ASSESSMENT OF THE FOOD RETAIL ENVIRONMENT IN THE
TAMALE METROPOLIS

BY
MATTHEW YOSAH KONLAN
(10602656)

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DECLARATION

I, MATTHEW YOSAH KONLAN declare that except for other people’s work which are duly acknowledged, this dissertation is the result of my own original work carried out under the supervision of DR. AMOS LAAR, and that, this dissertation either in part or in whole has not been presented elsewhere for the award of any degree.

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MATTHEW YOSAH KONLAN DATE

(STUDENT)

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Dr. AMOS LAAR DATE

(SUPERVISOR)
DEDICATION

I dedicate this work to God all mighty for granting me good health, wisdom and resources to carry out the study and my lovely wife and son for their support in diverse ways.
ACKNOWLEDGEMENT

My most sincere thanks go to God almighty for the sense of direction and good health in the course of putting up this work.

My profound gratitude also goes to Dr. Amos Laar for his relentless and selfless guidance and support in the course of writing this dissertation.

I thank my wife, Mrs. Mary Y. Konlan, son-Vladimir Y. Konlan and Dr. Sampson Konlan for their invaluable support in diverse forms in the course of writing this dissertation.

I further thank every individual who contributed in whatever kind in putting up this dissertation including the retailers of the four major traditional markets in the Tamale Metropolis, the Metropolitan assembly of Tamale for their cooperation and support in putting up this dissertation.
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ABSTRACT

**Background:** The link between food retail environment and health disparities continue to grow. Assessment of the food environment is one key strategy in undertaking healthy food retail initiatives. However, little is known about the retail food environment in developing countries like Ghana. This study therefore, aimed to examine the food retail environment in the Tamale Metropolis.

**Methods:** This study was a descriptive cross-sectional study and employed simple random sampling technique to recruit the study participants. Questionnaires and protocols were adapted from the validated Nutrition Environment Measurement Surveys (NEMS) for both stores and corner stores and refined for use. Structured questionnaires were administered to collect primary data from August, 2018 to September, 2018. Factors including demographic characteristics, traditional market attributes, types of food advertised in front of retailers’ shops or market exits, sale of at least two fresh produce, the existence of food retail assistance programs and policies (FRAPP) and retailers’ awareness of FRAPP were assessed.

**Results:** About 45% retailers sold fresh fruits and vegetables, 44% sold whole grains, 29% sold snack foods and 19% sold dairy foods. An extremely small number (0.2%) of packaged snack foods had nutrition information. About 59% of the retailers advertised various food items; almost 51% was on fresh fruits and vegetables, 46% was on snack foods, 20% was on whole grain and 15% was on low or no fat dairy. Thirty six percent of retailers sold at least two fresh produce. A direct communication between the principal investigator and the Metropolitan coordinating director of Tamale revealed that food retail assistance programs and policies that support or incentivize healthier retail did not exist in Tamale markets. About 5% of the retailers reported that they were aware of food retail assistance programs and policies.

**Conclusions:** This survey finding highlights an important opportunity for intervention to improve the micro level food retail environment and dietary choices of urban
populations. Availability, promotion and nutrition information of certain healthier foods could be improved.

**Recommendations:** Given that there is limited availability (<50%) of healthy foods (fresh fruits and vegetables, whole grain, dairy foods) and the lack of nutrition information on packaged snack foods, there should be more campaign on the availability, quality and promotion of healthy foods by the Tamale Metropolitan assembly and other stakeholders. Policies that would compel manufacturers of packaged food items to provide nutrition information should be enforced.
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATTA</td>
<td>Agbogbloshie Tomatoes Traders Association</td>
</tr>
<tr>
<td>CDC</td>
<td>Center for Disease Control and Prevention</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agricultural Organization of the United Nations</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>GAPTO</td>
<td>Ghana Agricultural Products Traders Organization</td>
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<tr>
<td>GDHS</td>
<td>Ghana Demographic and Health Survey</td>
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<td>GLOPAN</td>
<td>Global Panel on Agriculture and food systems for Nutrition</td>
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<td>GSS</td>
<td>Ghana Statistical Service</td>
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<td>LMIs</td>
<td>Lower and Middle Income countries</td>
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<td>MoHG</td>
<td>The Ministry of Health, Ghana</td>
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<tr>
<td>NCDs</td>
<td>Non-Communicable Diseases</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic and Cooperative Development</td>
</tr>
<tr>
<td>PAHO</td>
<td>Pan American Health Organization</td>
</tr>
<tr>
<td>PPME</td>
<td>Policy Planning, Monitoring, and Evaluation</td>
</tr>
<tr>
<td>RF</td>
<td>Rockefeller Foundation</td>
</tr>
<tr>
<td>ROSCA</td>
<td>Rotating credit and savings Associations</td>
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<tr>
<td>SAPs</td>
<td>Structural Adjustment Programs</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>SNAP</td>
<td>Supplemental Nutrition Assistance Program</td>
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<tr>
<td>SSA</td>
<td>Sub Saharan Africa</td>
</tr>
<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
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<td>WCRFI</td>
<td>World Cancer Research Fund International</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<td>WIC</td>
<td>Supplemental Nutrition for Women, Infants and Children</td>
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DEFINITION OF CONCEPTS

Healthy food environment: environment where foods that contribute to a population’s diet meeting national dietary guidelines are widely available, affordably priced and widely promoted ((Vandevijvere & Swinburn, 2014)

Healthier food retail: refers to increased access to healthy foods through the provision and/or gentrification of food retail venues (CDC, 2014)

Healthy foods: whole grain, fat free, fruits and vegetables, low fat or fat free products (CDC, 2014)

Unhealthy foods: these include highly processed and packaged foods with long shelf life such as salty snacks, sweets and soda ((Kern et al., n.d.)

Food accessibility: a concept that covers food quality, cost, price and availability (CDC, 2014)

Food availability: a term that describes healthy food presence in retail venues (CDC, 2014)

Healthful: has relevance to mind or body (Webster, 1828)

Traditional market is a place where different traders who specialize in specific products sell food items from designated areas and traders selling same products are clustered within same location (Minten, 2007)

Food product advertising: refers to ways used for communicating the benefits and features of food produce to customers in order to persuade them to buy
CHAPTER ONE

1.1 BACKGROUND OF STUDY

The relationship between food environment and health outcomes continue to grow and has become of great public health concern to many (Holsten, 2008; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009; Meng, Florkowski, Sarpong, & Chinnan, 2014). Food retail environment describes the collective economic, policy and socio-cultural factors which influence the dietary patterns and nutritional status of populations (Vandevijvere & Swinburn, 2014). In furtherance, the food retail environment refers to a multitude of factors that affects consumer food choices: the physical built environment (markets, restaurants etc), marketing and advertising and the social environment which themselves are in turn influenced by other external forces such as market forces, cultural norms and government policy (Buczynski et al., 2015). In this study however, the focus is on the physically built environment (traditional markets) and marketing and advertising of food items in the built environment. Food environments influence dietary behavior, which intend influence nutritional status and health outcomes.

