NUTRITION STANDARDS AND NATURE OF FOODS SOLD AT THE UNIVERSITY OF GHANA CANTEENS

BY

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JULY, 2019
DECLARATION

I, Maxwell Bisala Konlan hereby declare that except for references made to other people’s work which have been duly acknowledged, this research is my own work. I affirm that this work has neither been submitted in whole nor part for the award of any degree.

........................................

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DEDICATION

This work is dedicated to the Almighty God for His grace and mercies, to my beloved mother of blessed memory and my entire family for their immense support and encouragement throughout this period of study.
ACKNOWLEDGEMENT

My endless appreciation goes to the Almighty God, whose abundant grace has seen me to the successful completion of this work as a climax to the MPH program.

My profound thanks to Dr Amos Laar, my supervisor for his support and encouragement that helped me to reach the completion of this work.

To the staff of Physical Development and Municipal Service Directorate (PDMSD), University Legal Aid, Hall Masters and Food service managers of eateries operating within the University of Ghana main campus, I am grateful for your support. I deeply appreciate the immense contributions from all respondents.
ABSTRACT

Background
Substantial evidence have shown that food environment contributes to the increasing obesity and other nutrition-related non-communicable diseases (NCDs) among children and adults. The increasing obesity prevalence and nutrition-related NCDs suggest there is a need for a more comprehensive and robust approach including regulating environmental food exposures. In certain jurisdictions, nutrition standards can regulate the nature and quality of foods sold in schools contributing to a healthy food environment.

Aim: The study aimed to determine the availability of nutrition standards and to assess the nature of foods sold in canteens at the University of Ghana.

Methodology: A cross sectional study design using both qualitative and quantitative methods was used. In-depth interviews were conducted with stakeholders who have core mandate in regulation of food service businesses in the University of Ghana. A Questionnaire was used to determine nature of food and food hygiene practices of canteens at the University of Ghana. Descriptive statistics were used to summarize data from the different food categories sold at the canteens and presented in the form of means, percentages, graphs, tables and charts. Proportions were calculated for categorical variables. Associations were determined between food categories and some selected food outlets characteristics using the Pearson chi square. A p-value less than 0.05 was regarded as significant.

Results: There was sale of energy-dense foods in canteens of the University of Ghana. Majority of the eateries sold sugar sweetened beverages (84.7%), refined carbohydrates (80.6%), and fried foods (93.9 %). The sale of fruits or vegetables and whole grains were 40.8% and 38.8% respectively. There was a significant association between the sale of sugar sweetened beverages and years of operation of food outlets. The study identified two nutrition standards that regulate food service business at the University of Ghana. These were food hygiene and safety standards (with University-wide application) and food-based standards (pertaining to the only female-residence of the University).

The food hygiene and safety practices of the food outlets determined from several food hygiene and safety factors was fair.

Conclusion: The University of Ghana canteens sell energy dense meals substantial consumption of which increases one’s risk to NCDs.
Majority of the food outlets were involved in the sale of sugar sweetened beverages, fried foods, refined carbohydrates compared to the sale of fruits and vegetables and whole grains. There was availability of food hygiene and food based standard with scanty information about its implementation and enforcement. The overall food hygiene score based on several factors to assess food hygiene and safety practices of the canteens was fair.
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LIST OF ABBREVIATIONS

FAO                                      Food and Agriculture organization.
HACCP                                    Hazard Analysis and Critical Control points
NCDs                                     Non-communicable diseases
PI                                       Principal investigator.
PDMSD                                    Physical Development and Municipal Services Development
SMEs                                     Small to Medium Size Enterprises.
WHO                                      World Health Organization
DEFINITION OF TERMS

Canteen: A canteen is a well demarcated area with a shed where food or drinks are sold in an organization.

Diet-related non communicable diseases: Type 2 diabetes, cardiovascular diseases and nutrition related cancers excluding micro nutrient deficiencies, under nutrition, osteoporosis, mental health and gastrointestinal diseases.

Food hygiene: Food hygiene are the conditions and measures necessary to ensure the safety of food from production to consumption.

Food environment: A food environment is the collective physical, economic, policy and social cultural surroundings, opportunities that influence people’s food and beverage choices and nutritional status.

Healthy food: Foods recommended in national food based dietary guidelines or food based standards.

Healthy food environment: A food environment that promotes the health and well-being of an individual is known as a healthy food environment.

Nature of foods: Refers to the food based categorization of a particular type of food which predicts its nutritional significance.

Non Communicable Diseases: A non-communicable Diseases also known as chronic diseases are diseases which have a long duration as result of genetic, physiologic, environmental and behaviour factors.

Nutrition standards: A Set of standard protocols that determine the wholesomeness and type of food sold in a particular jurisdiction, which could be in a form of nutrient based, food based standards or food hygiene and safety standard.
Obesity: Obesity is defined as a state of increased body weight due to adipose tissue accumulation which is of significant magnitude to cause an adverse health effect.

Special diet: Special diet is any regular diet which has been modified by restriction of one or more nutrients for therapeutic purposes.

Unhealthy foods: Processed foods and refined beverages high in saturated, trans and added sugars and/or salt.
CHAPTER ONE

INTRODUCTION

1.1 Background

Food and eating environment likely contribute to the increasing endemic of obesity and chronic diseases (Mary Story, Karen M. Kaphingst, Ramona Robinson-Obrien and Karen Glanz, 2008). Although food choices and eating habits can emanate from many sources, school food environment have a significant influence on students diet and play an important role in teaching and modelling appropriate health behaviours (Nicole Larson and Mary Story, 2010).

There have been several individual-based interventions to tackle obesity in schools but most of these interventions have had limited success (Karen Glanz, James F. Sallis, Brain E. Saelens and Lawrence D. Frank, 2005). Addressing obesity epidemic and diet related chronic diseases demand new focus on environmental food exposures that discourage excessive energy intake (Cummins & Macintyre, 2006). Food environment influences what is being consumed and hence addressing obesogenic promoting factors within the food environment can effectively curtail the obesity menace (L'Abbé et al., 2013). In certain jurisdictions there are evidences of reduction in high sugar, salt and fatty foods sold within the school environment. This has been attributed to the existence and implementation of nutrition standards policies regulating the nature and types of food sold in such environment (Story et al., 2008)

Nutrition standards for the purpose of this study is defined as set of standard protocols that determine the wholesomeness and type of food sold in a particular jurisdiction, which could be in a form of nutrient based standards, food based standards or food hygiene and
safety standard. (L’Abbé et al., 2013). Stronger food policy and nutrition standards in schools are needed to provide healthy meals to students and limit their access to low nutrient and energy dense meals while increasing their frequency, duration and intensity of physical activity (Story, Nanney, & Schwartz, 2009).

Nature of foods refers to the food based categorization of a particular food which can be used to predict its nutritional significance (L’Abbé et al., 2013). Nutritional profile and nature of foods sold in the public settings contribute substantially to excessive energy intake leading to obesity epidemic (Swinburn et al., 2011). Also food hygiene practices in schools can affect the nature of foods offered for sale and pre-dispose school children to food borne illnesses and hence it is of importance to assess the food hygiene practices of school canteens. Out-of-home eating has increased considerably over the past decades and contributes significantly to excessive energy consumption (Story et al., 2009). Eating out of home presents additional nutritional challenges compared to home foods (Lachat et al., 2009).

When entering the University, many students leave their family environment and reside in the University. The University canteens are important contributor to out-of-home consumption of meals for students and staff. It has been shown in other contexts that school canteens can contribute to creation of an obesogenic environment (Bell & Swinburn, 2004), but can also represent an opportunity to improve students’ diet through effective strategies to regulate food environment through strengthening of existing food standards within the school environment. Elsewhere school authorities show positive attitudes about providing a healthy food environment but have limited commitment in enforcing food standards in their schools (Neumark-Sztainer, French, Hannan, Story, & Fulkerson, 2005).
Over the years, the number of canteens in the University of Ghana has increased with increased student enrolment.

Despite the increasing establishment of these canteens, there is limited information on the nutrition standards and protocols that regulate the operations of these canteens as well as the nature of foods sold in these canteens. This study therefore, sought to determine nutrition standards and nature of foods sold in within the Canteens of University of Ghana.

1.2 Problem Statement
There has been a global shift from consumption of home-made meals to frequent consumption of outside meals hence addressing obesity demands focus on environmental food exposures (Lachat et al., 2009).

Poor dietary and lifestyle related changes are risk factors for increase trend of obesity with a global prevalence of 39% and 13% for overweight and obesity respectively (WHO, 2004). This increasing trend of obesity poses a major risk of diet-related non-communicable diseases including diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer (Glanz et al., 2005).

Africa is experiencing nutrition transition with increased consumption of meals outside from home. This transition has an adverse outcome of rapid economic development and globalization (Dalal et al., 2011). A notable trend that is observed as a result of this nutrition transition is a shift in our source of food. Frequent consumption of unhealthy meals outside home contributes to obesity. The increasing trend in obesity is influenced by unhealthy food
environments due to lack of nutrition standards to regulate the nature and quality of healthy foods sold at food service canteens (L'Abbé et al., 2013).

The school food environment can contribute to obesity due to the poor quality of meals sold at the canteens of the schools (L'Abbé et al., 2013). A systematic review and meta-analysis of overweight and obesity epidemic in all the ten regions of Ghana by Ofori-Asenso et al., (2016) indicates that nearly 43% of Ghanaians are either overweight or obese with national prevalence of overweight and obesity estimated to be 25.4% and 17.1% respectively. Obesity prevalence in the University of Ghana has been on the rise with associated increase in non-communicable diseases. A research conducted by Mohammed and Vuvor (2012) to investigate the prevalence of obesity in University of Ghana basic school children reported high prevalence of obesity of 10.9%. Another study conducted by Sutherland et al., (2018) to investigate the causes of death at the university of Ghana hospital from 1979-2015 found almost 60% of deaths were caused by NCDs. The study found that there was a shift from communicable to non-communicable diseases. Among the top ten causes of death were cardiovascular diseases and cancer. Diet plays a very important role in the development of NCDs and hence for this matter it is of relevance to investigate the food environment that expose students and staff to these increase risk of NCDs since they spend more hours in the University.

This increasing obesity prevalence demands a more robust approach looking beyond individual based approach by assessing the environmental food exposures where individual based decisions are made (Cummins & Macintyre, 2006). There is increasing drive to achieve economic sustainability, making people to work out of home and hence relying on out-of-home meals (Lin, Guthrie, & Frazão, 1999).
Out-of-home meals contribute significantly to individual energy intake leading to the obesity epidemic (Lin et al., 1999). University canteen meals are considered out-of-home meals to students and staff. Due to convenience, majority of students eat 90% of their meals from university canteens according to a study by L’Abbe et al., (2013). Though the study was not done in Africa and for that matter Ghana, but there is likelihood of a similar trend among University of Ghana students.

Despite the increased risk of excess energy consumption these canteen foods may present, there is paucity of data on the nutrition standards and nature of meals sold in most public university canteens in Ghana.

