in Agricultural Development officers of the Department of Food and Agriculture be reviewed to collaborate more with the MMDAs and other stakeholders in handling food safety issues at the district level. The WIAD officers should be given a complementary enforcement role at the point of ready-to–eat food sale in addition to their health education role especially in the remotest parts of the rural districts. Appropriate policy reforms are recommended to empower the Department of Food and Agriculture at the district level becomes more pro-active in both food security and safety issues. The potential conflict of roles and responsibilities between the veterinary services department and health inspectors could be resolved through training. The MoFA and the Ministry of Fisheries at the local level must take appropriate measures to prevent the deterioration and spoilage of ingredients which could adversely impact on street-vended food quality and safety.

Ghana Education Service

Basic and high schools in the region run the School Health Education Programme (SHEP) of the Ghana Education Service. They have school-

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based health teachers who carry out, in collaboration with environmental health personnel, food-hygiene inspections on their school premises. They are expected to ensure that food vendors who sell on school premises comply with food hygiene standards. It is recommended that a well-structured training programme be drawn up for the SHEP coordinators, and a monitoring system put in place by the GES in collaboration with the district environmental health office and the GHS, to ensure safer street food and to prevent the incidence of foodborne diseases among students/pupils and staff which could adversely affect their health and the overall teaching and learning output.

Traditional Authorities/ Religious Groups

Traditional authorities, unit committees, religious groups and community members have a complementary role to play in the areas of environmental hygiene. Regular community clean-up exercises are recommended to eliminate or control the breeding grounds of foodborne disease vectors especially houseflies. In coastal communities, beach guards may be recruited by the District Assemblies to collaborate with the environmental health personnel and the police to keep watch and to arrest or reprimand individuals who resort to open defeacation; or do not comply with environmental health and food regulations. Additionally it is recommended that food safety educational programmes be regularly organized at the community level for women groups in churches and mosques. Consumer associations may also be formed to serve as pressure groups in street food quality systems in the communities.

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Traditional Caterers Association

The Ghana Traditional Caterers Association exists mainly at the national level and are either non existent at the district level as in KEEA or not vibrant as in the AEE district. Not surprisingly no vendor mentioned any vendor association or cooperative as their source of food safety training in the study area. Since group membership could have psychological and economic benefits to the individual vendor, it is recommended that the regional environmental health department work in tandem with the national level GTCA and other relevant bodies to explore the formation of local associations to serve as a link with the generality of vendors to improve their food safety knowledge, attitudes and practices. Vendor associations could be supported to ensure quick dissemination of information and facilitate vendor education and training. Associations could ensure that food vendors adhere to relevant and appropriate codes of practice in street food vending. This is likely to serve as an avenue for peer monitoring. It is recommended also that some reward schemes be instituted in each district for rewarding best performing food vendors in terms of regulation compliance. Social sanction within a group may have a more long lasting impact.

The Media

The masss media particularly radio stations have a major role to play in food safety programmes. Complemented with home visits by community health nurses and supported by Assemblymen, the media must be encouraged to prioritize food safety issues. For the effectiveness of education of vendors and the general public, educational messages should be timely, culturally

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appropriate and economically feasible. Target groups should include women groups in churches and mosques. Fortunately there are a number of local FM stations in the study area including Breezy FM Station at Bisease in the AEE District and the local FM stations (*Ahomka, Asafo*) in the KEEA Municipality not to mention many other radio stations in the Central Region, Accra and surrounding regions whose spectrum widely cover the study area.

Judiciary

The Judiciary is a key stakeholder in the enforcement of the law on food safety. The courts are the last resort in the enforcement of the law and that requires that appropriate admissible evidence is adduced in court by the prosecutors. Through the swift application of the law they could potentially provide deterrence for recalcitrant food vendors to achieve the ultimate goal of food safety. It is recommended that special fast track courts are put in place to handle breaches of public health regulations including breaches of food and environmental hygiene regulations. However, in this study none of the study vendors said they had ever been brought before or sanctioned by the court for breach of food regulations. This is possible only when there is pro-active food inspectorate system is in place in the study area with adequate resource support.

Ultimately, food safety strategies must aim at eliminating or controlling epidemiological risk factors to street foods and this should span the whole continuum of the food vending business, from *farm to plate*, to ensure that street foods are safe for consumption. There is the need for a coordinated,

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inter-sectoral action across the entire street food supply and consumption chain.

Suggestions for Further Research

Further researches on street food hygiene and safety may be conducted in other coastal regions of Ghana and into the health impact of polythene bags used in serving some street-vended food. Further researches may be necessary in this area because it raises serious food safety questions especially in view of the fact that many street foods are sold wrapped in polythene bags together with the traditional leave wrappers. Another area recommended for further research is the effectiveness of the SHEP Programme on school premises with respect to food hygiene and safety.

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APPENDIX A

RESEARCH INSTRUMENTS

STREET-FOOD VENDORS' QUESTIONNAIRE

Questionnaire Serial Number:.....

Date…… **Name of Interviewer**:……

Locality ……**Town/city**……**District** . . ……..

Supervisor's Signature ……...

INTRODUCTION: (Introduce yourself and purpose of research. Assure them of confidentiality).

The purpose of this questionnaire is to study how you street-food vendors do your work . The study is purely an academic exercise. All information you provide will be treated private and confidential. Refusal to participate (or discontinue participation) will involve no penalty.

Identification

Type of SFV: (1) Stationary 2) Mobile).

Type(S) of Street-Vended-Food Sold……..……

……..

Location of Vending (Near Street/Market/School/Offices/ Pathway/Lorry station Other, Specify……..)