Assessing food retail environments is one pragmatic approach in understanding the nature and extent of the discrepancies in the availability of nutritious and affordable diet to populations and also helps in undertaking healthy food retail initiatives (Centers for Disease Control, 2014). In developing countries, retail food environment assessments are considerably important because of fast growing modernization, urbanization, and the rising burden of obesity (Hua, Seto, Li, & Wang, 2014). The assessments usually include
the types of food sold in retail venues, number of stores in neighborhoods, and the marketing strategies of retailers (Centers for Disease Control, 2014) which play vital roles in determining the dietary patterns of consumers as has been revealed by factor analysis research. Factor analysis has shown that health, mood, familiarity, appeal to senses, weight control, price, natural content of food, convenience and ethical concerns are among the key reasons pronouncedly associated with food choices of individuals (A., T.M., & J., 1995). This may not absolutely be the case in Sub Saharan Africa (SSA) with the highest level of food insecurity (35%) globally. Even though it has been projected to get better by 2028, it may not be applicable in the whole sub region (Thome, Meade, Daugherty, & Christensen, 2018). Cereal growth is projected to increase at 3% annually except for Burkina Faso and Ghana where drought and the fall armyworm are pervasive respectively (Karen, Meade, Daugherty & Christensen, 2018).

Overwhelming evidence suggests that urbanization is accompanied by behavior change in diet (Haddad, 2003), which promotes overweight and obesity in developing countries (Popkin, Adair, & Ng, 2013). The increased consumption of energy dense foods, added sugars, salts, saturated and trans fats in processed and ultra-processed foods as shown by nutritional profile of these foods is a determinant of overweight and obesity among consumers (Louzada et al., 2015). This can lead to increased chronic diseases such as heart disease and diabetes resulting from lack of corresponding physical activity or in the presence of a genetic or physiologic problem. This drift however, may occur in the presence of persistent under nutrition resulting in malnutrition or the under and over nutrition phenomenon (Haddad, 2003). This has forced researchers to propose that governments’ role in promoting healthy food environments and decreasing overweight, obesity as well as nutrition related non-communicable diseases (NR-NCDs) is crucial (Hawkes, Jewell, & Allen, 2013; Swinburn et al., 2013).
Zenk et al., (2009) found that there is a significant relationship unhealthy food environment and the intake of fresh fruits and vegetables. This suggests that retail food environment has a significant impact on the consumption of fruits and vegetables but may differ in places and among populations (Zenk et al., 2012). Fruits and vegetables consumption has pronounced positive health benefits including reducing the risk for many NR-NCD. However, evidence suggests that these fruits and vegetables and other healthy foods such as whole grain, fat free foods are under consumed due to inaccessibility and/or unavailability (CDC, n.d.). It is of essence therefore, to include parameters such as availability, quality, price, nutrition information and promotion of healthy and less healthy foods in food environment assessment (Black et al., 2014).

A research revealed that among north American populations, food environment influences the dietary behavior of consumers and subsequently obesity (Cummins & Macintyre, 2006). This raised major health concerns among minority populations with the highest prevalence of overweight and obesity in the United States (Communities, Odoms-young, Zenk, & Mason, 2009) and challenged the U.S government to initiate steps that will improve the quality of diet (USDA, 2017).

Healthy food retail improves access to healthy foods through the gentrification of food retail venues (Centers for Disease Control, 2014) thus, makes healthy food retail a determinant of health in the contemporary world (WHO, 2006). Unfortunately, some food retail venues are associated with the emergence NCDs (WHO, 2016). Also, modern retail emergence has brought marked nutrition and health impacts through food price reduction, assortment and ease of access to junk foods (Rockefeller Foundation, 2013).

The emergence of modern food retail formats has brought competition to the food retailing system leading to the improvement in the type and quality of products sold
especially fresh produce (Senauer & Seltzer, 2010).

In Africa, obesity which was seen as a problem of the affluent because of its peaked prevalence among rich populations is no longer the case as recent findings have revealed significant increase of obesity in people of low economic status (F. A. A. Dake, Thompson, Ng, Agyei-Mensah, & Codjoe, 2016). In South Africa, ‘big foods’ (big players in food retail) has become increasingly spread and implicated in unhealthy dietary behavior among consumers (Igumbor et al., 2012).

There is a growing body of evidence in Ghana that suggests that beyond individual characteristics, the food environment impacts obesity prevalence (F. A. A. Dake et al., 2016).

This therefore, stimulated a rapid assessment of the food retail environment that will inform planning and decisions.

1.2 PROBLEM STATEMENT

Consumers in most developing countries have access to only foods that are desirable and affordable to them and therefore, are exposed to unhealthy foods in their diet (Rockefeller Foundation, 2013). Food desirability is determined by both internal (taste) and external (marketing, placement, quality, cultural norms etc) factors (Herforth & Ahmed, 2015). In this study however, the focus is on the external factors.

According to Rockefeller Foundation (2013), over 1 billion low-income people who earn 2-13US$ a day are affected globally. Evidence suggests that a change in food environment caused by the emergence of modern retail may present benefits and better options but overconsumption of these foods may be burdensome (Rockefeller Foundation, 2013). Modern retail has brought enormous transformation to traditional
markets, industry players and employment meanwhile, traditional markets are the major sources of fresh produce including fresh fruits and vegetables (FFV) in developing countries (Mad Nasir and Jinap, 2005; Neven, Reardon, Chege and Wang, 2016). Conversely, Terano, Yahya, Mohammed and Bin Saimin (2014) found that modern retail venues are the major sources of fresh produce. In Ghana, the traditional markets are the primary source of food for household consumption (Meng et al., 2014; Aryeetey, Oltmans, & Owusu, 2016; Therien, 2017).

Additional evidence from a study showed that foods produced in the Northern region of Ghana are mainly staple and are usually poor in value (Field, Masakure & Henson, 2010). This may account for the seasonal consumption of little protein; fruits and vegetables by children in Tamale who lack diet diversification and are therefore exposed to high tendencies of developing anemia (Abiba, Naa, Grace, & Kubreziga, 2012).

In spite of the above findings, very few if not non-existent studies have assessed the retail food environment in Ghana to determine the healthfulness or otherwise of food items retailed creating the gap for this study in Tamale considering the marked unequal economic growth between the northern sector and southern sector of Ghana.

This study aimed to examine the food environment in Tamale in the upsurge of nutrition transition and NR-NCDs. This will help provide basic information in the design of pragmatic strategies and solutions that are specific for Tamale and Ghana at large.

1.3 CONCEPTUAL FRAMEWORK

1.3.1 CONCEPTUAL FRAMEWORK

Many factors predict food retail environment and these factors influence each other in
different ways. However in this study, the factors of interest have been summarized below in a conceptual framework.

The food retail environment framework is determined by two level factors. The first level consists of the existence and awareness of food retail programs and policies and the second level is determined by the sale of at least two fresh produce, the types of foods advertised at market exits and in front of retailers’ shops, and the market attributes of the traditional markets such as food prices, quality, availability, promotion and nutritional information on prepackaged foods.

The first level factors serve, as the underlying factors while the second level are the immediate determinants of the food retail environment. The underlying factors covertly influence the immediate factors, which intend influences the food retail environment as shown in the conceptual framework below.

The existence of food retail assistance programs and policies and the awareness of their existence by the retailers directly influence the sale of at least two fresh produce, the types of food items retailers advertise in front of shops or market exit areas and the market attributes such as food price, quality, promotion, and nutrition information.

On the second level the market attributes and types of food items advertised influence each other interchangeably.