Nutrition standards in most schools are important for making healthy foods available by providing a way of standardizing the nutritional quality of foods offered across the jurisdiction (L’Abbé et al., 2013). Obesity epidemic in most schools cannot be mitigated if out-of-home meals such as school canteens are not regulated by food standards to provide a healthy food environment (L’Abbé et al., 2013). A healthy food environment makes it easy for achieving success in individual based interventions targeting obesity and diet-related diseases (Cummins & Macintyre, 2006). In this regard, there is a need to determine nutrition standards and assess the nature of foods sold in the university of Ghana canteens.

1.3. Conceptual framework.

This study used an adapted modified logic framework for creating healthy food environment by Robles et al., (2012). The framework illustrates that nutrition standards such as food base, nutrient and food hygiene and safety standard can regulate the nature foods offered for sale in eateries as well as Food hygiene and safety of foods. Improved food hygiene and
safety can also improve the nature of foods by ensuring food is free from contamination. This can help maintain the nature and nutritional quality of foods. The improved nature and nutritional profile of foods therefore lead to healthy food environment making healthy foods accessible in eateries. The availability of healthy meals consequently leads to improved dietary intake and this result in better health outcomes such as reduced obesity risk, reduced risk of cardiovascular diseases and diet-related NCDs.

**Figure 1.1: Conceptual framework for nutrition standards and nature of foods**
1.4 Justification of Study

This study needs to be done to provide baseline data on the availability of nutrition standards and nature of foods sold at the canteens of University of Ghana hence this will contribute to provide a healthy food environment.

The study will influence food policy and decision making in most public Universities in attempt to address the increasing global trend of obesity since out-of–home meals increase obesogenic environment (Bell & Swinburn, 2004). This data will be helpful for both public University management and the government for targeting interventions to improve the standards of food canteens within the public Universities in Ghana.

In Ghana, this research will provide a preliminary data to government and University management to strengthen existing nutrition standards and food policies in the public setting and University Canteens there by contributing to a healthy food environment. The provision of a healthy food environment will lead to a population wide benefits by limiting the exposure of people to foods high in fat, sugar and salt and reduce their risk to obesity and dietary related non-communicable diseases.

The study results will bring to light the nature of foods sold in the university canteens and its influence on obesogenic environment at the University campus. The results of the study will be used as preliminary data to trigger action campaign to curb the public health burden of obesity through strengthening of the existing food standards and limiting availability of certain foods that are high in sugar, salt and fat.
1.5 Objectives of the Study

1.5.1 General Objective

The objective of the study was to determine the availability of nutrition standards and to assess the nature of foods sold at the University of Ghana canteens.

1.5.2 Specific Objectives

1. To determine the availability of nutrition standards for regulating food services at the University of Ghana.

2. To assess the nature of foods sold at the canteens of University of Ghana.

3. To assess the food hygiene and safety practices at the University of Ghana Canteens.

1.5.3 Research Questions

1. What nutrition standards regulate food service business at the University of Ghana?

2. What is the nature of foods and non-alcoholic beverages sold at the university of Ghana canteens?

3. What are the food hygiene practices of canteens at the University of Ghana?
CHAPTER TWO

LITERATURE REVIEW

This review of literature was conducted by searching for words and phrases relevant to the topic from search engines such as PubMed, ScienceDirect, Google scholar and Google. The Boolean operators “AND” and “OR” were used to broaden or restrict the search. References cited in retrieved articles were also followed up and used where they were found relevant.

2.1 Nature and Profile of Foods in Public Schools

The nature and profile of foods sold in universities can present a major setback to fighting the ever-increasing prevalence of obesity among students. Food access and availability determine what is being consumed by students (Deliens et al., 2014). Therefore, a food environment which provides poor nature and quality of foods will predispose students to unhealthy food choices and hence increase their risk of obesity and diet-related NCDs.

Poor nutritional profile and nature of foods sold in schools can contribute to the increasing rate of adolescence obesity in most schools (Craypo et al., 2002). A study done in California to investigate the frequency of fast foods sold in Californian high schools, found high prevalence of fast foods sold in schools (Craypo et al., 2002). The study reported that 65% of students liked fast foods in the 105 districts sampled (Craypo et al., 2002). This has implications for increasing the risk of obesity and diet-related NCDs in schools as fast foods may put students at risk of excessive energy consumption.

Another study done to assess the nutritional profile of foods sold in a Belgian university reported that 17% of the meals consumed contained 2000mg of sodium. On the average 37.5% of the meals were supplied from fat (Lachat et al., 2009). The meals consumed were
high in fat and protein compared to the Belgian university recommendations for a hot lunch (Lachat et al., 2009). The study by Lachat et al., (2009) confirms that nutritional profile of foods sold in public Universities are of poor quality contributing to excessive energy consumption. Therefore, there is a need for sustained efforts by introducing nutrition standards to regulate the food choices by limiting the sale of energy dense foods while promoting the sale of fruits and vegetables.

2.2 Nutrition Standards in Schools

Improving nutrition standards in schools is key strategy to improving healthy food environment thereby reducing risk of obesity and non-communicable diseases (L'Abbé et al., 2013). Students eat majority of their meals from school canteens and hence school canteens can provide an opportunity in reducing foods high in fat, sugar and salt while increasing the intake of whole grains, fruits and vegetables (L'Abbé et al., 2013). In a review study by L’Abbe et al., (2013), several studies revealed that most public settings including schools have no nutrition standards in place with little information on nature of foods offered for sale in these schools.

It has been reported in other jurisdiction that strengthened nutrition policies in most schools can contribute to healthy food environment and limit the availability of foods high in fat, sugar and salt leading to reduction in obesity epidemic and diet-related NCDs (L'Abbé et al., 2013). Food environments contribute to the increasing obesity epidemic and chronic diseases. Healthy food environments and strengthened nutrition standards are effective strategies for creating population wide improvements in eating among school children (Story et al., 2008).
Over the years, most school authorities have shown limited commitment in setting nutrition or enforcing nutrition standards or policies in schools. A study by Simone et al., (2002) to investigate school food policies and practices found that 65% of the School Principals believed it was important to have a nutrition standard or policy in their schools but only 32% of them had a policy or nutrition standard in their schools. The study found school authorities having a positive attitudes about providing a healthy food environment but 98% of the schools had soft drink vending machines with 77% having contracts with soft drink companies. This study results, reinforces the fact that most should authorities have adequate knowledge about the fact that nutrition standards are vital to improving students eating habits but there is lack of political commitment on the part of school authorities to either set nutrition standards or enforce the few existing ones to improve upon healthy food environment in schools. With schools being a very important avenues to shape and improve the eating habits of students, lack of sustained effort towards establishing nutrition standards will have implications for reduced risk of obesity and diet-related NCDs.

2.3 Food Environment and Obesity

Obesity is an imbalance of energy input and output leading to excessive accumulation of excess body fat which is of significant magnitude to cause an adverse health effect (Cummins & Macintyre, 2006). A food environment is the collective physical, economic, policy and socio-cultural opportunities and conditions that influence people’s food and beverage choice and nutritional status (Laar et al., 2018). Researchers have described food environment using the ecological models. There are four community food environments identified which include; community, organization, consumer and information food environments.
Several individual based dietary interventions have yielded less success with wide spread of obesity suggesting the need to focus on environmental food exposures where individuals based decisions are made in order to effectively fight the obesity menace (Cummins & Macintyre, 2006). Several observational studies have established unhealthy food environment and obesity rates to be higher in low income and deprived area. This contradicts the initial notion that, obesity is the disease of the affluence.

A study conducted by Morland and Everson (2009) to investigate the disparities of access to healthy foods in the United states found that the prevalence of obesity was lower in areas that had supermarkets with healthy meal options compared to areas with small grocery stores or fast food restaurants. This confirms the assertion that types of food stores and restaurants available in a particular locality determines food choice of consumers. The results of their suggested that the prevalence of obesity was lowered by 0.73 in areas that had at least one super market while each mile closer to a super market was associated with 6% increase in obesity. A higher prevalence of obesity was associated with more than one franchised food restaurant (Morland & Evenson, 2009).

In reviewed studies by Holsten (2008) found five (5) out of the seven (7) reviewed studies showing significant association between obesity and unhealthy food environments. These findings suggest food environments may play a vital role to foods offered for sale and predispose people to increased consumption of energy dense foods leading to increased risk of obesity.
2.4 Food Hygiene Practices in Public Setting Canteens.

Food safety and hygiene represent a key role to combating cholera outbreak and food poisoning in most public settings. However, there is limited available data regarding hygiene practices in most institutions in Ghana. A literature review to assess food safety and food hygiene studies in Ghana reported that there were variations in the safe levels of microbial levels in foods with most food canteens not adhering to international food safety management systems especially among the locally owned food businesses (Foriwaa & Lovatt, 2015). Based on the findings of the review study by Foriwaa and Lovatt (2015), they recommended food hygiene and safety training and implementation of HACCP as key to addressing food hygiene problems in public sector eateries.

In another study to assess the food hygiene knowledge, attitudes and practices of food vendors in Accra the study revealed that, food hygiene knowledge and attitudes were satisfactory, however its use was challenging (Annor & Baiden, 2011). Also gender, educational level of respondents, age of respondents did not influence their food hygiene practices. Microbial count of food samples were generally high and the food hygiene knowledge and attitudes of the food handlers did not result in efficient food hygiene practices (Annor & Baiden, 2011).

In a study by Marras et al., (2016) to investigate food hygiene practices of street food vendors in Accra, it was found that one half of the food vendors had valid food handler certificate. The overall based food hygiene score on quantitative analysis found that three quarters of the street food vendors scored between fair and extremely good. It turned out that the overall food hygiene and safety among the street food vendors was good.
The study also found that 3.5% of food outlets near schools having food handler certificate compared with whole sample, those with food hygiene training in the last year was 5% higher and medical training was 3% higher compared the overall sample. The overall food hygiene score was high in food eateries near schools compared to the sample of street food vendors.

2.5 Diet and Non-Communicable Disease

Diet-related NCDs is a leading cause of mortality with increase disease burden in low and middle income countries (Lachat et al., 2013). World Health Organization (WHO) has recommended healthy diet as one of shared risk factors to reduce the risk of NCDs (Ministry of Health- Ghana, 2012). There is a link between consumption of saturated, trans and high sodium diet with increased risk of NCDs such as hypertension, ischemic heart diseases, diabetes, certain types of cancer among others (WHO, 2003). Increased consumption of fruits and vegetables have been shown to reduce the risk of NCDs yet fruits and vegetable consumption have been reported to be low among individuals (WHO, 2003). There is the need to educate people to increase their consumption of fruits and vegetables and also ensure food environment that promotes the sale of fruits and vegetables. The World Health Organization in an effort to curb the proliferation of NCDs developed the global strategy on diet, physical activity and health. The document provides a tool for countries to adapt and implement the global strategy at national level. The frame work consist of population based approaches to increasing physical activity and global strategy on diet and marketing of food and non-alcoholic beverages to children. Despite these global efforts and strategies, there has been lack of commitment from government of member nations to effectively implement these strategies with continuous increase in NCDs (Lachat et al., 2013). In a systematic review on policies promoting the role of diet and physical activity for prevention of NCDs
in low and middle income countries found 83% of policies but few countries proposed actions to promote healthier diet (Lachat et al., 2013). Also in this same study only 12% had policies addressing all the four risk factors (alcohol intake, cigarette intake, unhealthy diet and physical inactivity).