Length of Vending Life (Yrs/Mths)……..**Vendor Cares for a baby/child?** Yes / No

A. GENERAL INFORMATION	ANSWER (Please tick the correct

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		answers)
1.	Sex of Respondent	1) M 2) F
2	How old are you? (age in completed years).....	1) Below 11 years 2) 11-17 years 3) 18 – 29 years 4) 30-49 years 5) 50-60 years 6) Above 60 years
3.	Highest level of Education	1)Primary 2) JHS/Middle 3) Voc/Technical 4) SHS 5)Tertiary 6)Arabic school 7) No Schooling
4.	Marital status	1) Married 2) Separated 3) Divorced 4) Never married 5) Widowed 6) Other, specify…….
5.	What is your religion?	1) Catholic 2) Protestant/Pentecostal/Charismatic 3) Other Christian, Specify…….. 4) Islam 5)Traditional/Spiritualist 6) No religion 7)Other, Specify……
6.	How many days in a week do you sell food?	1) 1 2) 2-3 3) 4-5 4) 6-7
7	How many hours of vending do you do per Day?	……hrs
B. KNOWLEDGE OF VENDORS		

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8	Who are your clientele/customers? (Multiple answers are possible)	1) School children 2) Workers 3) Market women 4) Travellers/tourists 5) Public/civil servants 6) Artisans 7) Others (Specify) ……
9	What do you understand by the term *safe food*?	…… …… …… …… ……
10	What things must you do to ensure that the food you sell is *safe* for the consumer?	1)Observe personal hygiene 2) Wash hands with soap appropriately 3) Keep environment clean 4) Separate raw and ready-to-eat foods separately 5) Cooking food thoroughly 6) Use safe water 7) Any Other, specify..... 9) DK
11	Can food be a source of disease?	1) Yes 2) No [If no go to Q 14]
12	If Yes, name any food-borne disease(s) you know.	1)Typhoid 2) Cholera 3) Diarrhoea 4) Intestinal worms Any Other, specify..... 9) DK
13	What is the source of your knowledge?	1) Radio 2) Health worker/nurse 3) Health Inspector 4)TV

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		5) Other Specify …… 9) DK/Don't Remember
14	Have you had any food-borne disease in the last one year?	1) Yes 2) No 9)DK/ Don't Remember
15	If yes, which one(s)? (*if no go to Q17*)	1) Typhoid 2) Cholera 3) Diarrhoea 4) Intestinal worms 5) Any Other, specify.....9) DK
16	If yes, What were the signs & symptoms of your disease?	1) Stomach pain 2) Diarrhoea 3) Vomiting 4) Headache 5) Nausea 6) Other, Specify……
17	Have you had any training in food hygiene and safety?	1) Yes 2) No
18	If yes, who trained you?	1) Health Inspector 2)Nurse/health worker 3) Vocational school 4) Family Apprenticeship 5) Any Other Specify……
19	Do you sell your food guided by any standards, regulation or legislation? (*If no go to Q 21*)	1) Yes 2) No 9) DK
20	If yes, which regulation or legislation?	1) District Assembly bye-law 2) Food and Drugs Authority law 3) Market Association regulation 4) Other, Specify ..... 9) DK/Don't Remember

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21	Who is/are responsible for enforcing the regulations on street-vended food?	1) DA 2) Sub-structures of DA 3) Food & Drugs Authority 4) Police 5) None 6) Other, Specify …… .
C.	**VENDOR ATTITUDES**	
22	What do you think your clients expect from you?	1) Reduced Price 2) Increase in quantity 3) Clean/ Safe food 4) Sanitary condition 5) None 6) Other, specify.....
23	A food handler/vendor needs to wash his/her hands regularly with water and soap.	1) I agree 2) I do not agree 9) don't know (DK)
24	Should a sick person handle and sell food?	1) Yes 2) No 3) Other, specify.....9) DK
25	If no, why?	1) Can transmit disease 2) Not strong to 3) Other,specify..... 9) DK
26	If yes (from Q24), why?	1) Need money 2) No harm 3) No substitute 9) Other, specify .....
27	How important is safety of street – vended-food to the consumer?	1) Not important 2) Quite important 3) Important 4) Highly important 9)DK
28	How important is the quality and	**1)** Not important 2) Quite important

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	safety of ingredients used for preparing vended food?	3) Not Sure 4) Important 5) Highly important
D.	**VENDOR PRACTICES**	
29	Where do you prepare the food you sell? (Observe)	1) Cooked/prepared at vending site 2) Prepared at Home 3) Brought from another vending site 4) Other, Specify ……
30	Are you a licensed street-food vendor?	1) Yes 2) No 9)DK/Can't remember
31	Have you done any medical check up ?	1)Yes 2) No 9)DK/Can't remember
32	If yes, after the first medical examination how frequent have you been having the medical examination?	1) Once a year 2) once in two years 3) once in five years 4) occasionally 5) None 9) DK/can't remember
33	How Clean is the immediate environment where food is sold? **(*Observe*)**	1) Garbage/littered 2) clean 3) flies present 4) stagnant water present 5) Other, Specify ……..
34	Is vending site close to any of these? (***Observe***)	1) Dusty road 2) Drain/open gutter 3) Toilet 4) Rubbish dump 4) None of Above 5) Other, Specify …… 9) DK
35	Is vendor in clean Apron/ protective	1) Yes 2) No 3) NA

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	garments? (***Observe***)	
36	How clean/long are food handler's finger nails? ***(Observe)***	1) Long nails 2) Short nails 3) Other, specify ……
37	Is vendor's hair (head) covered ? ***(Observe)***	1) Hair covered 2) Hair uncovered 9)NA
38	Does she/he handle food with bare hands? ***(Observe)***	1) Yes 2) No (Explain) ……
39	What do you use for washing your hands? ***(Observe)***	1) Only water 2) Soap and water 3) Muddy water 4) No washing 5) Other, Specify----------
40	What is the mode of display of street -vended Food ? ***(Observe)***	1) Mosquito-net container 2) Glass case 3) Open-air exposure 4) On ground level 5) Other, specify ……
41	What is used to serve food? (***Observe)***	1) Plates/utensils 2) take away container 3) Cups 4) calabash 5) leaves 6) newsprint 7) polythene 8) Other, Specify ……
42	Are utensils/plates for serving food clean ***(Observe)***	1) Clean 2) Not Clean 9) NA
43	What type of water is used for washing dishes/utensils?	1) Stored water 2) Tap water 3) Ponds water 4) Rainwater 5) Other, Specify ---------- 9) NA