The interplay of these factors impacts the food retail environment in many ways. An explicit understanding of the relationship between these factors will provide evidence to support context specific policies; programs etc to improve the food environment and associated nutrition and health outcomes.
1.4 RESEARCH QUESTIONS

The study seeks to answer the following questions:

1. What are the attributes of traditional markets in Tamale Metropolis?

2. What type of food items do retailers advertise at market exits or in front of their shops in the traditional markets in Tamale?
3. What percentage of retailers sell at least two fresh produce in the Traditional markets in Tamale?

4. Do food assistance programs and policies that support or incentivize healthier retail exist and are retailers aware of them in the traditional markets in the Tamale Metropolis?

1.5 MAIN AND SPECIFIC OBJECTIVES

MAIN OBJECTIVE

The main objective of this study was to examine the food retail environment in Tamale.

SPECIFIC OBJECTIVES

Specifically, the study:

1. Assessed attributes of traditional markets in Tamale.

2. Determined food types advertised at market exits or in front of retailers’ shops and selected background characteristics of respondents.

3. Determined the sale of at least two fresh produce and selected background characteristics of respondents.

4. Found out if food assistance programs and policies that support or incentivize healthier food retail exist, and whether retailers are aware of their existence in the traditional markets in Tamale.

1.6 JUSTIFICATION OF THE STUDY

Inaccessibility to healthy affordable food options and the emerging health challenges in developing countries resulting from the consumption of nutritionally inadequate foods will worsen the already existing problems of under nutrition and DR-NCDs if food retail environments are not given the needed attention (Rockefeller Foundation, 2013).
In developing countries, access to unhealthy foods (high in fats, salt and sugar) is increasing at a very fast pace, contributing greatly to the worrying trend in the incidence of NCDs (Rockefeller foundation, 2013).

Of the 52.8 million deaths that were recorded globally, 34.5 million deaths were caused by NCDs with a significantly higher number (80%) of the NCDs related deaths occurring in LMICs (World Cancer Research Fund & The NCD Alliance, 2014). These figures grow at an alarming rate that requires prompt attention.

Additionally, the world over is experiencing various transitions, which are concurrently occurring. First, there is an attributable foreign direct investment nutrition transition (Popkin, 2002; Hawkes, 2014) from nutritionally adequate diet to nutritionally inadequate diet (Popkin, 2006). There is also a transition from high mortality rates caused by infectious diseases and nutritional deficiencies to low mortalities where NCDs are now the major causes of death globally.

Findings of a study in Ethiopia found that overweight and obesity in children is growing at an alarming rate that requires immediate attention (Desalew, Mandesh, & Semahegn, 2017).

In Ghana, NCDs are increasingly becoming significant causes of morbidities and mortalities. Hypertension, heart failure and diabetes are among the top ten causes of deaths with hypertension alone accounting for 4.7% of total deaths (GHS, 2007).

In 2008, NCDs led the way in the number of healthcare facility reported deaths in Ghana where 14.5% were reported to have died from cardiovascular diseases (CVD) compared to malaria, which was responsible for 13.4% of total deaths; but this was projected to worsen due to urbanization and lifestyles (MoHG, 2012). NCDs in Ghana does not only
affect all categories of people and add economic burden to the affected driving the poor further into intense poverty due to high costs of treatment per se, but also increases the risk of morbidity and mortality due to weak health systems, lack of government policies on NCDs and knowledge deficit on the part of the population at risk (de-Graft Aikens, Addo, Ofei, Bosu and Agyemang, 2012).

The generational health implications, healthcare cost, burden of NCDs, and the wider economy of this rising prevalence of overweight and obesity in Ghana could worsen if immediate public health interventions are not initiated to address this challenge (Ofori-Asenso, Agyeman, Laar, & Boateng, 2016).

This problem may increase in urgency due to many evolving trends in the food retail environment including; consumer demand for convenience and the increased presence and dominance of supermarkets if nothing is done.

This study sought to provide information on the healthfulness or otherwise of the food environment in the traditional markets in Tamale and feed into better Public health strategies that will deal with NCDs.
CHAPTER TWO

2.0 REVIEW OF AVAILABLE RELEVANT LITERATURE AND INFORMATION

In this chapter, relevant works done on this topic are diligently reviewed.

Literature is reviewed on the following thematic areas; changing food retail environment, traditional food retail environment and distribution system in Ghana, institutions, policies and programs and consumer access and behavior.

2.1 CHANGING FOOD RETAIL ENVIRONMENT

According to the Global Panel on Agriculture and Food Systems & for Nutrition, (2017), food retail environments are experiencing changes, particularly in lower and middle income countries (LMICs). Consumers in these countries have changed their dietary patterns from the consumption of less processed healthy food to highly processed foods from modern retail venues. This accounts for why traditional markets are fast losing their grounds to modern food retail with a consequential effect of dwindling presence of fresh healthy and affordable foods especially for the poor (Banwell et al., 2013).

The arrival of supermarkets has actually led to the closure of other retail venues (Shamsudin & Selamat, 2005; Banwell et al., 2013) even though traditional markets are strongly resisting competition from modern retailing by improving the quality, diversity, convenience and safety of food (Banwell et al., 2013). A comparative study by Dubowitz et al., (2015) found that the presence of supermarket chains in food deserts only increases perceived access to healthy foods but showed no improvement in healthy
food accessibility and body mass index (BMI).

In Thailand, obesity is increasing concomitantly with increasing emergence modern retail venues. The upsurge of modern retail in Thailand has put traditional markets under some economic pressure leading to their gradual extinction and loses of fresh healthy and affordable foods for poorer Thais (Banwell et al., 2013).

Traditional food retail is comprised of three types; the first and most important type is the traditional, fixed-location daily market where different traders who specialize in specific products sell food from designated areas and traders dealing in the same products are clustered in one location. The second group is the smaller retailers or street vendors who specialize only in certain products retail which they sell in limited quantities and in locations outside the formal markets without formal registration. The third group is the small shops that sell different types of food in addition to a variety of other products (Minten, 2007).

Open-air markets (traditional markets) are usually associated with less healthy food retailing forcing consumers to seek healthy options at different retail venues (Cannuscio et al., 2013; Thornton, Crawford, Lamb & Ball, 2017). Bai, Thomas, Wahl and McCluskey (2008) however, found that traditional markets fill the niche of providing fresh produce.

In LMICs, consumers are increasingly incorporating and spending large sums of money on highly processed food. Many of the foods are now more likely to be processed or reformulated on a long journey to retail markets causing substantial changes to fresh produce (GLOPAN, 2017). This changing food retail environment in developing countries is largely accounted for by urbanization and poverty indices (Goldman, Krider, & Ramaswami, 1999; Weatherspoon & Reardon, 2003). Liberalization of international
markets and Foreign Direct Investment (FDI) through trade agreements which have had profound impact on food systems and for that matter availability, nutritional quality, prices and promotion of foods in different locations also contribute to the changing food environment (Friel et al., 2013). Food market liberalizations were traditionally meant to induce heavy trader entry and competitive trade in Africa which has actually seen the light of the day (Barrett, 1997).

The presence of modern food retail in developing countries with buoyant economic growth due to increased competition and saturation in Europe and north America has brought many transformations to traditional markets, industry players, trade and employment making traditional markets to appear to be fast losing their grounds (Weatherspoon & Reardon, 2003; Mad Nasir & Jinap, 2005). Meanwhile traditional markets remain the major source of fresh fruits and vegetables in developing countries (Mad Nasir and Jinap, 2005; Neven, Reardon, Chege and Wang, 2006). Conversely, other findings reveal that the implications for traditional markets by fast growing supermarkets remain widely unknown (Schipmann & Qaim, 2011).