The disconnect between burden of NCDs and national responses to NCDs is a worrying trend as national nutrition policies or standards have a potential to regulate food environments and result in population wide benefits to curb the NCD epidemic.

2.6 Nutrition Services in Schools

Schools can be used as a medium to promote healthy dietary behaviors and help ensure appropriate nutrient intake (O’Toole et al., 2007). However, though most school authorities show positive attitudes towards improving nutrition services in their schools yet only a few schools have policies to regulate food services (French et al., 2002).

There have been increasing interest in foods sold in schools with some jurisdictions setting nutrition standards to regulate the sale of certain foods in schools. Despite the increasing concern, several schools do not have any policy or standard with the few who have not fully enforcing them. Such low commitment on the part of school authorities can have implications on nutrition services offered in schools.

In a study to investigate nutrition services and foods available in schools in the United States of America found that few states required schools to restrict the availability of deep-fried foods and prohibit the sale of foods that have low nutrient density.
Nutrition services in schools should be improved by ensuring opportunities to eat and drink at schools and to encourage daily consumption of whole grains, vegetables, fruits and low fat dairy products (O’Toole et al., 2007). Improved nutrition services in schools need improvement to reduce the risk of obesity among students with implementation of food preparation practices that reduce total fat, saturated fat, sodium and added sugar content of school meals (O’Toole et al., 2007).

2.7 Nutrition standards and policies in Ghana.
Nutrition standards serve as model for shaping eating habits of students in several settings. There is some evidence suggesting that nutrition standards if well enforced at the national or school levels can serve as an effective regulation of unhealthy food environments and hence reduce the risk of people to obesity and diet-related NCDs. There have been several nutrition policy interventions in many countries in attempt to combat unhealthy food environment towards reducing obesity and diet-related NCDs (Laar et al., 2018).

The government of Ghana signed the convention of WHO global strategy on diet, physical activity and health in attempt to foster healthy food environments through nutrition policy or standards. However, review of literature brings to light staggering nature of nutrition standards at the national, work or school levels. A literature review to assess Ghana’s policies for creating healthy food environments revealed that, there was no published evidence of nutrition standards for food composition however, the study found that, the 2012-2016 strategy focusing on prevention and management of non-communicable diseases (NCDs) suggest that attempts may be made in future to address nutrition composition. In this same study there was evidence of some progress of food composition standards in some countries, for example in Denmark the government has adopted a law on mandatory
maximum limits of sodium permitted in meat products, breads, soups seasonings and tinned foods. Also in South Africa, the government has adapted nutrition standards for target of salt reduction for some food categories (Laar et al., 2019)

There was also no evidence of national nutrition standards in schools or work place. The Ghana government since 2005 has been implementing the School Feeding Program aimed at providing one warm nutritionally adequate locally produced meal. Despite several years of this program there have been limited information on available nutrition standards guiding the caterers and nutrition officers in charge of this program. A review study by Laar et al., (2019) to investigate Ghana’s policies towards creating healthy food environment found no published evidence of nutrition policy or standards by government in schools or other public settings for food service activities to ensure the provision and promotion of healthy food choices. With regards to schools, there was no evidence of good support and training systems to help schools and other public sector organizations and their caterers to meet the healthy food policies guidelines or standards. The review study revealed that there was some form of supervision for caterers contracted for the school feeding program but with no evidence of exist nutrition standards guiding the work of the caterers.

2.8 Food environment and food choice among school students

Food environment has long be associated with food choice among students. Food choice which has been mostly shaped by food availability and food environment has been reported as an important determinant of food choice among students. Though there been concern about the methodologies used to assess the relationship between food environment and food choice among school students, however several of such studies have shown a consistent relationship between food environments and food choice among school students (Deliens et
The complex interaction between food environment and food choice culminating to increase risk of obesity and diet-related NCDs needs to be fully understood to be able to put efforts to promote healthy food environment that can improve upon healthy food choices of students.

In a qualitative study to investigate the determinants of eating behavior in university students, food environment was reported as a strong determinant of food choice among students (Deliens et al., 2014). The study reported that meals offered in campus canteens influenced student food choices. Students were more likely to choose meals in campus canteens due to convenience. This was mostly reported as important predictor especially during exams when students don’t enough time and need to find convenience foods within the university environment.

In another study, to assess the school food environment and dietary behaviors among adolescents there was a strong association between school food environment and food choices (Papas et al., 2007). The results indicated that fruits and vegetables intake was low whiles there was a positive consumption of total and saturated fatty foods. The school food environment was reported as contributor for decrease consumption of fruits and vegetables and positive association of consumption of total fat and saturated fatty foods.

This consistent above findings brings to light the contributions of food environments to food choice among students. With the increasing rise of obesity among school children, there is a need to influence the establishment of healthy food environment by setting and enforcement of nutrition standards to be able to mitigate the impact unhealthy food environment.
2.9 Gaps in Literature

A review of literature brings to light the staggering gaps that exist in available information on the nutrition standards and nature of foods and non-alcoholic beverages sold in most public universities in Ghana and its contributions to obesity and non-communicable diseases.

In Ghana there is paucity of data on the availability of nutrition standards and nature of foods and nonalcoholic beverages sold in schools and public settings. A review of several studies show there is no data on studies in Ghana on nutrition standards and nature of foods in schools. In a review by Laar et al., (2019) to investigate Ghana’s policies for creating healthy food environments reported there no published evidence of food provision or composition standards for Ghanaian schools and public sector settings. The study revealed that, the 2012-2016 strategy focusing on prevention and management of non-communicable diseases (NCDs) suggests that attempts may be made in future to address nutrition standards in the near future. With regards to the nature of foods sold in schools there is paucity of data.

This study will provide a preliminary data for strengthening nutrition standards and regulate the profile of foods and non-alcoholic beverages in most public universities.
CHAPTER THREE
METHODOLOGY

3.1 Study Design

A cross-sectional study design using both qualitative and quantitative methods was used in this study.

3.2 Study Site.

The study was conducted at the University of Ghana main campus. The University currently has a student population of about 37,940. Legon Campus is located within an urban dwelling space with numerous economic activities. Legon campus serves as the main campus among the University’s various satellite campuses. It is located within the capital city of Ghana, Accra precisely the Ayawaso sub-metro Area. This campus have a very dynamic environment with teaching and residential facilities for students, lecturers and other workers of the university. The University currently has 4 colleges and 18 schools. These schools have about 96 departments running various programs in the University.

The University has an estimated number of 148 canteens with at least each hall having a minimum of two canteens providing various services of food retailing business to students. Within the campus and its surrounding are numerous economic activities including food retailing.

3.3 Study Population

Food service canteens within the University of Ghana main campus and key informants from food outlets and the University were the study population.
3.4 Variables

3.4.1 Outcome (dependent) Variables
The outcome variables of this study include:
Nature of foods sold: eg. Sale of fruits and vegetables, the sale of sugar sweetened beverages, sale of whole grains, sale of refined carbohydrates and sale of fried foods. The availability of nutrition standards and Food hygiene and safety practices of canteens within the University of Ghana.

3.4.2 Explanatory (independent) Variables
The explanatory variables are:
Type of food outlets: eg. Hall canteens, market canteens and table top foods.
Type of food service business: individual and partnership
Duration of operation of food service business: e.g < 5 years, 5-10 years and more than 10 years of operation.

3.5 Inclusion Criteria
All canteens operating within the University of Ghana main campus and key informants from the university who are responsible for regulating food services were included.

3.6 Exclusion Criteria
Canteens which sold only food provisions were excluded in the study.
3.7 Sampling Method

A census was used in this study, where all canteens operating within the University of Ghana main campus were enumerated.

3.8 Data Collection Techniques and Tools

3.8.1 Determining the availability of nutrition standards

A combination of qualitative and quantitative tools was used in data collection. The main instrument for qualitative data collection was an interview guide administered by the investigator to the University authorities who have the core mandate for regulating food service business on campus. Key informant interviews was done by face-to-face interview with an interview guide and list of open ended questions relevant to assessing nutrition standards in the University of Ghana. Notes were taken during the interview as well as tape recording. The interview guide for determining availability of nutrition standards can be found in Appendix 1.

3.8.2 Describing the nature of foods and non-alcohol beverages.

A modified questionnaire adopted from a study by Marras et al., (2016) on street food vending in Accra, was used to help describe the nature of food and non-alcoholic beverages. All foods and non-alcoholic beverages was categorized into food group of nutritional significance. This checklist contained a list of all possible foods and non-alcohol beverages which was grouped into fruits, vegetable salad, cooked dishes, industrial beverages, homemade snacks, natural or homemade beverages and prepackaged snacks. This was used to collect data to assess the nature of foods sold at the canteens of University of Ghana. This checklist can be found in Appendix 2.
3.8.3 Assessing hygiene practices of canteens at the University of Ghana

Data on hygiene practices of the canteens was collected through the use of a modified questionnaire from a study by Marras et al., (2016) on street food vending in Accra, Ghana. The questionnaire contained a set of questions about several factors that determined food hygiene and safety levels. This included certified health food safety certificates, availability of water and cleanliness of water used in the canteen, use of detergents, practices and ways to preserving foods and ingredients, means for preparation of foods. This check list can be found in Appendix 3.

3.9 Quality Assurance

Adequate mechanisms were put in place to safeguard and guarantee data accuracy and quality and to rid it of any bias. The measures included training of research assistants, pre-testing of questionnaires, editing of completed questionnaires, and same day data entry. Research assistants were monitored on daily basis. All completed data was validated and entered on daily basis. Also, the dataset was cleaned before analysis. Completed questionnaires was kept under lock and key to prevent unauthorized people from gaining access to them. Also, the questionnaires and audio files will be discarded 6 months after publication of the findings of the study.

3.10 Training of Field Workers

Two (2) research assistants were recruited to help administer questionnaire, code and enter the information obtained into Microsoft Excel (version 2010). These research assistants were fluent in English and were trained for two (2) days on the questionnaires and how to obtain consent, as well as handling the information collected. Their work was additionally supervised and reviewed daily.
3.10.1 Pre-Testing of Questionnaires

The questionnaires were pre-tested prior to final administration to the candidate participants. Pre-testing was conducted among operators of canteens outside the University of Ghana Campus. However, this sample was not part of the sample for the main study. This stage also offered the interviewer a better understanding of the questionnaire and a chance to organize appropriate answers for likely questions that may be asked by some members of the study population.

3.10.2 Editing Pre-Tested Questionnaires

Exposed errors and inconsistencies from the conducted pre-testing were amended and reviewed before actual commencement of the study.

3.10.3 Data Entry and Processing

The information collected was screened thoroughly, validated, serialized and coded within 24 hours before entry into Microsoft Excel 2010. After entry, the data set was crosschecked for errors with hard copies individually to ensure every variable defined is in the right place.