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44	Which type of water is used in cooking?	1) Pipe borne 2) Well/pit 3) borehole 4)Rainwater 5)Other specify..... 9) DK/Not Applicable
45	What do you do with daily left-over food?	1) Throw away 2) Reheat and sell 3) Eaten at home 4) kept in the refrigerator and sold later 5) No left-over 6) Other, Specify .....
46	Where do you dispose of your refuse/garbage**?(*observe*)**	1)Nearby bush 2) Drain/open gutter 3) Nearby 4) Rubbish dump 5) All the Above 5) Other, Specify …… 9) NA
47	Where do you dispose of your used dirty water**? (*observe*)**	1)Nearby bush 2) Drain/open gutter 3) Nearby 4) Rubbish dump 5) All the Above 6) Other, Specify …… 9) NA
48	Where do you go if you need to use the toilet? (*can be more than one answer*)	1) Public toilet 2) At the vending site 3) At home 4) At neighbor's house/shop 5) Nearby bush 6) Beach 7) Other, Specify ----------
49	What do you do after you visit the toilet?	1) Wash hands with water only 2) Wash hands with water & soap 3)Nothing /don't wash hands 4) Other, Specify …….

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50	Is vended food exposed to vectors (eg. flies, rats)?(***Observe)***	1) Yes 2) No 3) If yes specify vector(s) ……..…
E.	**ENFORCEMENT , COMPLIANCE & SANCTIONS**	
51	Is your vending business Inspected?	1)Yes 2) No (if **no** or NA go to Q 56.) 9) NA
52	If Yes, how often?	1) Daily 2) Weekly 3) Monthly 4) Quarterly 5) Yearly 6) Sometimes
53	Who does the inspection?	1) Health Inspector 2) Health Worker 3) EPA 4) Tourism Officer 5) Other, Specify ……
54	Do the inspections have any effect on your work?	1) Yes 2) No 9) Don't Know
55	If yes, what effects?	…… ……
56	Have you ever been sanctioned by the authorities?	1) Yes 2) No (*if no skip to Q 59*)
57	If yes, what was your offence?	…… …… ……
58	What was your sanctions?	…… …… ……
59	Are you a member of any food	1) Yes 2) No (If no go to 62)

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	association?	
60	If yes, specify the type of association	1) Traditional caterers association 2) Hawkers association 3) Association of restaurant keepers 4) Other, Specify ……
61	What role does your association play?	…… …..…… ……..…… ……..……
62	In your opinion, what should be done to improve the safety of street - vended foods in this district/municipality?	…… …… …… …… …… …… …… …….
THANK YOU FOR YOUR COOPERATION		

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STREET-FOOD VENDORS' QUESTIONNAIRE FANTI TRANSLATION (TRAINING TOOL)

Name of Interviewer:…… Signature…….

Supervisor's Signature …….

	A. GENERAL INFORMATION	FANTI TRANSLATION
1.	Sex of Respondent	-
2	How old are you? (age in completed years).....	*Edzi mfe ahen?*
3.	Highest level of Education	*Akɔ skuul da a? Ikoduu ahen?*
4.	Marital status	*Ana awar a?*
5.	What is your religion?	*Ekɔ ebɛn asor?*
6.	How many days in a week do you sell food?	*Dapɛn biara etɔn edziban nda ahen?*
7	How many hours of vending do you do per day?	*Etɔn adze dɔnwher ahen dakor?*
	B. KNOWLEDGE OF VENDORS	
8	Who are your clientele/customers? (Multiple answers are possible)	*Whana nom nna wotaa tɔ w'edziban?*
9	What do you understand by the term *safe food*?	*Sɛ wɔ ka dɛ edziban ho tsew a asekyerɛ nye dɛn?*
10	What things must you do to ensure that your food is *safe* for the consumer?	*Ebɛn adze na ɔwɔ de eyɛ ama w'edziban ho atsew?*
11	Can food be a source of disease?	*Ana obi botum enya yareba wɔ*

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		n'edzibandzi mu?
12	If yes, name any food-borne disease(s) you know.	*Ebɛn edziban ho yɛreba nna iyim?*
13	What is the source of your knowledge?	*Isuaa dɛm yimdzii yi wɔ hen?*
14	Have you had any food-borne disease in the last three years?	*Ana enya edziban ho yɛreba wɔ mfe ebaasa a wabɔsen kɔ yi ?*
15	If yes, which one? (*if no go to Q17*)	Ebɛn yɛreba a?
16	If yes, What were the signs & symptoms of your disease?	*Nna woyɛreban' nensɛnkyerɛdze nye dɛn?*
17	Have you had any training in food hygiene and safety?	*Ana enya nkyerɛkyerɛ wɔ edziban ahotsew ho?*
18	If yes, who trained you?	*Whana maa wo dɛm nkyerɛkyerɛ yi?*
19	Do you sell your food according to any regulation? (*If no go to Q 21*)	*Ana mbra bi wɔ hɔ a wɔdze hwɛ edziban edwuma do?*
20	If yes, which regulation?	*Ebɛn mbra a? Bɔ dzin*
21	Who is/are responsible for enforcing the regulations on street food?	*Ebɛn edwumafo anaa mpanyinfo na wɔhwɛ dɛ mbra no yɛ edwuma?*
C.	**VENDOR ATTITUDE**	
22	What do you think your consumers expect from you?	*Ebɛn adze nna ehwɛ a ehɔn a wɔtɔ edziban wɔ wo hɔ rehwehwɛ ma w'edziban ayɛ?*
23	A food handler/vendor needs to wash his/her hands regularly with water and	*Edziban tɔnnyi hia de ɔdze nsu na semina hohor ne nsa ho aber biara.*