Cummins and Macintyre (2005) in their study found that food availability and prices are essential mediating factors for determining the relationship between food environment, diet quality, and obesity.

In Thailand, research findings revealed that, modern food retail sell high quality produce at very high costs irrespective of quality attributes (Minten, 2007; Schipman & Qaim, 2011) including fresh produce which majority of modern retailers import with claim that it is cheaper than the locally produced ones in the case of Ghana (Field, Henson & Masakure, 2010). The cost definition of products sold in modern retail venues is in contravention with the findings of Reardon et al., (2003) that reduced prices of food
items and assortment are inherent part of modern food retail. It is however, clear that the targets of the modern food retail are consumers of high wealth quintile and not competition with players in the same industry (traditional markets) (Schipmann & Qaim, 2011). In Ghana, only the rich and educated people purchase food from modern retail venues (Field, Henson & Masakure, 2010; Meng et al., 2014).

In another research it has been found that as economic growth advances in developing countries, there is a paradigm shift from fragmented traditional markets to centralized wholesale markets with initial uptakes in grains and later fresh products, which are gradually, integrated with the introduction of specialized production areas. This integration is accelerated by urbanization and good road network (Reardon, Timmer, Barrett, & Berdegué, 2003). Governments have thus, played a key role especially in fresh food retail until the rise of supermarkets in recent times.

Supermarket diffusion came as a demand from consumers. Urbanization, economic growth and modernization led to the creation of jobs and empowerment of women who now decided to take up busy jobs outside of the home. They now had little time to move to traditional markets to source food from different locations for household consumption, which triggered their choice of supermarkets where they get the items they need in just one retail venue (Reardon et al., 2003). Further research has revealed that the change in food retail environment occurred in three tranches known as ‘waves’ in a process called ‘diffusion’ of supermarkets.

The first wave started in the early 1990’s in South America, East Asia and South Africa. The second wave started in mid 1990s to late 1990s in Mexico, Central America and much of Southeast Asia. The third wave also started in late 1990s and early 2000s in China, India and Vietnam (Reardon & Gulati, 2008).
The fourth wave started over one decade ago in South Africa and the rest of Africa (Reardon & Berdegué, 2008; Reardon et al., 2003). This has contributed to marked transformation in food environments in developing countries and resulting inequalities.

In Thailand, the growth of modern food retail outlets comes with a corresponding increase in obesity. As supermarkets have overtaken traditional markets, there is a greater likelihood of losing affordable fresh healthy foods (Banwell et al., 2013). However, Reardon and Gulati (2008) posited that, jobs created by supermarket expansion serves as a swap of traditional market employment.

In Africa, South Africa led in the supermarket diffusion. The fastest change is taking place in South Africa, Kenya and Nigeria and now taking place in countries receiving foreign direct investment (FDI) from South Africa and Kenya, including in descending order; Zimbabwe, Zambia, Namibia, Botswana, Swaziland and more recently Madagascar, Mauritius, Angola, and Mozambique thus making Eastern Africa the second place of investment destination, and lastly and very more recently in Ghana (Reardon et al., 2003; Weatherspoon & Reardon, 2003). This expansion of supermarket in Africa was as a result of the direct influx of Foreign Direct Investments, which was motivated by the availability of natural resources and to put Africa on a pedestal for marginal growth (OECD, 2002)

In Ghana, the traditional food retail outlets remain an important and integral part of the food supply system. Most foods sold there are of domestic origin including fresh produce and serves as a place where households access most locally produced foods including in-season fresh vegetables and fruits (Meng et al., 2014)
2.2 TRADITIONAL FOOD RETAILING AND DISTRIBUTION SYSTEM IN GHANA

A mix of events and very fascinating dynamics dominate the Ghanaian traditional market (Lyon, 2003). Although there is a rapid emergence and establishment of modern food retail outlets, the key decision makers in the food retail industry are the industry players (Taylor, 2017). This industry players control the market, branding of products, and market prices of products, especially given the unstable currency (Taylor, 2017).

Traditional markets focus more on local environment and consumers, and have expanded to serve people from afar. Ghana has gained popularity in the sector of traditional food retailing as a result. The Techiman food market for example is claimed to be the largest food and agricultural sector market in West Africa although the operation system of the traditional markets in Ghana is not fixed (Meng et al., 2014). While some operate on daily basis, others operate on a regular cycle with a characteristic sale of locally produced food (Meng et al., 2014) including produce that has been rejected by exporters for poor quality (Field, Henson & Masakure, 2010). In addition, traditional markets since the liberalization of the global food markets and improved food distribution systems have transcended from the sale of local produce to the importation and sale of processed and highly processed foods (Boselie, Henson and Weatherspoon, 2003) accounting for a greater share of the retail subsector in Ghana (Taylor, 2017).

Traditional markets are the dominant, retail outlets in Ghana where majority purchase food for household consumption though modern food retail is evolving very rapidly (Aryeetey et al., 2016; Taylor, 2017; Therien, 2017). The majority of Ghanaians are not aware of the supermarket chains, but they are very aware of the countless traditional
markets where you will find Ghana’s staple products (vegetable oil, rice, fish, tomato sauce, and packaged goods). It is in line with this practice that majority of importers and distributors say that majority share of their business are for the traditional markets where industry players (retailers and wholesalers) throughout Ghana converge to purchase products and then return to their respective hometowns to sell them. Wholesalers usually sell their produce to other retailers and bigger institutions such as restaurants (Clark, 1994).

It is profoundly evident that this is one of many points where food modification including adulteration and fraudulent labeling takes place. Buyers purchase in bulk and then rebrand, as they deem appropriate and convenient (Taylor, 2017). It is also notable that some businesses purchase highly discounted products from the supermarkets to sell in traditional markets. This is in spite of the findings that prices of food items in traditional markets are relatively cheap.

Also, available evidence points to the fact that traditional retail outlets are gradually taking up the features of modern retail in Ghana by stocking more imported food products than local ones due to lack of manufacturing sector and storage facilities as most local unprocessed foods have short shelf life if not properly kept (Meng et al., 2014; Taylor, 2017). This has occasioned the sun drying of some fresh food items such as tomatoes which has a short half-life if not appropriately preserved as a local technology to prevent losses by some local retailers (Owureku-Asare, Ambrose, Oduro, Tortoe & Saalia, 2016).

Additionally, robust scientific research has found that ultra-Processed foods are high in salt, saturated and trans fats which are implicated in the cause of NCDs (Neal et al., 2013). Most wholesalers prefer retailers from traditional markets to those from modern
markets because of the significant gap in payment. Retailers in traditional markets tend to pay instantly for food items while those from modern retail pay in installments and at later dates (Taylor, 2017).

Traditional markets are made of small stalls clustered in large groupings under single roofs or open-air venues. Retailers in this environment buy food items from sub-wholesalers or super-retailers due to insufficient capital. A considerable quantity of imported high value products are sold through middle men located in the traditional markets and majority of the various groups of traders who are mostly women are located in the traditional markets (Taylor, 2017). Sale prices are often fixed and not negotiable for high value products in the traditional markets, as opposed to staple foodstuffs. More than 90 percent of the local staple foodstuffs, including fresh fruit and vegetables, meat and frozen fish, are sold to consumers at the traditional markets.