3.11 Data Analysis

3.11.1 Quantitative data analysis

Analysis of research data was done using Statistical Package for Social Science version 21 (SPSS). Descriptive statistics were be used to summarize data from the different food categories sold at the canteens and presented in the form of means, percentages, graphs, tables and charts. Associations were determined between food categories and some selected food outlets characteristics using Pearson chi square. A p-value less than 0.05 was regarded as significant. The questionnaire used to collect information on the food hygiene and safety
practices of the canteens, had scores assigned to each questions ranging from -1 (extremely poor) to +1 (extremely good). The average scores of responses were used to evaluate the food hygiene and safety of food outlets on a 7-level scale: Extremely good (> 0.7), very good (0.5 to 0.7), Good (0.2 to 0.4), fair (0.1 to -0.1), Poor (-0.2 to -0.4), very poor (-0.5 to -0.7), extremely poor (< -0.7).

3.11.2 Qualitative Data Analysis

The recorded IDIs were transcribed and compared with hand written field notes to ensure that every piece of the data were captured. The data was initially sorted into responses from the different categories of respondents namely availability of nutrition standards and implementation of existing nutrition standards. For each of the above categories of respondents, the responses (transcript and field notes) were manually analyzed using thematic content analysis technique.

Themes were developed from the responses of participants to the various questions asked. Alphabets were used to code the various themes and the alphabets were used to label responses that were closely related to the respective themes. Responses were then grouped under the various themes and reported appropriately. Descriptive narratives supported by illustrative quotes were used to present the results to determine availability of nutrition standards.

3.12 Ethical Considerations

The study was done at the university of Ghana canteens. Ethical approval was obtained from the University of Ghana, College of Health Sciences Ethical and Protocol Review Committee as a requirement to conduct a research at the canteens of university of Ghana.
Approval was sought from the Director of Physical Development and Municipal Services Directorate (PDMSD) of University of Ghana. Subjects who were involved in the study were key informants from the university who regulate food service business, key informants from food service business, foods sold at the university canteens.

3.13 Risks
Participants in this study were not exposed to any risks. In view of this, the design of the questionnaire were well structured to facilitate the discourse. The respondents were told about the general nature of the study and assured of no potential harm.

3.14 Compensation
Compensation was not paid to participants for consenting to be part of the study. Participants’ contribution to this study was however, recognized and appreciated.

Though the participants did not have any immediate or direct benefits from the study, their responses would be helpful in policy planning and formulation of nutrition standards in the university to promote a healthy food environment and contribute to WHO global action to prevention and control of NCDS.

Participants were told of their freedom to decline participation or withdraw from the study, with no consequences should they decide to do so.

3.15 Participants’ Consent
A written informed consent was sought from study participants prior to data collection. Canteen managers and university authorities were required to sign a form to indicate
consent. All participants were allowed to ask any questions they might have in relation to the study.

3.16 Confidentiality

Participants were assured of confidentiality of the data to be collected. Regarding privacy and anonymity, the information provided were treated with strict confidentiality. Filled questionnaires and tapes were kept under lock and key to prevent unauthorized people from gaining access to them. Questionnaires will be discarded 6 months after publication of the findings of the study. No participant’s name was mentioned in any of the report.

3.17 Conflict of Interest

The Principal investigator declares no conflict of interest with respect to the conduct of this study. This study is being self-sponsored by the researcher in partial fulfillment for a Masters of Public Health Degree from the University of Ghana.
CHAPTER FOUR

RESULTS

The findings of nutrition standards and nature of foods sold in the University of Ghana Canteens are presented in this chapter. The results are presented under the following thematic areas: background characteristics of key informants and food outlets, nature of foods and food hygiene and safety status of food outlets.

4.1 Background characteristics of key informants from the University.

A total of nine eligible key informants from the university aged between 34 to 57 years were interviewed. The key informants who were directly responsible for regulating food service business in the University are staff of PDMSD (n=3), hall masters (n=5) and the University Legal Council (n=1).

4.1.1 Background characteristics of food outlets and canteen staff.

Table 4.1 presents the background characteristics of the food outlets and canteen staff. Data was collected from 98 food outlets. Out of the 98 food outlets, 79.6% were canteens and 20.4% were table top foods. Among the 79.6% canteens, majority were market canteens (71%) and the rest being canteens located in the halls (29%).

The food outlets with the longest duration of operation was between 5-10 years (33.7%), followed by those who have been in operation for more than 10 years (24.5%) and those with less than 5 years of operation (10.2%).
With regards to type of food service business, 91.8% were individual businesses and 8.2% being partnership. About 27.6% of food outlets reported having a menu and 10.5% reported having a special diet.

Background information of Canteen staff who completed the questionnaire on behalf of the food outlets were made of owners (38.8%), followed by employees (33.7%) and managers (27.5%). Majority of those who completed the questionnaire were females (81.6%). Details can be found in Table 4.1 below.

Table 4.1: Background characteristics of food outlets and Canteen staff (n=98 unless otherwise stated)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Frequency (n=98)</th>
<th>Percent (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of food outlet</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canteen</td>
<td>76</td>
<td>79.6</td>
</tr>
<tr>
<td>Table top foods</td>
<td>22</td>
<td>20.4</td>
</tr>
<tr>
<td><strong>Canteen type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market canteens</td>
<td>54</td>
<td>71</td>
</tr>
<tr>
<td>Hall canteens</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>100</td>
</tr>
<tr>
<td><strong>Duration of food service in the University</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>10</td>
<td>10.2</td>
</tr>
<tr>
<td>5 - 10 years</td>
<td>33</td>
<td>33.7</td>
</tr>
<tr>
<td>more than 10 years</td>
<td>24</td>
<td>24.5</td>
</tr>
<tr>
<td><strong>Type of food service</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>90</td>
<td>91.8</td>
</tr>
<tr>
<td>Partnership</td>
<td>8</td>
<td>8.2</td>
</tr>
<tr>
<td><strong>Availability of Menu</strong></td>
<td>27</td>
<td>27.6</td>
</tr>
<tr>
<td><strong>Presence of special diet</strong></td>
<td>8</td>
<td>10.5</td>
</tr>
<tr>
<td><strong>Position of key informant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner</td>
<td>38</td>
<td>38.8</td>
</tr>
<tr>
<td>Manager</td>
<td>27</td>
<td>27.6</td>
</tr>
<tr>
<td>Employee</td>
<td>33</td>
<td>33.7</td>
</tr>
<tr>
<td><strong>Sex of key informant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>18.4</td>
</tr>
<tr>
<td>Female</td>
<td>80</td>
<td>81.6</td>
</tr>
</tbody>
</table>
4.2 Nature of foods sold at the university of Ghana canteens.

Out of the 98 food outlets, 93.9% sold fried foods, 84.7% sold sugar sweetened beverages, 83.9% sold either fish or meat, 82.7% sold starchy roots and tubers, 80.6% sold refined carbohydrates, 73.7% sold carbonated drinks, 49% sold energy drinks, 40.8% sold fruits or vegetables, 45.6% sold sell industrial juice, 38.8% sold whole grains and 22.4% sell industrial snacks. Details are presented in table 4.2 below.

Table 4.2: Food based categorization of the different types of foods offered for sale.
(n=98, unless otherwise stated).

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Frequency (n=98)</th>
<th>Percent (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food category</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-packaged industrial snacks</td>
<td>22</td>
<td>22.4</td>
</tr>
<tr>
<td>Ingredients include meat or</td>
<td>78</td>
<td>83.9</td>
</tr>
<tr>
<td>Fish on sale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbonated drinks</td>
<td>42</td>
<td>73.7</td>
</tr>
<tr>
<td>Energy drinks on sale</td>
<td>28</td>
<td>49</td>
</tr>
<tr>
<td>Industrial Juice</td>
<td>26</td>
<td>45.6</td>
</tr>
<tr>
<td><strong>Fruits and vegetables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of fruits or vegetables</td>
<td>40</td>
<td>40.8</td>
</tr>
<tr>
<td><strong>Whole grains</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of whole grains</td>
<td>38</td>
<td>38.8</td>
</tr>
<tr>
<td><strong>Fried foods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of Fried foods.</td>
<td>92</td>
<td>93.9</td>
</tr>
<tr>
<td><strong>starchy roots and tubers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale starchy roots and tubers</td>
<td>81</td>
<td>82.7</td>
</tr>
<tr>
<td><strong>Sugar sweetened beverage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of sugar sweetened beverages</td>
<td>83</td>
<td>84.7</td>
</tr>
<tr>
<td><strong>Refined Carbohydrates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of refined carbohydrates</td>
<td>79</td>
<td>80.6</td>
</tr>
</tbody>
</table>
4.3 Associations between food categories and some selected food outlets characteristics.

A chi square analysis was used to explore the relationship between food categories and some selected food outlets characteristics. Results from the analysis (table 4.3) show that sale of whole grains (p<0.001) was significantly associated with type of food outlets. Sale of Sugar sweetened beverages (p<0.01) was significantly associated with years of operation of food outlets. However, sale fruits or vegetables and sugar sweetened beverages were not significantly associated with type of food outlets. Also, sale of fruits or vegetables and whole grains were not significantly associated with years of operation of food outlets. Food outlets characteristics (fruits or vegetables, whole grains and fried foods) were not significantly associated with type of business.

Results from the analysis (Table 4.4) also show sale of refined carbohydrates and fried foods were not significantly associated with any of the food outlets characteristics (type of food outlets, operation of years of food outlets and type of business). Details can be found in Table 4.3 and 4.4 below.
Table 4.3: Associations between food categories and some selected food outlets characteristics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fruits or vegetables</th>
<th>Sugar sweetened beverages</th>
<th>Whole grains</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>P-value</td>
</tr>
<tr>
<td><strong>Type of food outlet</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market canteens</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18 (34)</td>
<td>35 (66)</td>
<td>0.053</td>
</tr>
<tr>
<td>No</td>
<td>14 (63.6)</td>
<td>8 (36.4)</td>
<td>20 (90.9)</td>
</tr>
<tr>
<td>Hall canteens</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8 (34.8)</td>
<td>15 (65.2)</td>
<td>19 (82.6)</td>
</tr>
<tr>
<td>No</td>
<td>14 (63.6)</td>
<td>8 (36.4)</td>
<td>20 (90.9)</td>
</tr>
<tr>
<td>Table top foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (27.8)</td>
<td>26 (72.2)</td>
<td>0.143</td>
</tr>
<tr>
<td>No</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>28 (90.3)</td>
</tr>
<tr>
<td>Years of operation of food outlet.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (27.8)</td>
<td>26 (72.2)</td>
<td>0.143</td>
</tr>
<tr>
<td>No</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>28 (90.3)</td>
</tr>
<tr>
<td>5-10 years</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>21 (67.7)</td>
</tr>
<tr>
<td>No</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>21 (67.7)</td>
</tr>
<tr>
<td>More than 10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>21 (67.7)</td>
</tr>
<tr>
<td>No</td>
<td>15 (48.4)</td>
<td>16 (51.6)</td>
<td>21 (67.7)</td>
</tr>
<tr>
<td>Type of business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>36 (90)</td>
<td>54 (60)</td>
<td>0.712</td>
</tr>
<tr>
<td>No</td>
<td>4 (10)</td>
<td>4 (50)</td>
<td>6 (75)</td>
</tr>
<tr>
<td>Partnership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (25.6)</td>
<td>30 (74.4)</td>
<td>0.047</td>
</tr>
<tr>
<td>No</td>
<td>15 (40)</td>
<td>30 (60)</td>
<td>22 (73.3)</td>
</tr>
</tbody>
</table>
### Table 4.4: Associations between food categories and some selected food outlets characteristics continued.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Refined carbohydrates</th>
<th>P-value</th>
<th>Fried foods</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Type of food outlet</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market canteens</td>
<td>39 (73.6)</td>
<td>14 (26.4)</td>
<td>0.180</td>
<td>34 (94.4)</td>
</tr>
<tr>
<td>Hall canteens</td>
<td>20 (90.9)</td>
<td>2 (9.1)</td>
<td></td>
<td>29 (93.5)</td>
</tr>
<tr>
<td>Table top foods</td>
<td>20 (87)</td>
<td>3 (13)</td>
<td></td>
<td>29 (93.5)</td>
</tr>
<tr>
<td><strong>Years of operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of food outlets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>28(22.2)</td>
<td>8 (77.8)</td>
<td>0.565</td>
<td>34 (94.4)</td>
</tr>
<tr>
<td>5-10 years</td>
<td>27(87.1)</td>
<td>4 (12.9)</td>
<td></td>
<td>29 (93.5)</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>24(22.6)</td>
<td>7 (77.4)</td>
<td></td>
<td>29 (93.5)</td>
</tr>
<tr>
<td><strong>Type of business</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>73 (18.9)</td>
<td>17 (18.9)</td>
<td>0.650</td>
<td>85 (94.4)</td>
</tr>
<tr>
<td>Partnership</td>
<td>6 (25)</td>
<td>2 (25)</td>
<td></td>
<td>7 (87.5)</td>
</tr>
</tbody>
</table>