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	soap.	
24	Should a sick person handle and sell food?	*Ana oye dɛ sɛ obi yɛr a ɔbɔtɔn edziban a?*
25	If no, why?	*Ebɛn adze ntsir a?*
26	If yes (from Q24), why?	*Sɛ nnyew a, ebɛn adze ntsir a?*
27	Why is personal hygiene of a street food vendor important?	*Ebɛn adze ntsi na ahotsew ho hia ma edzibantɔnnyi?*
28	What factors do you take into consideration before you buy the ingredients for your vended food?=	*Ndzɛma a edze yɛ w'edziban no ebɛn adze nna ehwɛ ho ana atɔ?*
D. VENDOR PRACTICES		
29	Where do you prepare the food you sell? **(observe)**	*Edziban yi a etɔn yi eyɛ wɔ hen?*
30	Are you a licensed street-food vendor?	*Ana ewɔ krataa a ɔma wo tum dɛ ebɔtɔn edziban?*
31	Have you had any medical check up ?	*Ana w'ahwehwɛ wo bogyaa mu afe yi mu ana eretɔn edziban yi?*
32	If yes, after the first medical examination how frequent have you been having the medical examination?	*Ana wɔhwehwɛɛ wo bogyaa mun' wasan ahwehwɛ wobogyaa mu bio? Mpɛn ahen?*
33	Cleanliness of the immediate environment where food is prepared (***Observe***)	
34	Is vending site near any of these?	

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	(***Observe***)	
35	Is vendor in Apron/ protective garments? (***Observe***)	
36	How clean is food handler's finger nails? ***(Observe)***	
37	Is vendor's hair covered ? ***(Observe)***	
38	Does she/he handle food with bare hands? ***(Observe)***	
39	What do you use for washing your hands? ***(Observe)***	
40	What is the Mode of Display of Food ***(Observe)***	
41	What is used to serve your food? (***Observe)***	
42	Are utensils/plates for serving food clean ***(Observe)***	
43	What type of water is used for washing dishes/utensils?	*Ebɛn nsu na edze hohor wo nkyɛnseem nna mprɛtsem' ?*
44	Which type of water is used in cooking?	*Ebɛn nsu na edze yɛ w'edziban?*
45	What do you do with daily left-over food?	*Sɛ w'edziban yi ibi ka a, edze yɛ dɛn ?*
46	Where do you dispose of refuse/garbage?	*Hen na edze wo wura gu?*
47	Where do you dispose of your dirty used water?	*Hen na edze wo nsufi gu?*

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48	Where do you go if you need to use the toilet? (*can be more than one answer*)	*Sɛ epɛ dɛ egya wo nan a (ekɔ tseefi a) hen na eyɛ wɔ?*
49	What do you do after you visit the toilet?	*Ana egya wo nan wie a eyɛ dɛn?*
50	Is vended food exposed to vectors (eg. flies, rats)?(***Observe)***	
E. ENFORCEMENT, COMPLIANCE & SANCTIONS		
51	Is your vending business Inspected?	*Ana mpanyimfo bi ba bɔhwɛ dɛ eridzi mbra do?*
52	If Yes, how often?	*Sɛ nnyew a, mpɛn ahen na wɔba?*
53	Who does the inspection?	*Hɔnanom na wɔtaa ba bɔhwɛ* w'edwuma dɛ iridzi mbra do?
54	Do the inspections have any effect on your work?	*Ana hɔn mbae no nya nsunsuando bi wɔ w'edwuma do?*
55	If yes, what effects?	*Ebɛn nsunsuando a?*
56	Have you ever you been sanctioned by the authorities?	*Ana wɔabo wo sombo wɔ w'edziban tɔn ho da?*
57	If yes, what was your offence?	*Sɛ nnyew a, eyɛɛ ebɛn bɔn ntsir a?*
58	What was your sanctions?	*Ebɛn asotwe na wɔdze maa wo?*
59	Are you a member of any food association?	*Ana edɔm edzibantɔnfo kuw bi?*
60	If yes, specify the type of association	*Ebɛn kuw a?*
61	What role does your association play?	*Ebɛn edwuma na wo kuw no yɛ?*

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62	In your opinion, what should be done to improve the safety of street vended foods in this district/municipality?	*Ebɛn adze na ohia dɛ wɔye ama ekwan ho edziban a wɔtɔn ho atsew wɔ mansin yi mu?*
THANK YOU FOR YOUR COOPERATION		**MEDA WO ASE PII**

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IN-DEPTH INTERVIEW GUIDE

DISTRICT/MUNICIPAL ENVIRONMENTAL HEALTH OFFICERS

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. What are the types of street-food vendors common in your municipality/district?
2. Explain if any, the regulatory procedures street-food vendors go through before they start doing business and after they start doing business to ensure food safety.
3. Does your unit/department maintain any register for street-food vendors? How many are registered?
4. Do you have any operational food-related bye-laws, standards or regulations? Explain.
5. How do you enforce street-vended-food regulation in your municipality/district? How effective has your department been in achieving street-vended-food safety?
6. What are the main risk factors to street-food safety in your municipality/district?
7. Have you had any cholera outbreak in your district in the last two years? What was the source? What does your department do in the event of cholera outbreaks?
8. How adequate is your street food health inspection personnel?

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9. Do you provide training for your staff or street-food vendors? Explain.

10. Which agencies, departments or organizations collaborate with you in enforcing food legislation and regulations in your districts? What role do they play?

11. How do you deal with infractions, infringements and non-compliance with food legislations by food vendors? What are the accompanying penalties or sanctions? Give examples.

12. Are there any problems, challenges or limitations in the enforcement of street food regulations? Are there any favourable factors?

13. How can street-vended- food safety be improved in your municipality/district?

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IN-DEPTH INTERVIEW GUIDE

REGIONAL ENVIRONMENTAL HEALTH OFFICER

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. Explain theregulatory procedures street-food vendors go through before they start doing business and after they start doing business to ensure food safety.
2. Does your department maintain any register for street-food vendors? How many are registered in the region?
3. Do you have any operational food-related standards or regulations for the region? Explain.
4. How do you enforce street-food regulation in the Central Region. How effective has your department been in achieving street-vended-food safety?
5. What are the main risk factors to street-food safety in the region?
6. What does your department do in the event of emergency situations like cholera outbreaks?
7. How adequate is your street food health inspection staff in the region? How many are they?
8. Do you have a documented training plan for your staff or street- food vendors? Explain.