Traditional markets organize promotional activities that tend to impact significantly consumer choices and behaviour (Taylor, 2017). A study conducted in Accra, Ghana revealed that the sale of fresh foods including fresh fruits and vegetables (FFV) are very limited in the food retail environment (F. Dake, Codjoe, & Agyei-Mensah, 2014). Vegetable prices in Ghana reduce substantially in the wet season because production is at its peak during the wet season and vice versa (Quaye et al., 2009). Traditional markets, despite its essential role in the provision of fresh produce may yet exert negative effects on the nutrition and health outcomes of consumers through the easy access to cheap, highly caloric and unhealthy foods (Cannuscio et al., 2013)
2.3 INSTITUTIONS, POLICIES AND PROGRAMS

The urban food systems in Africa are complex, with a range of actors with competing agendas. These governance actors impact on urban food systems, and thus on urban food security in a variety of ways (Smit, 2016). There are however, many gaps in our knowledge as the literature on urban food governance and security mainly focus on the large primary cities in Africa such as Accra, Lusaka and Maputo, etc. Although there is some literature on secondary cities, it is not enough given that these relatively smaller cities account for most of the urban population growth in Africa. While there has been a significant amount of research on the role of groupings such as traders' associations and urban farmers' associations, there has been surprisingly little research on the role and impact of local governments on urban food systems. Again, very little is known about the food distribution in Africa and the impact of inadequate transport systems on food distribution. Finally, little is also known about the impact of supermarkets (and their expanding supply chains) on urban food systems and their governance in Africa (Smit, 2016).

Domestic protection and support such as subsidies of healthier options have shown to improve dietary patterns of consumers (Friel et al., 2013). Due to lack of access to healthy foods, low-income communities are gradually incorporating healthy corner store programs. The availability and awareness of these programs are profoundly associated with higher healthfulness scores and that healthy adjustments to corner stores appear to be more effective (DeWeese et al., 2016). Gustafson (2013) contrarily, reported that participants of food retail programs have unhealthy dietary patterns and rather consume more energy dense food predisposing them to obesity and relative co morbidities.

In Ghana, a growing body of evidence suggests that there are no laws, programs and
incentives that encourage the production and sale of vegetables (Osei-kwarteng, Gweyi-onyango, & Mahunu, 2017). The distribution of vegetables in Ghana has the least intermediaries and often done under 24 hours with no storage facilities such as refrigerators for preservation (Lyon, 2003). This may have contributed to the very poor consumption rate of fresh fruits and vegetables in Ghana (Hall, Moore, Harper & Lynch, 2009).

Research findings further revealed that the existence and acceptance of healthy food retail programs in food retail environments are associated with healthy food retail (Cavanaugh, Mallya, Brensinger, Tierney & Glanz, 2012) creating the need to better understand existing urban governance processes and the competing interests of urban governance actors in order to be able to collaboratively design interventions to improve urban food security in Africa. In particular, we need to know more about the current and future roles of local governments. Local governments obviously have an important role to play in promoting urban food security but given that local governments in Africa usually have little resources at their disposal, simply replicating this approach may not be possible. Coordinating the role of different actors involved in governing urban food systems will be important, perhaps necessitating something like the Food Policy Councils found in North America, however, the frequently opposing behavior of governance actors in many African cities will make this challenging (Smit, 2016). This is in spite of the fact that diet related NCDs are increasing rapidly in low and middle-income countries (LMICs) and contributing greatly to the leading cause of deaths in these countries. Though a call for global concerted efforts has been resonating for years, the progress in national policies towards a healthy food environment is rarely assessed. A study conducted by Lachat et al (2013) revealed that there is a total disconnect between diet-related NCDs and national policies in LMICs.
In Ghana, evidence available suggests that it is only the formal sector food retailers in traditional markets who pay taxes compared to their hawking counterparts who do not pay any tax yet causes congestion in the traditional markets and beyond. This may be as a result of non-working local laws and lack of zoning in traditional markets (Asiedu and Agyei-Mensah, 2008). Meanwhile illegal operations of retailers in food environments attract fines and are sacked by concerned authorities (CDC, 2014). There are many others who have seized the market exit or checkout areas for their retail. The attributes of foods sold in checkouts remain widely unknown though it has been found in a study that majority of the checkouts sell unhealthy food such as candy, chips, gum, soft drinks and chocolate within easy reach including sugary items (Mah et al., 2018).

Governments in developing countries have very limited awareness on the challenges traditional markets pose occasioned by very few policies and educational programs in place. Governments and non-governmental organizations (NGOs) are still focused on under nutrition with limited partnerships working to address other nutrition issues (Rockefeller Foundation, 2013).

Following the liberalization of markets, the private sector now performs commercial food activities; credit facilities have however, remained the same. It is imperative that the needs of food retail industry players such as producers, processors, transporters, traders, shopkeepers and consumers are made known within the central government by local government authorities since they do not take part in direct policy making. This will complement the efforts by farmers’ associations, non-governmental organizations and local authorities in rural and peri-urban areas to lobby the central government. This mediation can prioritize programs and projects that will reduce production constraints and strengthen rural-urban linkages through improved road network, food assembly and
transport facilities, provision of market information and marketing extension assistance (FAO, 2000)

Urban areas are often associated with conflicts of interest regarding food supply and distribution against local laws and policies. To avoid these conflicts it is important to ensure that some local laws do not overly suppress the food supply and distribution systems for small scale food producers, processors, traders, shopkeepers and street food vendors (FAO, 2000)

For a healthy food retail environment, strategic context specific policies such as the restriction in the marketing of unhealthy food and beverages to children, regulation of school food environments (feeding programs and food and beverages sold in schools), use of front-of-package (FoP) warning labels, definition of taxation policies to limit consumption of unhealthy food, assessment of agricultural subsidies and the identification of foods to be provided by social programs to vulnerable groups must be adopted (Pan American Health Organization & WHO, 2016)

Metropolitan, Municipal and District Assemblies (MMDAs) control the food retail environment even though most Ghanaian traditional markets appear not to be under any form of control. They (MMDAs) have been delegated as part of central government’s decentralization policy to supervise and manage food retail activities within their catchment (MoFA-GH, 2012).

MMDAs usually have petty conflicts with people who are illegally operating in unauthorized places in the cities especially the street vendors who occupy spaces in the streets illegally. As a result, most MMDAs have formed task forces whose main duties include arresting street vendors found at unauthorized places in the metropolis. However, their actions have not yielded the desired effect. Invariably, the task forces set
up to deal with the squatters adopt the tactics of raiding and chasing them away from places. This approach has given them the nickname raiders. Consequently, the vendors are always on the run, and have to adopt spatial strategies by relocating to other places where they can still continue with their vending activities without harassment from metropolitan authorities (Asiedu and Agyei-Mensah, 2008).

The ineffectiveness of the special task force and the growing numbers of street vendors, especially in the central business districts, has led the metropolitan authorities to come up with some solutions in recent times. For example in 2007, a pedestrian shopping mall was built at Odawna near Kwame Nkrumah Circle in Accra and it provided space for 4000 petty traders. Interestingly, after about one week or so, most of the vendors had left the market and returned to the streets. They argued that they were fast losing their customers, and sales were not very good in their new market. Thus, the conflicts with metropolitan authorities still linger on (Asiedu and Agyei-Mensah, 2008).