### 4.4 Nutrition Standards

#### 4.4.1 Availability of nutrition standards

There were some nutrition standards available in the University of Ghana with very scanty information about its implementation and enforcement. Out of the nine key informants interviewed, four confirmed availability of some nutrition standards. The nutrition standards that were reported to be available were food hygiene and safety and food based standards. There was no availability of nutrient based standard in the university. These were responses of some key informant’s in relation to nutrition standards:
“We do not have any standard specifically on nutrient standards, we only have a standard on food hygiene. In relation to food hygiene and safety, we are normally interested in medical screening, sanitation and hygiene. We ensure food vendors do not sell closely to refuse dumps, we expect that hygienically finger nails of food vendors should be cut, the food sellers should cover their hair, the cooking area should be neat and ensuring food sellers wear apron when selling food” (male, 43 years).

“There is nothing specifically on food based and nutrient standards in the tenancy agreement except a few clauses on food hygiene that states the kitchen and other cooking materials are subject to inspection by PDMSD. So PDMSD are supposed to be in charge of that food hygiene standard” (Female, 35 years).

The only food based standard in the university was at Volta hall where the hall management have taken initiative to sell vegetables salads and smoothies and were not applicable to the entire University Community.

“So for Volta hall, we have a standard where one of our private canteen can only serve salads and smoothies. They prepare different types of salads and smoothies for sale. One of key things was that we didn’t want competition with our kitchen where they will sell the same meals with them because it’s an income generator for us. Also we needed healthy foods like the salads and smoothies hence they need for such initiative” (Female, 48 years).

With the exception of the standard on food hygiene, there was no evidence of written documents on the food based standard.

“There are few things I may say we do in relation to nutrition standards and that has to do with the sale of vegetable salad and smoothies but they are not written guidelines.

There is some regulation for food service canteens in the tenancy agreement document, which talks about food hygiene, waste disposal, no trash in cooking area hazardous material, smoking and no noise around the premises” (Female, 35 years)
4.4.2 Implementation and enforcement of the existing nutrition standards.

Despite the availability of some nutrition standards, some of the key informants expressed concerns about the implementation and enforcement of the standards. These are the responses of some key informants in relation to implementation and enforcement of nutrition standards:

“No, am not sure standard on hygiene are being implemented as it should be. Until recently, there was a little challenge with the implementation, the head of the Environmental Department of PDMSD felt they should have been in charge of the market instead of the Estate Department leading to confusion of roles. The university auditors came around and discovered that in the process of their audit only two people in the market had gone for their medical exam so a query was raised” (Male, 34 years).

“Night market as I discussed, is not in good shape. They are supposed to dispose their refuse around the Ecobank Credit union area, which is very far and hence they sometimes dump the refuse with sacks around the market. They (market women) should have containers and dustbins to help them dispose refuse well. So I think the standards on hygiene and sanitation are not being implemented as it should be (Male, 34 years)”

Again, another officer had this to say regarding the implementation and enforcement of existing nutrition standards.

“I was given the task to write a report on the state of bush canteen and night market canteens. It’s true that food canteens at night market don’t have a place of convenience and also they have sewage problems, no proper drainage, they do not have a place for waste disposal, no dust bins and there is improper waste disposal. Most of them store waste in fertilizer sacks” (Male, 44 years)

Some of the hall masters expressed dissatisfaction in the implementation and enforcement of food hygiene and safety practices of some of the canteens in their halls and the university in general.
“I do not think PDMSD does a regular checkup of these canteens as they should. I know for sure that PDMSD are responsible for food hygiene of these canteens but I doubt if they do it as their supposed monitor” (Female, 48 years).

### 4.4.3 Views of key informants on whether nutrition standards can help improve the nature and quality of foods on sale.

The key informants expressed positive views on the role of nutrition standards in regulating the nature and quality of foods sold at the canteens of University of Ghana. All of them unanimously indicated nutrition standards are key in the regulation of unhealthy meals but this can only be done only if it is well implemented and enforced. These were some responses of key informants in relation to whether nutrition standards can improve the quality and nature of foods offered for sale:

“*Yes definitely nutrition standards can help improve the nature and quality of foods. I know of a few instances not in the halls but generally in the university where one or more people have had poisoning. One of our student died from night market after having food poisoning from night market could recover from it. So definitely if the university will come up with some form of legislation to curb these things we would all go for it*” (Female 48 years).

“It will go a long way to improve health by regulating the sale of unhealthy meals. As you are coming with this research, I will also plead that environmental health officers should have Dietitians in their monitoring team to ensure that food canteens staff and food vendors are educated on how to improve the quality of the foods” (Male, 44 years).

“*Certainly yes, nutrition standards can help improve the nature and quality of foods sold on campus. We are managers and if we have to do anything that will ensure the students, the staff and lecturers are eating well, why not. If the university hospital can give us Dietitians in that regard we will be willing to partner with them for technical assistance*” (Male, 34 years).
4.4.4 Views of key informants on the university Ghana’s priority in implementing and setting nutrition standards.

Key informants expressed their views about lack of priority on the part of the University of Ghana in setting and enforcing of nutrition standards to make the University a nutrition friendly school. All key informants reported nutrition standards are not of priority to the University. They expressed lack of commitment on the part of university to setting, implementing and enforcement of nutrition standards. These are the responses of key informants in relation to their views on whether nutrition standards are of priority to the university.

“As a University, I wouldn’t say it was been a priority to the university may be a particular university department like the nutrition and food science department because it’s in their field they would have done a lot of research in that field but not much has been done as a university in general in relation to nutrition standards” (Female, 48 years).

“The university has not put much priority in regulating food standards. I think it’s so because may be they do not have policies and I don’t know how they are going to regulate it” (Female 35 years).

“The focus of the University has not been on nutrition standards. May be the nutrition departments can send a proposal so it can factored it. Even the food for senior members is always pastries and drinks. This is because that has not been the core mandate of the university” (Female, 35 years).

“I would say much attention has not be given to set nutrition standards in the university. More priority can be put in to attach Dietitians to PDMSD to help in the nutrition standards to enable us to set nutrition standards” (Male, 43 years).

Only one of the key informant said nutrition standards have been a priority to the university. This was the response of the key informant:

“As From where I sit I think the university have given priority to nutrition standards, thus why we have PDMSD to regulate medical exams of people selling food. The university have the programs as to whether they do well in terms of monitoring is
Another issue but I will say the university has some priority as far as health and nutrition standard is concern” (Male, 46 years)

4.4.5 Process food service businesses are required to satisfy before being granted a space to operate in the University of Ghana.

All the key informants described a process they consider before issuing permission for food service business to operate in the University. The processes were similar across food service businesses in the halls, market, and other rented food service business within the University. Some of those processes were an application letter, medical screening, payment of rent, and tenancy agreement as some of the processes or requirement a person will have to satisfy before being qualified and granted a space to set up a food service business. These were the responses of key informants on the some of the process they consider in granting license to food service managers:

“Food service canteen managers are first of all required to bring an application and inform us what they need the space for. After the form has been filled we generate an allocation letter, in which they are certain things they are required to satisfy which include, paying their rent, report to the environment health department of PDMSD for medical screening to be done since they are going to sell food” (Male, 35 years)

“The university has guidelines and criteria for allowing people to sell food not just in the halls but on campus in general. They are normally required to apply to PDMSD and you will need to take some medical tests am not sure of the test but some tests like TB among others; once you pass you are then allowed to apply to the hall” (Female, 48 years)

“I think it went through a bidding process and we have a developmental community and who interacted with them and the winner was given the contract which happened to be tasty treats. In the bidding process they were asked to bring a proposal specifying what business they would want to run. Whether it is for food alone or pastries alone. These were things the committee looked at in awarding the contract” (, Male, 46 years).
4.5 Food hygiene and safety practices of food outlets.

The food hygiene and safety practices of canteens were determined by measuring several factors that can determine the food hygiene and safety status of food outlets. The food hygiene and safety factors of the food outlets turned out that 79.6% had valid food handler certificate with those who have done medical screening for their staff less than 12 months being 45.9% and the least of them having done medical screening for their staff more than 24 months ago (11.2%). Availability of clean water for hand washing at selling point revealed 62.2% of the food outlets had buckets with clean running water for hand washing and buckets with dirty water at food outlets least (7.1%). Those with hand sanitizer or soap at selling point was 82.7%. Majority of the food outlets prepares food on the spot, followed by those who prepare from home (28.6%) and 5.1% reported having professional kitchen or laboratory. About 28.6% reported buying meat/fish/eggs/chicken on the same day whiles 28.6% reported the sale of left overs. About 66.3% reported having a fridge for food storage with 79.6% reported selling food whiles it’s hot. Majority about 69.4% reported using disinfectant for treating vegetables. With regards to the use of fuel type, 72.4% reported the use of electricity and 44.9% reported using charcoal or wood.
Table 4.5: Factors that determine food hygiene and safety practices of food outlets.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Frequency (n=98)</th>
<th>Percent (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid food handler certificate</td>
<td>78</td>
<td>79.6</td>
</tr>
<tr>
<td>Medical screening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 12 months ago</td>
<td>45</td>
<td>45.9</td>
</tr>
<tr>
<td>Between 12 to 24 months ago</td>
<td>23</td>
<td>23.5</td>
</tr>
<tr>
<td>More than 24 months ago</td>
<td>11</td>
<td>11.2</td>
</tr>
<tr>
<td>Never</td>
<td>19</td>
<td>19.4</td>
</tr>
<tr>
<td>Water for washing at food outlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running water from plastic tanks</td>
<td>9</td>
<td>9.2</td>
</tr>
<tr>
<td>In buckets (clean water)</td>
<td>61</td>
<td>62.2</td>
</tr>
<tr>
<td>In buckets (dirty water) or No water</td>
<td>7</td>
<td>7.1</td>
</tr>
<tr>
<td>Presence of hand sanitizer or soap at selling point.</td>
<td>81</td>
<td>82.7</td>
</tr>
<tr>
<td>Place of food Preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional kitchen /laboratory</td>
<td>5</td>
<td>5.1</td>
</tr>
<tr>
<td>On the spot</td>
<td>55</td>
<td>56.1</td>
</tr>
<tr>
<td>At home</td>
<td>28</td>
<td>28.6</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>10</td>
<td>10.2</td>
</tr>
<tr>
<td>When meat/fish/eggs/chicken are</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchased</td>
<td>28</td>
<td>28.6</td>
</tr>
<tr>
<td>On the same day</td>
<td>28</td>
<td>28.6</td>
</tr>
<tr>
<td>Sale of left overs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of a fridge for food storage</td>
<td>65</td>
<td>66.3</td>
</tr>
<tr>
<td>Food is served hot</td>
<td>78</td>
<td>79.6</td>
</tr>
<tr>
<td>Use of disinfectant for treating vegetables</td>
<td>68</td>
<td>69.4</td>
</tr>
<tr>
<td>Use of electricity or gas</td>
<td>71</td>
<td>72.4</td>
</tr>
<tr>
<td>Use of wood/charcoal</td>
<td>44</td>
<td>44.9</td>
</tr>
</tbody>
</table>

(n=98, unless otherwise stated).
4.6 Food hygiene and safety training among food outlets.