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9. Which agencies, departments or organizations do you collaborate with in enforcing food legislation and regulations in your districts? What role do they play?

10. Are there any problems, challenges or limitations in the enforcement of street food regulations? Are there any favourable factors?

11. How can street-vended- food safety be improved in this region?

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IN-DEPTH INTERVIEW GUIDE

MUNICIPAL/DISTRICT DIRECTORS OF HEALTH SERVICES

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. What role does your department play in ensuring street-vended-food safety for the consumer in your district/municipality? How effective has your department been in performing that role?
2. Does your department have a documented training or education plan for street food vendors, health inspectors or consumers? Explain.
3. Which food-related diseases are prevalent or common in your district/municipality?
4. Has there been any cholera incidence or outbreak in your district within the last two years? What was the source of the outbreak? How widespread or fatal was it?
5. What do you do in the event of emergency situations like cholera outbreaks/epidemics? Is your department resourced to meet those challenges?
6. What are the main risk factors to street-food safety in your municipality/district?
7. Explain the level of collaboration between your department and the Metropolitan/Municipal/District Assembly or other agencies or departments if any, in ensuring safe street-food in your district.

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8. Are there any problems, challenges or limitations that your department encounters if any, in the enforcement of street food regulations? Are there any favourable factors?

9. How can street-vended- food safety be improved in your municipality/district?

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IN-DEPTH INTERVIEW GUIDE

REGIONAL DISEASE CONTROL OFFICER

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. What role does your directorate play in ensuring street-vended-food safety for the consumer in the region? How effective has your department been in performing that role?
2. Does your directorate have a Health education plan for street food vendors, health inspectors or consumers? Explain.
3. Which food-related diseases are prevalent or common in the region? Has there been any cholera incidence or outbreak in your district within the last two years? What was the source of the outbreak? How widespread or fatal was it?
4. What do you do as a directorate in the event of emergency situations like cholera outbreaks/epidemics? Is your department resourced to meet those challenges?
5. What are the main risk factors to street-food safety in the region?
6. Explain the level of collaboration between your directorate and the Regional Coordinating Council, Metropolitan/Municipal/District Assemblies or other agencies or departments if any, in ensuring safe street-food in the region.

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7. Are there any problems, challenges or limitations if any, in the enforcement of street-vended- food regulations? Are there any favourable factors?

8. How can street-vended food safety be improved in the region?

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IN-DEPTH INTERVIEW GUIDE

FOOD AND DRUGS AUTHORITY

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. What role if any, does your Authority play in ensuring the safety of street-vended-food for the consumer in the region?
2. How effective have you been in performing that role? Explain.
3. Do you have FDA offices in the districts of the Central Region? How do you perform your functions in the districts?
4. Does your Authority provide training for street food vendors, health inspectors or consumers on food safety? Explain.
5. What are the main risk factors to street-food safety in the Central Region?
6. Which agencies, departments or organizations do you collaborate with in enforcing street-food legislations or regulations in the region?
7. How do you deal with infractions, breaches or non-compliance with food legislations?
8. Are there any problems, challenges or limitations that your Authority encounters if any, in the enforcement of street food regulations? Are there any favourable factors?
9. How can street-vended- food safety be improved?

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IN-DEPTH INTERVIEW GUIDE

MUNICIPAL/DISTRICT DIRECTORS OF FOOD & AGRICULTURE

Street-vended food: Risk Factors and Regulation Enforcement in Selected Ditricts in the Central Region of Ghana.

Introduction: This research is purely for academic purposes. Its aim is to study street-vended-food in Central Region. I assure you that all the information you provide will be treated private and confidential.

1. What role if any, does your Department play in ensuring the safety of street-vended-food for the consumer?
2. How effective have you been in performing that role? Explain.
3. Does your Department have a training or education plan for street food vendors, health inspectors or consumers? Explain.
4. What are the main risk factors to street-food safety in your district?
5. Explain the level of collaboration between your department and the metropolitan/municipal/District Assembly or other agencies or departments if any, in ensuring safe street-vended-food in your district.
6. Are there any problems, challenges or limitations that your department or district encounters if any, in the enforcement of street food regulations? Are there any favourable factors?
7. How can street-vended food safety be improved in your district ?

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FOCUS GROUP DISCUSSION GUIDE

CONSUMERS OF STREET-FOOD IN CENTRAL REGION

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF FGD PARTICIPANTS

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

DATE_____

LOCALITY_____**DISTRICT**_____

#	Sex	Age(Yrs)	Marital Status	Educ. Status	Occupation

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FOCUS GROUP DISCUSSION GUIDE

CONSUMERS OF STREET-VENDED FOOD

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region of Ghana.

DATE_____TOWN/VILLAGE_____

DISTRICT_____

Introductory Statement: This research is purely for academic purposes. Its aim is to study street-food in the Central Region. I assure you that all the information you provide will be treated private and confidential.

1. **Socio- demographics of Participants: (**Sex**,** Age, Marital Status, Educational status, Occupation)
2. Do you often prepare the food you eat at home or you buy it from elsewhere?
3. Do you patronize street-vended-food? Explain why you buy street-vended-food. How often?
4. Which types do you buy often? What are your reasons?
5. What are your reasons for patronizing a particular street-food vendor?
6. What do you think are the risk factors to street-vended-food safety in this community?
7. Can street –vended-food be a source of disease? Which disease(s) could be caused by street-vended food?
8. Have you or any member of your family suffered from any of them within the past one year? Which? Explain.

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9. What are your sources of information on street-vended- food safety?

10. What do you do as a consumer to ensure that street-vended food you eat is safe?

11. Is hand-washing important? When do you normally wash your hands? Explain.

12. Which authorities are responsible for ensuring that street-vended foods are safe for consumption in this community? Do you think they have been performing their duties well? Explain.