The conflict situations exacerbate the poverty levels of vendors as the latter sometimes become redundant for certain time periods before finding new locations for their businesses. Relocating to the more spacious and less congested suburban areas has always been an unattractive option due to the perceived reduced volume of sales and hence profit margins. Congestion, and the cycle of conflicts and threats and the attendant arrests, has become part of their operational difficulties. It was also recognized that the lack of avenues for job change or mobility due to poor educational backgrounds and lack of professional training was a further source of vendors’ vulnerability. Most of the respondents were either school dropouts or dropouts from professional training. With these limited educational back-grounds, the vendors’ ability to switch to other jobs when difficulties emerge is limited (Asiedu and Agyei-Mensah, 2008)
Healthier food retail legislation in the last decade has either generally established a legislative task force or advisory panel to study the issue of healthier food access in the state and to make recommendations to address it or provided financial assistance or other type(s) of incentives to attract healthier food retail outlets to underserved areas or to improve healthier food offerings in existing stores. Financial assistance may take the form of grants, loans, or tax incentives to assist with costs associated with establishing new food retail outlets, such as land acquisition, building and construction, or feasibility studies. Costs associated with improving healthier food offerings in existing retail outlets may include remodeling, refurbishing equipment, and the purchase of refrigeration to store fresh produce. A few countries have enacted legislation that provides other types of incentives, such as technical assistance to small corner stores to assist with purchasing, stocking, or marketing fresh produce, or offers to waive existing zoning requirements to make it easier for grocery stores and supermarkets to locate in underserved areas. It is therefore, imperative to bring together the efforts of the private sector, civil society and government to improve food retail environments and shift consumer preferences towards more nutritious, high-quality diets. This is not just a task for agriculture and health ministries, or governments alone. Other actors (private sector) play critical roles in delivering high-quality diets to individuals and populations (Sacks et al., 2013). Multinational and local agribusiness and food service companies increasingly influence what is grown, processed and consumed. Retailers can increase the availability and access to high-quality diverse diets while food manufacturers can process foods to contain more micronutrient. Technologists can develop innovative products, processes, and management practices to preserve nutrients, reduce food waste, and enhance efficiency and lower prices for nutritious foods (GLOPAN, 2017)
In Ghana, the Ministry of Health has instituted a policy with priority measures to achieve healthy diets to include health promotion to increase awareness about healthy diet, increase the availability of healthier foods, use pricing controls to discourage consumption of unhealthy foods, regulate advertising of unhealthy foods and non-alcoholic beverages particularly to children, enact legislation for manufacturers to manufacture foods that meet defined standards and display food content on product labels (MoHG, 2012).

In another perspective, providing training, technical assistance, and education for retailers are major components for increasing access to healthier food options in urban communities within developing countries. Training can be designed to portray the ability of retailers to offer healthier food retail options in urban areas. These assistance can be offered to both existing and prospective retailers on topics such as startup requirement, operational issues and participation in healthier food retail programs such as WIC and SNAP (CDC, 2014).

2.4 CONSUMERS BEHAVIOUR AND ACCESS

Globally, consumer behavior in food retail environment is dependent on many factors but the crucial and most determining factors are food prices, quality, availability, promotion, taste and nutritional information on prepackaged foods. The elite within the populations always require this information to be able to make informed choices (WCRF, 2017; Black et al., 2014; French, 2003).

Notably, the environment in which people live influences their health behaviors and outcomes including obesity and non-communicable diseases (F. Dake et al., 2014). Largely, freshness, prices, availability and quality of food determine its purchasing and
consumption patterns by consumers (Bai, Wahl & McCluskey, 2008; Terano, Yahya, Mohammed & Bin Saimin, 2014; Aschemann-Witzel, de Hooge, & Normann, 2016; Campbell et al., 2017) of which healthy foods have been found to have higher price tags; almost twice that of unhealthy foods (Rogus, 2015; Caspi et al., 2017; Kern et al., 2017). The prices of healthy foods are greatly higher in traditional markets compared to supermarkets (Caspi et al., 2017). In urban Ghana, traditional markets are still the dominant retail outlets despite the emergence of modern food retail (Aryeetey et al., 2016; Taylor, 2017; Therien, 2017).

In another research, it has been found that the prices and availability of healthy foods has a direct impact on the dietary intake, weight and purchasing patterns of consumers of those foods. These may present an obstacle in the consumption of healthy diet in certain neighborhoods especially those of low-income status due to limited availability of healthy foods, especially where prices are high (Krukowski, West, Harvey-Berini and Prewitt, 2011; Rogus, 2015).

In terms of food access, there is a significant gap between urban and rural populations. The rural populations are able to produce what they eat unlike the urban poor whose situation is worsened by rapid urbanization, economic recession and structural adjustments which limit government spending and increases the rate of unemployment (Armar-Klemesu, 2000).

In the United States, some low-income neighborhoods have been described as “food deserts” because they lack healthy and affordable foods (Ploeg, 2010). These neighborhoods were noted to be dominated by convenience stores or fast food restaurants and far from grocery stores that offer a full range of healthy foods (Ploeg, 2010). A resident of these neighborhoods who lack transportation or have low incomes become more reliant on smaller neighborhood stores that do not carry varieties and yet
offers them at cheaper prices (Ploeg, 2010). This suggests that consumer behavior in developing countries is largely dependent on prices of food items. Choices by low income urbanites are therefore skewed towards cheaper unhealthy foods that lead to poor diets and to diet-related conditions such as obesity. Concern over food deserts and the food environment in general has led some US states and cities to enact programs that increase access to healthy foods (Ploeg, 2010)

Evidence available from Thailand has shown that there is a consumer behavior shift from traditional markets to supermarkets. On all salient attributes affecting retail outlet choice, the supermarkets outperform traditional markets. While the traditional markets account for majority of the expenditure on fresh produce, their share has reduced drastically (Gorton & Sauer, 2011)

Food and non-alcoholic beverage marketing is also recognized as an important factor influencing food choices related to non-communicable diseases. There is therefore, the need for monitoring of populations’ exposure to food and non-alcoholic beverage promotions, and the content of these promotions to generate evidence to understand the extent of the problem, and to determine appropriate and effective policy responses. These promotions become attractive to consumers compelling them to try and see(Kelly et al., 2013).

Further scientific research also revealed that consumer behavior is determined by food prices and food affordability with consequential effect of obesity and NCDs. As governments around the world consider policies to promote the consumption of healthier foods, data on the relative price and affordability of foods, with a particular focus on the difference between ‘less healthy’ and ‘healthy’ foods and diets, are urgently needed (Lee et al., 2013).
In developing countries, consumer behavior continues to change. This is because they are exposed to rising income levels with increasing disposable income. People with increasing income prefer to patronize foods that are associated with wealth and status, which are usually unhealthy. In another dimension, the increase in disposable income has led consumers to demand different food choices and alternatives and now prefer healthier options due to increasing awareness on nutrition and health issues (Rockefeller Foundation, 2013). Caspi et al. (2016) also found among other reasons that, food retail outlet proximity to homes, workplaces and other institutions are the major reasons for shopping in those retail outlets.

In Ghana, high-income and well-educated households, especially large married households from developed urban areas have adopted supermarkets as a food retail outlet following market liberalization. It has been projected that for modern food retailers to be able to get the attention of more buyers, they would have to enhance and maintain their advantage by providing quality, variety, and good service. Modern retailers provide potential consumers with product or promotion information and encourage them to try the new shopping experience in supermarkets (Meng et al., 2014).