The graph below shows the distribution of food outlets who have done food hygiene and safety training for their staff. A total of 68.4% of the food outlets reported conducting a food hygiene safety training for their staff whiles 31.6% of reported no food hygiene and safety training. Figure below presents details.

**Figure 4.1: Percentage distribution of food outlets who have done food hygiene and safety training**

4.7 Food Outlets with presence of toilet and clean running water

The graph below shows the distribution of food outlets with a toilet facility and clean running water. It turned out that 70.4% of the food outlets has a toilet with clean running water whiles 29.6% has a no toilet facility with clean running water and safety training. Details can be found below.
Figure 4.2: Percentage distribution of food outlets with toilet and clean running water

4.8 Percentage distribution of food inspection at the point of sale

The figure below shows the percentage distribution of food inspection at the point of sale among food outlets. Majority of the food inspection at the point of sale was done quarterly (30.6%), followed by monthly (25.5%) with 14.3% of food outlets reported no food inspection has ever taken place at the point of sale. About 13.3% reported food inspection at the point of sale half yearly and 11.2% yearly and a few reported food inspection at the point of sale weekly (5.1%). Details are shown in the figure below.
4.9 Food hygiene and safety levels of food outlets

The figure 4.3 shows the food hygiene and safety levels of food outlets. The results of the food hygiene and safety levels revealed that 5% of the food outlets scored very poor, 20% scored poor, 5% scored fair, 26% scored good, 24% scored very good and 18% scored extremely good. Details can be found in the figure below.
Figure 4.4: Food hygiene and safety levels of the food outlets

![Bar chart showing food hygiene and safety levels of food outlets.](chart.png)
CHAPTER FIVE

DISCUSSION

This chapter discusses the findings of the study under the following areas; nature of foods sold in the University of Ghana canteens, nutrition standards in University of Ghana and food hygiene and safety practices of canteens or eateries in University of Ghana.

5.1 Nature of foods sold in the University of Ghana canteens

One of the objectives was to assess the nature of foods sold in the University of Ghana Canteens. The study revealed the sale of energy dense foods at the canteens of University of Ghana. Majority of the food outlets sold sugar sweetened beverages, refined carbohydrates, and fried foods. Though a number of the food outlets sold fruits or vegetables, there is still a need to foster an environment that will allow the sale of more fruits or vegetables.

This current study findings is consistent with a study done in Columbia which investigated nutrition services, foods and beverages sold in schools which found high sale of sugar sweetened beverages, deep fried foods and low sale of fruits and vegetables (O’Toole et al., 2007). Also, another study done in Belgian to assess the nutritional profile of foods offered in a Belgian University canteen also showed availability of poor quality of foods offered for sale (Lachat et al., 2009).

This has implications for food choices and excess energy consumption since meal choices and consumption is mostly determined by what is available (Deliens et al., 2014). Given the rise of obesity and diet-related NCDs, effective regulation of sale of unhealthy food choices in schools is needed to improve the dietary intake of students. Also students cannot
make healthy food choices if what is being offered for sale are unhealthy. This hampers the
efforts by schools and health professionals to build healthy eating habits among students
through nutrition education. Students are receiving inconsistent messages about health and
safety of foods given the unhealthy food environment they are surrounded with (O’Toole et
al., 2007). The high prevalence of energy dense meals found in these eateries will expose
students to consumption of energy dense meals hence increasing their risk of diet-related
NCDs (Kubik et al., 2003). Policy makers in schools also need to effectively regulate the
sale of non-nutritive foods through implementation of healthy nutrition policies. The
outcome of the study also further suggests more research need to be done on school food
environment and its contributions to obesity and health of students given the rise of obesity
among students in schools (Story et al., 2009).

5.1.1 Sale of fruits and vegetables.
The study reported 40.8% of the food outlets sold either fruits or vegetables. This is
consistent with the findings by Marras et al., that reported the sale of fruits and vegetables
among food vendors in Accra to be between 30-46% (Marras et al., 2016). The sale of
fruits or vegetables in this study did not vary much from that reported in the Accra street
food survey. This may be because that study was also conducted in Ghana hence a similar
trend of the sale of unhealthy foods over the sale of fruits and vegetables. The low sale of
fruits or vegetables compared to energy dense meals reflect a common practice where food
service businesses prioritize the sale of non-nutritive foods over nutritive foods (Lachat et
al., 2009). This suggests there is a need for nutrition policy to promote the sale of fruits and
vegetables. Also food service managers should be educated on the need to provide healthy
food choices.
Fruits and vegetables intake has been generally regarded as healthy due to its numerous health benefits (Slavin & Lloyd, 2012). The World Health Organization recommends 5-6 servings of fruits and vegetables per day for maximum health benefits (WHO, 2018). Given the unique role fruits and vegetables play to improve health it has always been recommended that schools foster an environment that will promote the sale of fruits and vegetables. The University of Ghana has no formal written policy that promotes the sale of fruits and vegetables and hence for that matter it was not surprising the sale of fruits or vegetables were low in the food outlets compared to the sale of sugar sweetened beverages, fried foods, pastries and refined carbohydrates. This has implications for increased risk of obesity and diet-related NCDs since fruits and vegetables consumption has been strongly associated with low disease risk (Slavin & Lloyd, 2012).

Also the high availability of energy dense meals offered within the University environment will present challenges for nutrition and dietetics practice because students and staff who need to have diet and lifestyle changes will find it difficult to comply with dietary regimen which may be attributed to lack of access to healthy foods. The data also show there is a need for further research to investigate why there is generally low sale of fruits and vegetables among eateries in schools for interventions toward improving the availability of fruits and vegetables offered for sale. The evidence of this findings reinforces the need for nutrition policies to promote the sale of fruits and vegetables among eateries in schools.

5.1.2 Sale of sugar sweetened beverages.

Data pertaining to the study reported high sale of sugar sweetened beverages among the food outlets. The study found 84.7% sale of sugar sweetened beverages among the food outlets.
The sale of sugar sweetened beverages was the second largest food category of nutritional importance among the food outlets in the University of Ghana. Most of the sugar sweetened beverages were industrial pre-packaged beverages. The outcome of the study is in line with a study done in the United States to investigate foods and beverages available for sale in schools which found high availability of sugar sweetened beverages. The sale of sugar sweetened beverages offered for sale in vending machines, canteens, snack bars was between 78.9% to 99.5% in all the schools sampled (Kann et al., 2005). The similarities in the sale of the sugar sweetened beverages could have been attributed to high purchase of sugar sweetened beverages among students since it’s been shown as common meal option for students due convenience (L’Abbé et al., 2013).

Excessive consumption of sugar sweetened has been linked to risk of obesity, diabetes and other metabolic diseases (Malik et al., 2010). Due to this WHO recommends limiting intake of sugar to less than 10% of the total energy intake (WHO, 2018). The results of the study therefore has implications for obesity and risk of metabolic diseases prevention since availability of meal choice can influence its consumption and purchase. There is also a need for further research on the nutritional contributions of these sugar sweetened beverages and risk of obesity. High availability of sugar sweetened beverages will have implication on the practice of dietetics and nutrition professionals effort toward educating people to limit the intake of energy dense meals and reduce their risk of diabetes, obesity, cardiovascular diseases and other diet-related NCDs. Policy makers must influence food environment towards restriction of refined sugary beverages and improve the nutritional quality of foods offered for sale in schools particularly given that a significant association between the sales of sugar sweetened beverages and years of operation of food outlets was found in this study. Majority of the food outlets with regards to the data from this study shows most of the food
outlets have been in operation for more than ten (10) years and hence a significant association between the sale of sugar sweetened beverages and years of operation of food outlets could therefore imply a common practice of selling sugar sweetened beverages among the food outlets. This observation is of public health significance because students and staff may have been long exposed to sugar sweetened beverages given the several years of operation of the food outlets. The exposure of sugar sweetened beverages will increase risk of consumption of energy dense meals leading to obesity and diet-related NCDs. This findings therefore suggest that food outlets within the University are potential places to consider when implementing food environment policies aimed at ensuring a healthy food environment at the University.

5.1.3 Sale of whole grains and refined carbohydrates

The study found sale of whole grains and refined carbohydrates to be 38.8% and 80.6% respectively. This is in agreement with the study to investigate nutrition services in schools that found high sale of refined carbohydrates (O’Toole et al., 2007). Adequate consumption of whole grains has been shown to be protective of cancer, obesity, type 2 Diabetes, cardiovascular diseases whiles excess consumption of refined carbohydrates increase risk of obesity and type 2 diabetes (Slavin, 2004). Despite the recommendations of choosing whole grains over refined carbohydrates there is still a gap with what is being provided in most food outlets.

The high sale of refined carbohydrates over whole grains is a worrying trend due to increased risk of obesity and diet-related NCDS. This will also have implications on managing diabetic patients since it has been shown that adequate intake of whole grains
improves glycemic control whiles intake of refined carbohydrates will result in poor glycemic control (Slavin, 2004).

To effectively prevent diabetes and improve the glycemic control of patients with diabetes a diet focusing on whole grains is key and hence the high available of refined carbohydrates will make it difficult for access to healthy foods and make diet interventions difficult to comply with within the University of Ghana campus.

There is a need for setting nutrition standards and policies to regulate and promote the sale of whole grains over refined carbohydrates to effectively reduce the risk of obesity and its associated health risk.

The study reinforces the fact that what is being offered for sale in food outlets in the University of Ghana are of poor nutritional quality and hence there a need to regulate unhealthy food environment in the University and this can be achieved if nutrition policies are put in place to regulate the sale of whole grains over the sale of refined carbohydrates.