13. Which advice will you give to street- food- vendors, Municipal/District Assembly and any other authorities regarding street-vended- food safety?

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FOCUS GROUP DISCUSSION GUIDE (FANTI TRANSLATION)

CONSUMERS OF STREET-VENDED FOOD

Street-vended food: Risk Factors and Regulation Enforcement in Selected Districts in the Central Region, Ghana.

DATE_____TOWN/VILLAGE_____

DISTRICT_____

Introductory Statement: Iyi yɛ nhwehwemu a yɛdze resua adze fano kwan ho edziban a wɔtɔn wɔ dɛm mansin yi mu. Mebebisa hom nsɛm. Mehyɛ hom bɔ dɛ asɛm biara a hom bɜkan' ɔbɜtsena ha yi ara . Yɛmbɔ obiara ne dzin wɔ asɛm a ɔbɛka ho.

1. **Socio-demographics of Participants:(**banyin/besia**,** mfe, Ana awar a? Ana ekɔr skuul koduu ahen? Eyɛ ebɛn edwuma?)
2. Ana etɔ edziban wɔ kwan ho anaa eyɛ wɔ fie?
3. Sɛ etɔ kwan ho edziban a ebɛn adze ntsi na etɔ kwan ho edziban? Mpɛn ahen na etɔ?
4. Ebɛn edziban nna etaa tɔ? Wo santsir nye dɛn?
5. Ebɛn sentsir ntsi nna etɔ edziban wɔ nyimpa kor bi hɔ?
6. Ebɛn ɔhaw nna ɔwɔ kwan-ho edziban dzi ho wɔ kurow mu ha?
7. Ana kwan-ho edziban tum ma yɛreba a? Ebɛn yereba a?
8. Ana ɔwo anaa wo ebusuanyi bi enya yɛreba yi bi wɔ afe kor yi mu? Ebɛn yɛreba a?
9. Ehen na etsee dɛ ohia dɛ edziban ho tsew?

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10. Ebɛn adze na eyɛ ama kwan ho edziban a idzin' ho bɛtsew?

11. Ana nsa ho nhohoree hia a? Ebɛnadze ntsir a? Ebɛn aber na ehohor wonsa ho? Kyerɛ ase.

12. Ebɛn edwumafo na ɔyɛ hɔn asɛdze dɛ wɔbɔhwɛ dɛ kwan-ho-edziban ho tsew? Ana wɔreyɛ hɔn edwuma yie? Kyerɛ ase.

13. Ebɛn afutu nna edze bɛma edziban tɔnfo, nna Assɛmblyfo, nna mpanyinfo fa kwan-ho edziban ahotsew?

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PARTICIPANT CONSENT FORM-INDEPTH INTERVIEW

I have read the benefits, risks and procedures for the research on Street-vended-food in the Central Region or have been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer and that I have the right to withdraw if I so wish.

_____ _____

Date Name and signature or Thumbprint of volunteer

If volunteers cannot thumbprint the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

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PARTICIPANT CONSENT FORM- FGD

I have read the benefits, risks and procedures for the research on Street-vended-food in the Central Region or have been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer and that I have the right to withdraw if I so wish.

_____ _____

Date Name and signature or Thumbprint of volunteer

If volunteers cannot thumbprint the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

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APPENDIX B

GLOSSARY OF DEFINITION OF TERMS

For purposes of this study, the following terminologies have the respective meanings stated:

- **Bola** – A local Ghanaian terminology for a site for crude dumping of usually solid wastes which sometimes get mixed up with liquid waste.
- **Chop Bar –**food eateries usually located in non-permanent structures in public places particularly along street which sell inexpensive local meals. The word chop is a West African slang that means 'food' or 'eat'.
- **Contaminant** – Any foreign matter, biological or chemical agent which unintentionally gets added to food and which may compromise food safety or suitability.
- **Dumsor** - a term used in Ghana to describe the phenomenon of frequent power outages.
- **Fast Food Joint** – small eatery made of simple structures along the street usually made of kiosk where ready-to- eat food are sold for immediate consumption by the consumer or sold in a 'take away' container to be eaten elsewhere.
- **Free Ranging** – Open and indiscriminate defeacation particularly at the beach or the bush or other unauthorised places.

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- **Hazard Analysis Critical Control Point System**- A system for identifying, evaluating, and controlling hazards to ensure food safety.
- **Primary production** – The steps in the food chain including planting, harvesting, sorting of food ingredients, animal slaughtering and fishing.
- **Ready-to-eat** - Food that is ordinarily eaten in the same state as that in which it is sold. It may be cooked or raw, hot or chilled, and can be consumed without further heat-treatment.
- **Risk factor** - risk factor to street-vended food safety is any condition, behaviours or practices emanating from breaches of hygiene or safety standards which predispose street-foods to microbiological, physical or chemical contamination. Risk denotes a measure of statistical probability of being ill if one is exposed to a risk factor
- **Street-food Centre -** Any public place from where a cluster of food vendors prepare, display and sell street-vended foods which may or may not be designated by the relevant District/Municipal/Metropolitan Assembly for such purposes.
- **Take Away** –human excreta packaged in a polythene bag and usually deposited at unauthorized places.
- **Tankasi –** A corrupted word from the phrase *town council* which is a traditional synonym for the term health inspectors.
- **Whitlow –** painful pus- producing- infection which usually affects the fingers or toes and locally called *kakaw* in the Fanti dialect.