In spite of the expanding presence of supermarkets in West Africa, traditional market remains a key player in the agro-food supply system. The traditional markets often meet the needs of less-educated households by providing them with available inexpensive foods. Large households of retired or unemployed households also frequently shop in traditional markets. Large-size, low-income and less-educated households with young children, especially those in low socio-economic dividend, prefer to purchase foods from hawkers because of the convenience and relative price (Meng et al., 2014)
CHAPTER THREE

3.0 METHODS

This section of the study presents the following methodological aspects: the design of the study, the study area, the variables of the study, study population, sampling, methods of data collection, tools used for data collection and analysis. Ethics is also given serious consideration in this section.

3.2 STUDY DESIGN

This study was a cross-sectional study. Paper-based questionnaires were administered to collect primary data from retailers.

3.3 STUDY AREA

Tamale is the capital of the northern regional and the fourth largest city in Ghana (GSS, 2010).

Tamale serves as a pivotal link between the North and south gates of Ghana, has a population size of 233,252 and made of multiethnic groups. Of this population, 47.3% are males while 50.3% are females. Eighty percent sub-section of this population live in the urban parts of the metropolis. There are 219,911 households living in 19,389 houses with an average household size of 6.3 persons (GSS, 2014).

Tamale has four major traditional markets, namely: the Aboabo, Kukuo, Lamashegu and Tamale central markets which serve people from both near and far. Aside these bigger markets, there are satellite markets in other communities within the Metropolis. The Tamale central market has shops and stalls which provide retailing space for traders. There is a large uncompleted modern supermarket which was started many years ago.
and expected to provide offices and shops for business and also offer retailing space to the roaming retailers (GSS, 2010)

Tamale markets retail large amounts of diversified food items (both local and imported) and has large number of retailers and consumers. In spite of the fact that the markets in Tamale are urban, there is scarcity of food items during lean seasons (when consumers have reduced options of meeting their needs), which is a common situation in West Africa. Aside serving other surrounding markets within the northern region, the traditional markets in Tamale supply the Upper East markets with rice, maize, yam and cassava (World Food Programme, 2012).

3.4 STUDY POPULATION AND VENUES OF INTEREST.

It is of prime essence to consider the population and venues of interest in food environment measurement. It is as important as choosing measures for the food environment and helps to eliminate barriers of survey team’s access to venues and populations of interest. The accessibility of the population and venues are very important to consider for the purposes of being able to collect data that meets study objectives (Lytle & Myers, 2017)

The study population were food retailers who were 18 years or older and were established in their current retail venue for more than 6 months and willing to take part in the study. Four (4) main traditional markets that were of open access to consumers and general public was included in this study.

3.5 CRITERIA FOR INCLUSIVENESS

Retailers who had established themselves in the markets in less than six months were excluded. Retailers who were below 18 years of age were excluded from the study
population. Establishments that did not deal in food products retailing were also excluded. Retailers who declined the study were respected as such.

All the identified main traditional markets in the Tamale Metropolis constituted the study sites. Establishments that are of open access to the public and consumers were also included in the study. Only selected food items representing specific food groups and characteristic of the Ghanaian traditional markets were included in the study.

3.6 SAMPLING

The respondents were drawn from four (4) major traditional markets in the Tamale Metropolis. This made data truly representative of the study area and eliminated any form of biases. Cochran’s single proportion formula was used to estimate sample size. The number of participants to be drawn from each market depended on the number of strata in each traditional market.

The sample was disproportionately allocated among the four (4) main markets (in this case, traditional markets-Tamale central, Aboabo, Lamashegu and Kukuo markets) due to nonexistent detailed datasets containing geotagged information on food retailers and the large number of scattered retailers in these traditional markets. Simple random sampling approach was employed to recruit the 421 participants. Retailers selling same food items were put in the same strata. Every five retailers who sold the same food items and clustered in the same location were put in one stratum. Each traditional market surveyed was subdivided into 105 strata with the Tamale main market subdivided into 106 strata. To give each food retailer in each stratum equal opportunity of taking part in the study, yes/no was written on pieces of papers based on the number of respondents in each traditional market and kept in a basket for respondents to pick. Whoever picked yes
was recruited and questionnaire administered after obtaining consent.

3.6.1 SAMPLE SIZE CALCULATION

The formula below proposed by Cochran (1977) was used to estimate the number of retailers to be recruited in this study.

\[ n = \frac{Z^2 \cdot p(1-p)}{d^2} \]

Where,

\( n \) = minimum number of retailers

\( Z = 1.96 \) for 95% confidence level.

\( P \) = prevalence of healthy food retail in food retail environment which is 47% (according to Al-Ani et al., 2016)

\( d \) = margin of error (5% was used).

The sample size therefore was: \( 1.96^2 \cdot 0.47(0.63)/0.05^2 \)

This gave an approximated sample of 383. To make up for non-response and non-complete data, a 10% (38) upward adjustment was made to give a total of 421 as the final number of retailers to be interviewed in the study.

3.7 DATA COLLECTION METHODS

Data collection process was completed from August, 2018 to September, 2018 by well-trained research assistants (RA’s) who administered questionnaires directly to retailers in their retail corners. For respondents who understood English, questionnaires were administered in English and for those who did not understand English, RA’s interpreted tool in either Dagbani or Twi for them. It was a close-ended survey. Survey was carried
out in the mornings and completed within 25 minutes. Data were collected using paper based instruments.

Retail food environments have been shown not to be static; thus, requires multiple measurements of the same retail outlet to be able to capture the usual food environment (Lytle & Myers, 2017). This study therefore, employed multiple data collection methods. These include: direct observation, interviews, food promotion and marketing survey.

3.7.1 DIRECT OBSERVATION

Direct observation has many names in relation to the measurement of food environment. They include: observational scans, observational assessments, environmental scan, log, record or inventory (Lytle & Myers, 2017). Direct observation refers to use of senses to collect information. Quantitatively, direct observation assesses most of the attributes of the physical food retail environment (Lytle & Myers, 2017), without depending on the ability of respondents to give feedback on questions (Taylor-powell & Steele, n.d.). Measurements of interest in this section are usually food product availability, quality, prices, product placement, food product information and advertisements (Lytle & Myers, 2017)

Direct observation of the built food retail environment through transect walk was conducted; first, to identify the various traditional food retail outlets and their respective locations for the purposes of ground-truthing and Secondly, to describe and classify the food retail environment in Tamale using a checklist. The checklist was used to identify food items commonly sold, the promotion of food products, nutrition information on selected prepackaged food products, the sale of at least two fresh produce, sale of fruits and vegetables and the types of food retailers advertised in front of their shops or market.
exits during data collection without depending on the respondents’ ability to give a feedback. The quality of fresh perishable fruits and vegetables was assessed at this point.

The following four major traditional markets were identified for the purposes of this study’ Tamale central, Aboabo, Lamashegu and Kukuo markets. The markets specialize in the retail of a wide variety of products including fresh produce.

3.7.2 INTERVIEWS

For better understanding of the food retail environment, research assistants conducted personal interviews with retailers. A survey questionnaire with only close-ended was used to interview the food retailers on the types of food items retailed, the promotion and marketing of healthy foods, retail experiences, food prices and demographic characteristics of respondents. In order to find out if food retail assistance programs and/or policies that support healthy food retail existed in the traditional markets in the Tamale metropolis, the principal investigator particularly interviewed the Metropolitan coordinator and written note was taken. All interviews were conducted after obtaining the consent of respondents and carried out at the convenience of retailers and in environments they were comfortable.