5.1.4 Sale of fried foods
Majority (93.9%) of the food outlets were involved in the sale of fried foods. Fried foods was the highest food category available for sale among the food outlets. The outcome of the study is similar with a study done in Belgian to investigate the nutritional profile of foods sold in a Belgian University which reported high sale of deep fried foods. This trend was not different in the University of Ghana because generally most school food environments are unhealthy due to lack of policies to regulate meal options available for sale.
The high sale of fried foods presents a risk to obesity and diet related NCDs. There are several risks associated with intake of fried foods to obesity, cardiovascular disease, diabetes, hypertension among others (Gadiraju et al., 2015). The high sale of fried foods in canteens of University of Ghana will predispose the students and staff of the University to excessive energy intake leading to obesity and risk of NCDs. The results of this study has implications on nutrition and dietetics practice. The rise of NCDs has led to various recommendations of less energy dense diet and hence if food environments offer highly energy dense meals it will be challenging for individuals to effectively limit their energy consumption given the sale of the high energy dense meals.

The evidence from this research suggest there is a need to engage food service managers to limit the sale of fried foods and adapt to other cooking methods which will reduce the energy content of foods prepared for sale. Further research to ascertain the type and amount of total fat contained in these fried foods will help in policy interventions towards creating a healthy food environment.

5.2 Availability of nutrition standards

One of the study objectives was to determine the availability of nutrition standards in the University of Ghana that regulate food service businesses. There was availability of nutrition standards for food hygiene and safety and food based standard. The food hygiene and safety standard was the only nutrition standard that was universally applicable to all food service businesses legally registered with the University and was part of the rules and regulations policy document expected to be observed by food service businesses operating within the University of Ghana.
The food based standard was only applicable to a private canteen in Volta hall an initiative taken by hall management to promote the sale of fruits and vegetables.

This was consistent with study done in Minnesota to investigate school policies and practices regulating sale of school lunches and snacks which found few of the schools having nutrition policies and standards regulating the sale of foods, however implementation of policies were a challenge to ensuring a healthy food environment (Neumark-Sztainer et al., 2005).

Another study done in Ghana done by Laar et al., (2019) to investigate Ghana’s policies for creating healthy food environments found no evidence of nutrition standards for nutrition composition. However the study found that, the 2012-2016 strategy focusing on prevention and management of non-communicable diseases (NCDs) suggests that attempts may be made in future to address establishment of nutrition composition standards. The results of the study were different from the review study by Laar et al., (2019) because their study reviewed literature on evidence of published nutrition policies or standards whiles this study focused on availability of existing nutrition policies at the University of Ghana.

There are several public health implications associated with this outcomes. Though some few standards exist in the University of Ghana the evidence of the data from this study suggest there is a need for setting more nutrition standards to fight the ever increasing risk of diet-related NCDs.

The evidence will trigger policy actions in schools to improve school food environment through establishment of nutrition standards. Also such policy action can contribute to
limiting students and staff to consumption of energy dense foods and reduce the burden of obesity and diet-related NCDs.

5.3 Food hygiene and safety Practices of Food outlets

Food hygiene and safety plays an important role in ensuring food is wholesome for consumption (Annor & Baiden, 2011). The food hygiene and safety practices was therefore an important objective of this study. The study revealed that, 5% of the food outlets scored very poor, 5% scored fair, 20% scored poor, 26% scored good, 24% scored very good and 18% scored extremely good. The overall food hygiene and safety practices score was fair.

The study findings differ from a study in Ghana that investigated the food hygiene and safety levels of food vendors in Accra, which found an overall food hygiene score of food vendors to be good (Marras et al., 2016). It would have been expected that the food hygiene and safety practices among the University of Ghana food outlets should have be better compared to the food hygiene practices of street food vendors since University of Ghana is an academic institution but this was not the case. This difference could have been attributed to the differences in individual food outlet factors used to compute the food hygiene and safety practice practices.

The overall food hygiene and safety practices being fair has implications for prevention of food borne diseases among students and staff. The findings of the study revealed there was no toilet facility for food outlets in the night market and this is a worrying trend as it poses a major threat to food hygiene and safety. Given the unique location of night market where it is closer to various halls and its proximity to University of Ghana basic schools, it’s a
disturbing situation to know that despite the availability of several food outlets operating within the night market there is no toilet facility for food vendors.

The evidence of this research will therefore be used to trigger action campaign towards establishing of a toilet with clean running water to facilitate the food hygiene and safety practices of food vendors at the night market. Also there is a need to PDMSD to improve upon food inspection at the point of sale and ensure there is improvement in the food hygiene standards of various food outlets within the University of Ghana. Policy makers in the University can also build on the evidence of this study to strengthen food hygiene and safety policies in the University. Clinicians can also use this evidence to target public health interventions to improve the food hygiene and safety among food vendors in the University community to reduce the risk of food borne diseases among staff and students.

5.4 Study strengths

The major strength of this study is that, a census was used to collect data on all food outlets operating within the University of Ghana. The results from this research is a true state of nutrition standards, nature and food hygiene practices of all food outlets operating within the University of Ghana main campus.

5.5 Limitations of the study

An important limitation of this study is that the study only looked at what is being offered for sale in the food outlets. There was no proximate analysis done to determine the energy and nutrient contribution of meals consumed by students and staff. However, data on foods collected were grouped under food groups of nutritional significance hence the outcome of
this survey still provides useful information for policy intervention against creating healthy food environment in an attempt to prevent the increase risk of diet-related NCDs.

Also, the study did not explore the percentage of students who eat their meals from these food outlets to enable us have actual picture of the implications of what is being offered for sale. This therefore suggest an indication for further research studies in these aforementioned areas to fully understand the complex interaction between food environments, obesity and health.

Finally this study was a cross-sectional study and therefore limited by its design since data collection was conducted at just one point in time. However data collection was conducted at a period when school was in full session so that a true representation of the different food options offered for sale in the eateries of University of Ghana were captured.
CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes and concludes on the study findings. In addition, it gives recommendations on how to improve school food environment.

6.1 Conclusions

The study revealed high prevalence of energy dense meals sold at the University of Ghana. Majority of the food outlets were involved in sale of sugar sweetened beverages, refined carbohydrates, pastries and fried foods.

The indepth interview revealed the only available nutrition standards that regulated food service business were food hygiene and safety standards and food based standards. The food hygiene and safety standards was the only standard that was universally applicable to all food outlets legally registered in the University. The food based standard was only applicable to one food outlet in Volta hall where one of their canteen has been set aside for the sale of fruits and vegetables.

The food hygiene and safety Practices of the food outlets were found to be fair based on food hygiene and safety categorization by Marras et al., 2016 Though some of the individual food hygiene and safety factors such as availability of clean water at selling point and the availability of soap or hand sanitizer at selling point were generally acceptable there is still a need to improve upon the hygiene and safety practices of food outlets.
6.2 Recommendations

Given the rise of obesity and diet related NCDs, there is a need for a more united front and commitment by University authorities to set nutrition standards to regulate the nature and improve on the nutritional profile of foods sold at the canteens of the university.

The evidence of the study revealed that canteens at the night market do not have a toilet facility. This a major challenge to food hygiene and safety given the strategic location of night market.

The study therefore recommends University authorities take steps to address the toilet facility problem at the night market of University of Ghana.

There is a need for further studies to do proximate analysis of the nutrient contributions of foods sold in these canteens.

The study recommends policy makers in the university to strengthen the food hygiene and safety standards of food outlets to improve upon the food hygiene and safety practices of the food outlets.

The Physical, Development and Municipal Services Directorate (PDMSD) should ensure medical screening among staff of various food service businesses are enforced.

The study also recommends the university employs more Dietitians to ensure that food service businesses in the University adhere to nutrition guidelines to improve the nutritional profile of foods offered for sale.
REFERENCES


Bell, A. C., & Swinburn, B. A. (2004). What are the key food groups to target for preventing obesity and improving nutrition in schools? European Journal of Clinical Nutrition, 58(2), 258–263. https://doi.org/10.1038/sj.ejcn.1601775


APPENDICES

Appendix 1.

Key informant interview guide.

Interview guide for assessing nutrition standards.

Informant Name: ________________________________

Informant Title/Position: _________________________

Length of time in current position: _______________________

Length of time with organisation: ________________________________

Interview date: ________________________________

Interviewer Name: ________________________________

Thank you for granting me audience to interview you. I am an interviewer on the ongoing survey to assess profile of foods and non-alcoholic beverages and nutrition standards for regulating food service business on campus. We are interviewing stakeholders and therefore interested in your point of view. We will be grateful if we could take a few moments of your time.
Nothing you tell me will be personally attributed to you in any reports that result from this evaluation. All of the reports will be written in a manner that no individual comment can be attributed to a particular person.

Your participation in this interview is voluntary. Are you willing to be interviewed?

Do you have any questions before we begin?

1. What guides your department decisions to issuing of licenses to food service managers to operate food service business in the University of Ghana?

2. Are there available nutrition standards that guides the regulation of food business in this university? If no why?

3. If there are nutrition standards, are they being implemented as required? If not why?

4. Do you think nutrition standards can improve health by regulating food options available for staff and students? If yes how? If no why?

5. Do you think strengthening and setting nutrition standards has been a priority to university management?

6. Do you think the food options available for sale in the university canteens are healthy and safe for consumption? If yes why? And If no why?

7. What has been the contribution of your department to enhance the provision of healthy meals at these canteens? Kindly mention some of the initiatives.

8. In your opinion do you think it is important to set nutrition standards to regulate food services and ensure the profile of foods sold are healthier in these canteens?

9. What measures do you put in place to ensure hygiene and food safety practices at the canteens of the university?

   Thank you for your time
## Appendix 2

### Questionnaire for assessing the nature of foods.

<table>
<thead>
<tr>
<th>N</th>
<th>QUESTION</th>
<th>ANSWER</th>
<th>SCORE</th>
<th>OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Your position</td>
<td>• Owner&lt;br&gt;• Manager&lt;br&gt;• Employee</td>
<td></td>
<td>Single choice</td>
</tr>
<tr>
<td>2</td>
<td>Key informant Gender</td>
<td>• Male&lt;br&gt;• Female</td>
<td></td>
<td>Single choice</td>
</tr>
<tr>
<td>3</td>
<td>Duration of food service in the university</td>
<td>• Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Type of business</td>
<td>• Individual&lt;br&gt;• Partnership&lt;br&gt;• Chain/Franchising</td>
<td></td>
<td>Single choice</td>
</tr>
<tr>
<td>5</td>
<td>Apart from the owner, how many people work in this business?</td>
<td>• Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Food on sale</td>
<td>• Fruit&lt;br&gt;• Vegetable salad&lt;br&gt;• Cooked dishes&lt;br&gt;• Snacks (Natural/homemade snacks)&lt;br&gt;• Snacks (Pre-packaged industrial)&lt;br&gt;• Beverages (Natural and homemade)&lt;br&gt;• Beverages (Industrial)</td>
<td></td>
<td>Multiple choice</td>
</tr>
<tr>
<td>7</td>
<td>Ingredients include meat or fish or eggs</td>
<td>Yes/No</td>
<td></td>
<td>Single choice</td>
</tr>
<tr>
<td>8</td>
<td>Fruit</td>
<td>• Apples&lt;br&gt;• Banana&lt;br&gt;• Coconut&lt;br&gt;• Pineapple&lt;br&gt;• Pawpaw&lt;br&gt;• Mango&lt;br&gt;• Grapes&lt;br&gt;• Watermelon&lt;br&gt;• Pear&lt;br&gt;• Orange&lt;br&gt;• others</td>
<td></td>
<td>Multiple choice</td>
</tr>
<tr>
<td>9</td>
<td>Cooked dishes</td>
<td>• Banku&lt;br&gt;• Beans stew&lt;br&gt;• Beef (Fried/grilled/stewed)&lt;br&gt;• Chicken(fried/grilled/stewed)&lt;br&gt;• Chofî&lt;br&gt;• Fish (grilled/fried/stewed)&lt;br&gt;• Fufu&lt;br&gt;• Eggs</td>
<td></td>
<td>Multiple choice</td>
</tr>
</tbody>
</table>
| 10. | Pastries and homemade snacks | • Cupcakes  
• Bofrot  
• Nuts  
• Porn corn  
• Nkate cake  
• Bread  
• Bread with cream  
• others | Multiple choice |
|---|---|---|---|
| 11. | Home-made and Natural beverages | • Bottled water  
• Sachet water  
• Coconut water  
• Fresh fruit juice  
• Animal milk  
• Vegetable milk  
• Herb tea  
• Coffee  
• Wines and spirits | Multiple choice |
<table>
<thead>
<tr>
<th></th>
<th>Beverage Type</th>
<th>Options</th>
<th></th>
</tr>
</thead>
</table>
| 12                   | Industrial Beverages | • Carbonated drinks  
                        |                       | • Energy drink  
                        |                       | • Industrial Juice  
                        |                       | • others            | Multiple choice    |
Appendix 3

Questionnaire for assessing food hygiene and safety of Canteens.