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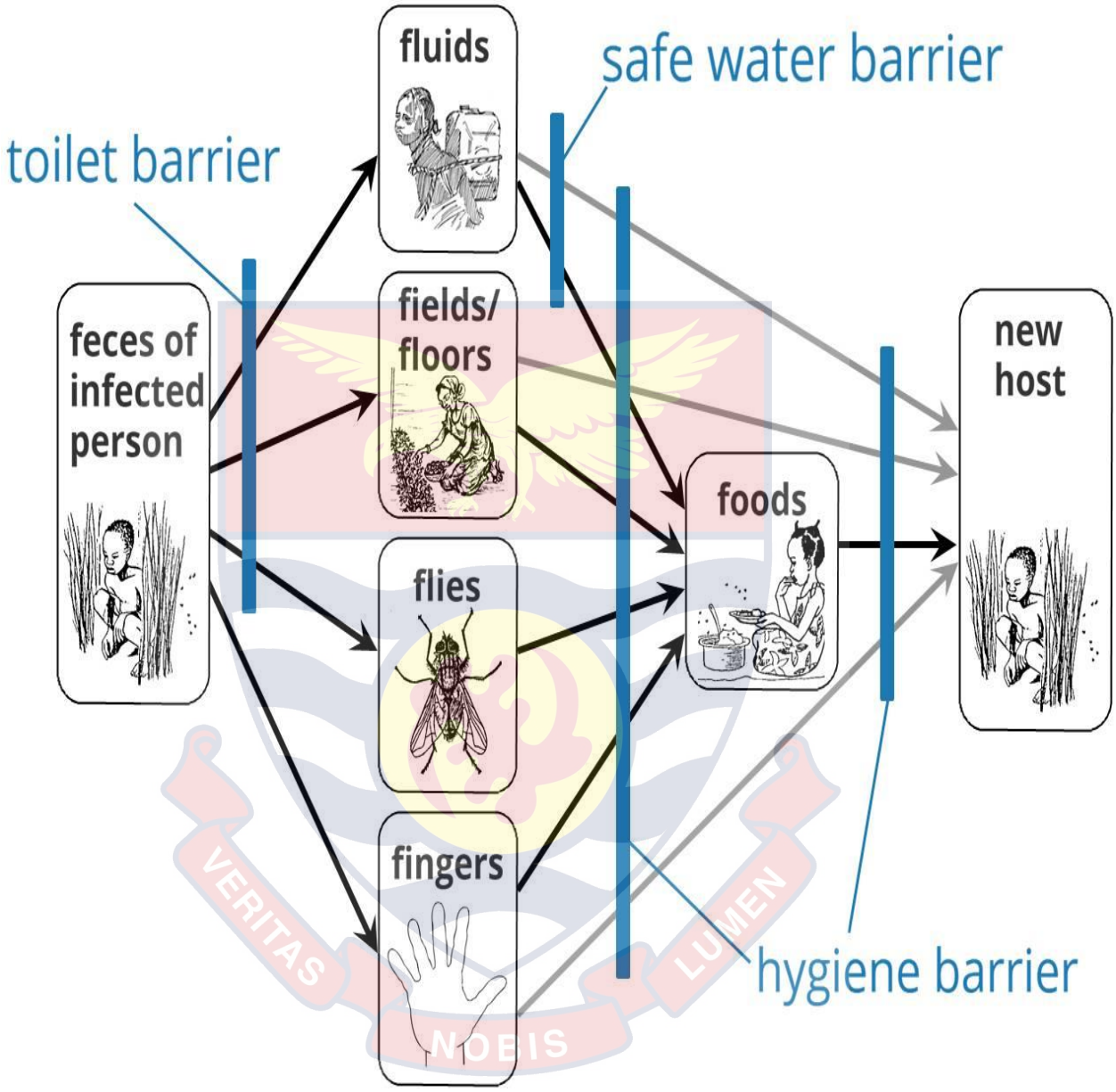
APPENDIX C



APPENDIX FIGURE C: **F-DIAGRAM (WHO, 1958)**

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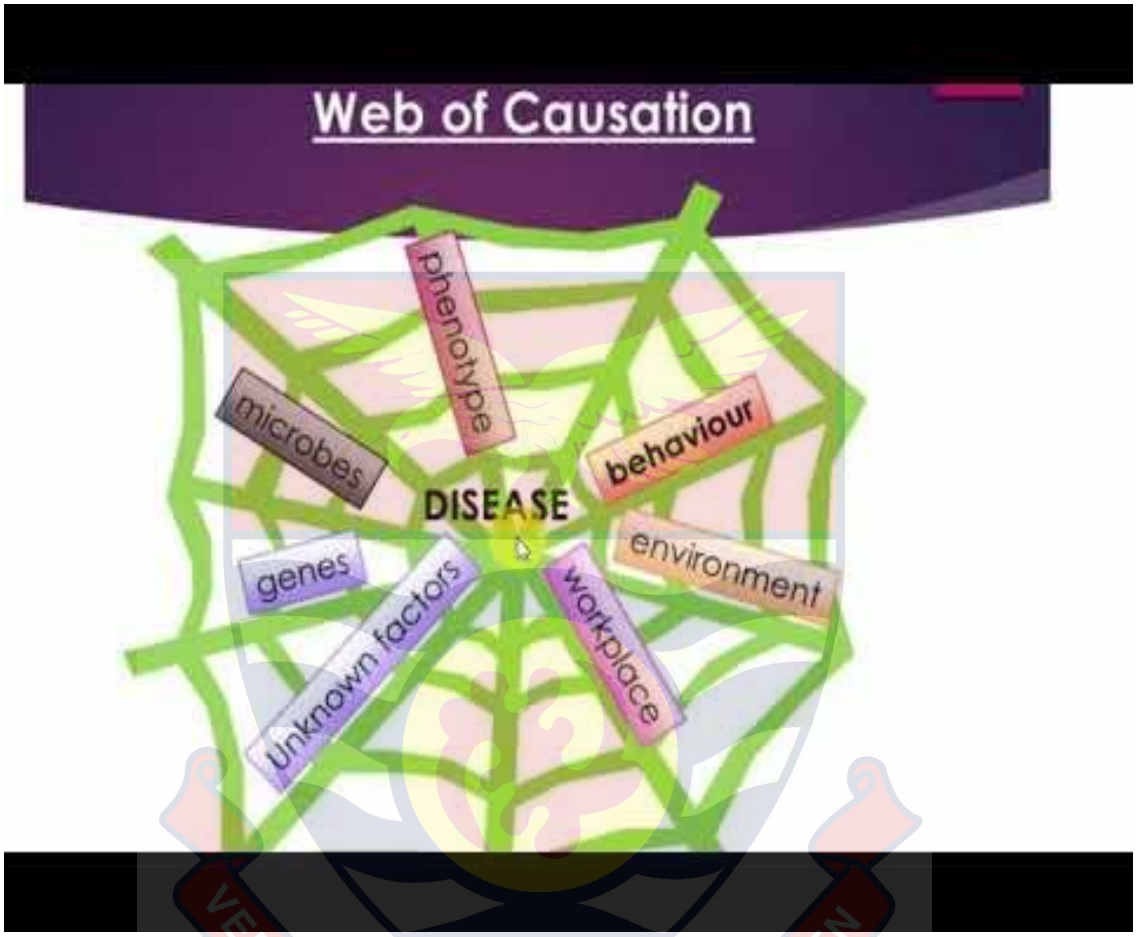
APPENDIX D



APPENDIX FIGURE D: **WEB OF DISEASE CAUSATION**

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APPENDIX E

TABLE A

STREET VENDED FOODS (FRUITS & VEGETABLES) SURVEYED

Food	Description	How it is Prepared	Accompaniments
Pineapple	Juicy tropical pine cone with spiny edged leaves	Sliced	-
Watermelon	Large, juicy fruit with a hard green rind and pink or red pulp having many seeds	Sliced	-
Orange	Reddish-yellow, round citrus fruit with a sweet , juicy pulp	Peeled and sliced	-
Sugarcane	Sweet tall tropical grass, source of common sugar	Peeled and sliced	-
Pawpaw	Yellowish melon-like fruit with many seeds	Peeled and sliced	-
Salad	Dish of mixture of fresh vegetables and fruits	No cooking	Rice, check check(fried rice sold by males)
Banana	Narrow, curved, sweet creamy flesh with yellow skin	Peeling	Groundnut
Groundnut	Legume with brittle pods ripening underground and containing edible seeds	Boiled,heated	Banana, roasted plantain
Apple	Round firm fleshy fruit with red, yellow or green skin	Slicing	_
Grapes	Small, round, dark purplish red juicy berry growing in clusters on woody vines	Eaten raw	_

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STREET-VENDED FOODS (BREAKFAST) SURVEYED

Breakfast	Description	How it is Prepared	Accompaniments
Koko	Fermented corn dough	Boiling	Koose(fried bean cake), bread
Rice water	Rice porridge	Boiling	Bread
Tea	Tea or coffee beverage	Boiling	Bread
Cocoa/milo	Cocoa beverage	Boiling	Bread
Bread	Kneaded flour dough	Baking	Tea, koko, ricewater
Boiled egg	Chicken egg	Boiling	Grinded pepper
Fried egg	Chicken egg	Frying	Bread

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STREET-VENDED-FOODS (SNACKS) SURVEYED

Snack	Description	How it is Prepared	Accompaniments
Ballfloat (Bofloat)	Fried flour dough	Frying in ball shapes	Koko,drinks, no accompaniment
Roasted Plantain	Ripe plantain	Slicing & Roasting	Groundnut
Cooked/Roasted maize	Cooked/Roasted maize cob	Boiling, roasting	Pieces of coconut, no accompaniment
Iced kenkey	Mashed kenkey with sugar additive	Mashing and packaging in bottles	Bread, no accompaniment
Kelewele	Spiced sliced pieces of ripe plantain	Frying	Roasted groundnut
Donought	Corn dough nut	Frying	No accompaniment
Atadwe milk	Bottled Tigernut milk	Boiling	No accompaniment
Khebab	Barbecue from beef, goat,pork, gizzard or sausage	Roasting	Pepper source,No accompaniment
Pancake	Thin flat cake of batter	Frying in a pan	No accompaniment
Meatpie	Baked flour dish sandwiched by meat	Baking	Drink,beverages,
Indomie	Salami type meal	Boiling	Eggs,bread
Spring rose	Fried flour dish sandwiched by meat or fruit	Frying	Drink, cocoa beverage
Sobolo	Pink Spiced Ginger drink	Boiling	No accompaniment

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STREET-VENDED FOODS (MAIN MEALS) SURVEYED

Food	Description	How it is Prepared	Accompaniments
Fufu	pounded cassava with plantain, cocoyam or yam),	Boiling and pounding	soups
Kokonte	Dried cassava flour	Heating and continuous stirring	soups
Banku	Fermented corn dough dumplings	Heating and continuous stirring	stews,Soups, fried or roasted fish
Gari	Fermented cassava flour	Used dry or cold water added	beans stew
Ga kenkey	Fermented corn dough dumplings.	Wrapped in corn husk and boiled	fried or grilled fish, Stews, Soups
Fanti kenkey	Fermented corn dough dumplings	Wrapped in plantain leaves and boiled	fried or grilled fish, Stews, Soups
Waakye	Rice and beans	Scooped into plate or bowl & served with spoon and hands	Pepper sauce, stew, salad, macaroni
Rice/jollof	Boiled rice	Scooped into plate or bowl & served with spoon and hands	Stews, chicken, salad
Yakeyake	Fermented cassava dough dumplings.	Heating	Fried fish with ground pepper or soup
Fried plantain	Fried plantain	frying	Beans stew
Kakro	Ground ripe	frying	Beans stew

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	plantain		
Omo tuo	Rice balls	Heating, continuous stirring & moulding into balls	soups
Akyeke	Fermented cassava with a yellowish look	Grating	Grinded pepper with fish
Aprapransa	Roasted maize flour mixed with palm nut soup with crab	Cooking	Stew, boiled crab
Tuo zaafi	Soft corn flour dumpling	Boiling and stiring	Soups eg okro, vegetable, palm nut, groundnut soups
Fried yam or potato	Fried yam or potato	frying	Stew, fried fish, fried chicken
Ampesi	Boiled plantain, cassava, yam, cocoyam	boiling	Stew, palava sauce
Fried fish	Fried fish	frying	kenkey,gari

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