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>ANSWER</th>
<th>SCORE</th>
<th>OPTION</th>
</tr>
</thead>
</table>
| 1 | Your position | • Owner  
• Manager  
• Employee | | Single choice |
| 2 | key informant Gender | • Male  
• Female | | Single choice |
| 3 | Duration of food service in the university of Ghana | • Number | | |
| 4 | Does food canteen possess a valid Food Handler Certificate? | Yes/No | | Single choice |
| 5 | Food canteen has done training courses on food and hygiene safety for staff. | • Less than 12 months ago  
• Between 12 to 24 months ago  
• More than 24 hours ago  
• Never | 1  
0  
-1  
-1 | Single choice |
| 6 | Food Canteen has done medical screening medical screening for staff. | • Less than 12 months ago  
• Between 12 to 24 months ago  
• More than 24 hours ago  
• Never | 1  
0  
-1  
-1 | Multiple choice |
| 7 | How often do food inspectors visit you to assess food and hygiene changes | • Never  
• Yearly  
• Half yearly  
• Quarterly  
• Monthly  
• Weekly  
• Daily | | Single choice |
| 8 | Water for washing is available at selling point | • Running water from public supply  
• Running water from plastic tanks  
• In buckets (dirty water) or No water | 1  
0  
-1  
-1 | Single choice |
| 9 | Soap or hand sanitizer is available on the spot | • Yes  
• No | 1  
-1 | Single choice |

University of Ghana http://ugspace.ug.edu.gh
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Options</th>
<th>Answers</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Food canteen has toilet with clean running water</td>
<td><strong>Yes</strong> • <strong>No</strong></td>
<td>1</td>
<td>Single choice</td>
</tr>
<tr>
<td>11</td>
<td>Where do you prepare /cook food?</td>
<td><strong>Professional kitchen /laboratory</strong> • <strong>On the spot</strong> • <strong>At home</strong></td>
<td></td>
<td>Multiple choice</td>
</tr>
<tr>
<td>12</td>
<td>When do you buy meat/fish/eggs</td>
<td><strong>The same day</strong> • <strong>The day before</strong> • <strong>A few days before</strong>.</td>
<td>1</td>
<td>Single choice</td>
</tr>
<tr>
<td>13</td>
<td>Do you sell left overs?</td>
<td><strong>Yes</strong> • <strong>No</strong></td>
<td>-1</td>
<td>Single choice</td>
</tr>
<tr>
<td>14</td>
<td>Does food canteen have a fridge?</td>
<td><strong>Yes</strong> • <strong>No</strong></td>
<td>1</td>
<td>Single choice</td>
</tr>
<tr>
<td>15</td>
<td>Cooked food is served hot?</td>
<td><strong>Yes</strong> • <strong>Warm</strong> • <strong>No</strong></td>
<td>1</td>
<td>Single choice</td>
</tr>
<tr>
<td>16</td>
<td>Vegetables prepared on the spot are washed with disinfectant</td>
<td><strong>Yes</strong> • <strong>No</strong></td>
<td>1</td>
<td>Single choice</td>
</tr>
<tr>
<td>17</td>
<td>Type of fuel used for cooking on the spot</td>
<td><strong>Electric/Gas</strong> • <strong>Wood/Charcoal</strong> • <strong>Hazardous material</strong></td>
<td>1</td>
<td>Multiple choice</td>
</tr>
</tbody>
</table>
Appendix 4A

Consent Form for key informant Interview.

Study Title: “Nutrition Standards and nature of foods sold at the University of Ghana Canteens”

General information about the research

Good morning/evening Sir/madam. My name is Maxwell Bisala Konlan a post-graduate student from the School of Public Health, University of Ghana. We would like to invite you to take part in a research project entitled: Nutrition standards and nature of foods sold at the university of Ghana Canteens” You will be interviewed by one of the members of the research team. The interviewer may be accompanied by another member of the research team, who will be observing, recording and taking detailed notes during the interview. It will involve individual interviews. We will however, want to get your consent for participating in the study, so what you are about to hear is part of the process of informed consent.

This is a research/study. This process will give you a basic idea of what the research is about and what your participation will involve. We will also describe your right to withdraw from the study at any time.

What is the purpose of this research?

The study aims to assess the nutrition standards and nature of foods sold at the university of Ghana canteens.
**Risks/discomforts**

Although there are no known discomforts and risks associated with this research, it is always possible that you may experience discomfort when addressing sensitive issues that may arise during the interviews. However, the research team has taken reasonable safeguards to minimize potential but unknown risks. If you experience psychological distress or other discomforts as a result of your participation in this study, please contact the principal investigator listed below. Please note that while nothing you tell us will be shared with anyone other than the researchers you are free to not respond to any of the questions posed by the researchers. You may also choose to pause or stop the interview at any time, and your data will be discarded and not used in the study.

**Benefits**

There are no direct benefits to you by participating in this research. The knowledge and information gathered would help in policy planning towards strengthening existing food policies to promote a healthy food environment in the university.

**Protecting data confidentiality**

We will protect information about you to the best of our ability. The information that you provide during the interview will be kept private. The only people who will have access to the information you provide are members of the research team. Your name will not be used in documents, reports, or publications related to this research. The data from the interview will be labeled by code numbers. All study documents will be kept in locked file cabinets PI’s office. You will not be named in any reports. Some measures will be taken to preserve anonymity and confidentiality of the data collected from you. These include using identification numbers instead of your real names, not disclosing your response to questions.
to members outside of the research team, reporting results of the study in a way not to disclose your identities. In fact, we highly value your participation in the study and will avoid behaviors that will compromise your anonymity.

**How long will my data be kept by the researchers?**

We do not intend to retain the interviews for an indefinite period of time. In accordance with Local Research Data Management Policy, the research data will be retained for 5 years in case the original data set needs to be referred to in the future.

**Compensation**

No compensation is provided for participation in this survey interview. However, we appreciate your time to help assess nutrition standards and policies regulating food canteens in the university.

**Voluntary Participation and Right to Leave the Research**

Your participation in this research is completely voluntary. Also, you can choose to end your participation at any time during the interview.

**Contacts for Additional Information**

Principal Investigators at: Maxwell Bisala Konlan, University of Ghana hospital, Box LG 79, legon. Telephone: +233542205538 Email: konlanmaxwell@yahoo.com
VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title “NUTRITION STANDARDS AND NATURE OF FOODS SOLD AT THE UNIVERSITY OF GHANA CANTEENS” has 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.

____________________   ______________________________
Date                                                        Name and signature or mark of volunteer

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.
Appendix 4B

Consent Form for Canteen staff.

Study Title: “Nutrition Standards and nature of Foods Sold at the University of Ghana Canteens”

General information about the research

Good morning/evening Sir/madam. My name is Maxwell Bisala Konlan a post-graduate student from the School of Public Health, University of Ghana. We would like to invite you to take part in a research project entitled: Nutrition standards and nature of foods sold at the university of Ghana Canteens” I would be very glad if you could participate in it. Your participation would allow you to give us the mandate to assess your menus, the food options available for sale and the food hygiene practices of your canteen. We will however, want to get your consent for participating in the study, so what you are about to hear is part of the process of informed consent.

This is a research/study. This process will give you a basic idea of what the research is about and what your participation will involve. We will also describe your right to withdraw from the study at any time.

What is the purpose of this research?

The study aims to assess the nutrition standards and mature of foods sold at the university of Ghana canteens.

Risks/discomforts

Although there are no known discomforts and risks associated with this research, it is always possible that you may experience discomfort and inconvenient by perhaps giving us some
portions of your food for assessment. However, the research team has taken reasonable safeguards to minimize potential but unknown risks. If you experience any discomforts as a result of your participation in this study, please contact the principal investigator listed below. Please note that while nothing observed in your company will be shared with anyone other than the researchers. You may also choose to pause or stop the interview at any time, and your data will be discarded and not used in the study.

**Benefits**

There are no direct benefits to you by participating in this research. The knowledge and information gathered would help in policy planning towards strengthening existing food policies to promote a healthy food environment in the university.

**Protecting data confidentiality**

We will protect information about your company to the best of our ability. The information that will be gathered in your company will be kept private. The only people who will have access to the information gathered are members of the research team. Your company’s name will not be used in documents, reports, or publications related to this research. The data from the interview will be labeled by code numbers. All study documents will be kept in locked file cabinets PI’s office. Your company will not be named in any reports. Some measures will be taken to preserve anonymity and confidentiality of the data collected from the company. These include using identification numbers instead of your real company names, not disclosing the data gathered to members outside of the research team, reporting results of the study in a way not to disclose your identities. In fact, we highly value your participation in the study and will avoid behaviors that will compromise your anonymity.
How long will my data be kept by the researchers?
We do not intend to retain the interviews for an indefinite period of time. In accordance with Local Research Data Management Policy, the research data will be retained for 5 years in case the original data set needs to be referred to in the future.

Compensation
No compensation is provided for participation in this survey interview. However, we appreciate your time to help assess nutrition standards and policies regulating food canteens in the university.

Voluntary Participation and Right to Leave the Research
Your participation in this research is completely voluntary. Also, you can choose to end your participation at any time during the interview.

Contacts for Additional Information
Principal Investigators at: Maxwell Bisala Konlan, University of Ghana hospital, Box LG 79, legon. Telephone: +233542205538 Email: konlanmaxwell@yahoo.com
VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title “NUTRITION STANDARDS AND NATURE OF FOODS SOLD AT THE UNIVERSITY OF GHANA CANTEENS” has 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.

____________________                                 ___________________________________
Date                                                            Name and signature or mark of canteen manager

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.