3.7.3 PROMOTION AND MARKETING OF HEALTHY OR UNHEALTHY FOOD SURVEY.

According to Bowlan & Whalen (2000), food promotion and marketing are drivers of food consumption patterns and depicters of the current obesogenic food environments among populations especially children and adolescents. Retailers sell food in many ways but it is often through the food items themselves. They do so by adapting strategies to coerce or persuade consumers in food environments such as promotion and marketing of
items, price incentives, increasing availability and providing point of purchase information (Glanz & Yaroch, 2004). The modus operandi of retailers to increase market shares remains widely unnoticed by consumers. They adapt other strategies such as allowing for assortment of the products, placement of products, adding shelf labels so that they can be selected easily for purchase by consumers (CDC, 2014). It is unclear the types of foods and attributes of the foods that retailers adapt these strategies to sell in the Tamale Metropolis though it has been found that retailers adapt these strategies to sell foods of poor nutritional quality (Cains, Angus, Hastings & Caraher, 2012)

Food marketing is conspicuously associated with obesity as it influences the eating environment (Chandon & Wansink, 2011)

The above method of data collection was deployed to provide information about food types retailers advertised in front of their shops or market exit areas and the promotion of indicator food items. Retailers were observed to see if they placed food items at eye level to attract the attention of consumers and asked whether there were price discounts for indicator food items. Respondents who either placed items at eye level or had price discounts were considered to either promote or advertise those items.

3.8 DATA COLLECTION TOOLS

Two commonest tools are adapted and used in the assessment of food retail environments; the Thrifty Food Plan (TFP) and the Nutrition Environment Measurement Survey for stores (NEMS-s) (Glanz et al., 2016). For purposes of this study, NEMS-S and Nutrition Environment Survey for corner stores (NEMS-cs) were adapted and refined for use in the traditional markets in Tamale. While the checklists were refined, the NEMS protocols for both stores and corner stores were used verbatim in the data collection process. Protocols were printed and added to the field hand book of RA’s. In
store data collection, specific group of food products are identified and their associated characteristics in order to evaluate accessibility of food in the study area (Lytle & Myers, 2017).

Nutrition Environment Measurement Survey for Stores (NEMS-S), an observational measure of the food retail environment instrument was adapted and refined for use in the Ghanaian traditional markets context. The NEMS-S tool evaluates food retail environments in retail outlets across a spectrum of measures such as prices, quality of fresh produce and availability of healthy and less healthy options (Glanz, Sallis, Saelens, & Frank, 2007). The original NEMS Stores tool has high inter-rater reliability (0.84 to 1.0) and test-retest reliability (0.73 to 1.00) (Glanz et al., 2007). However in this study, I assessed the availability, promotion (price discounts, placement), quality, prices and nutrition information of only healthy items due to major disparities in the availability of both healthy items and their regular/ less healthy options in the traditional markets in Ghana. Less healthy options such as frozen fruits, vegetables of NEMS-S food items are not available in most retail outlets in Ghana making it difficult to assess and compare healthy items and their less healthy options and among retail outlet types. Some of the healthy NEMS-S items assessed include: fresh fruits (banana, apple, orange), fresh vegetables (yam, pepper, carrot, cucumber, lettuce, tomatoes), dairy products (skim/fat free milk, low fat yogurt/cottage cheese) and snacks (candy/chocolate, cookies/cakes/sweets, chips-fried flour, baked flour and plantain). Some categories of items present in the NEMS-S tool (baked foods and frozen foods) were excluded to add categories and items that are vital in a healthy low-cost diet (whole grain- maize, millet, beans, yam etc) in Ghana. Some brands of items were changed to represent brands (maize, millet & beans) commonly found in Tamale. Fresh produce quantity, availability and promotion of food items was measured based on the ‘yes’/’no’
responses of retailers. In terms of quality, I focused on fresh perishable foods, specifically fruits and vegetables. Abiotic features (visual appearance) was used to rate quality of fruits and vegetables subjectively as a binary measure—either acceptable, characterized as peak condition, clean, fresh, firm, good colour and top quality or unacceptable, characterized as rotten, discoloured, bruised or unappealing. Fresh perishable produce was rated as acceptable or unacceptable based on whether ≥50% of the item was acceptable or unacceptable. In terms of nutrition information which was characterized as either ‘present’ or ‘absent’, only snack foods were rated. Absolute figures were recorded for prices of items. Socio demographic characteristics of retailers (age, sex, religion, monthly income, retail years, marital status, and educational status) and questions on types of foods advertised in front of shops or market exits were included in the NEMS-S tool. NEMS–CS expanded NEMS–S tool to include fresh produce quantity measure.

3.9 TRAINING OF RESEARCH ASSISTANTS

Two university graduates who understood local languages (Dagbani and Twi) were recruited as research assistants (RA’s) and trained over a two-day period; first day indoor training and second day field training in the presence of an independent bilingual expert.

On the first day, RA’s were taken through the survey methods, objectives and protocol, paying particular attention to how questions should be asked. They were made to interview each other to apprise themselves with instrument. RA’s were also taught to record measures they could observe without necessarily asking respondents.

RA’s were also taken through the adapted protocol, which was later printed and added to
the field handbook for RA’s. The adapted protocol was used verbatim without any refinements.

The second day was characterized by the practical demonstration of the first day’s lessons. RA’s were sent to a mini market in the Tamale Metropolis to demonstrate practically how questions should be asked face to face with retailers. It provided RA’s with helpful insights on how to ask questions. A consensus was reached on appropriate data during debriefing sessions.

3.11 PRETESTING
Two RAs and PI carried out the pilot exercise in Savelugu, one of the 28 districts in the Northern region of Ghana. The exercise was carried out with twenty (20) retailers. It was done to check for glitches in the wording of questions for better understanding, clarity of instructions, response rate and cooperation of retailers. Minor refinements were made to the protocol and instrument after debriefing on the pilot exercise.

3.12 QUALITY CONTROL
To maintain a good quality data, two university graduates who understood local languages (dagbani and twi) of the study area and have ever carried out similar study were employed as recruiters and data collectors (research assistants) and given a two day intensive training on various study objectives and survey methods.

RA’s were supervised by PI. PI intermittently crosschecked administered questionnaires with retailers on their responses on tool during data collection. RA’s were given printed copies of protocol to serve as guide before and during data collection after thoroughly taking them through the protocol. RA’s actively took part in the pilot testing of the adapted tool to increase their experience in the use of the tool. RA’s went through each
individual questionnaire after completing interview to ensure for completeness, accuracy and legibility. Principal investigator carefully reviewed completed questionnaires for completeness, accuracy and legibility at the end of field work each day.

As soon as questionnaires were received from RA’s and vetted, they were immediately entered into SPSS mac version 21. Entered data were password protected on principal investigator’s personal computer and accessible by only principal investigator.

3.13 VARIABLES

Variables refer to attributes that have the propensity to change. Dependent variables are the outcome while independent variables are used to explain the dependent variables. It is important to determine both the dependent and independent variables beforehand based on practical experiences and theory (Sarstedt & Mooi, 2014).

The variables of this study are detailed below;

3.13.1 DEPENDENT VARIABLE

The dependent variable of this study is the food retail environment. This was measured by examining traditional markets, which met the inclusion criteria in the study area. The outcome variable is binary in nature; either healthful or less healthful.

3.13.2 INDEPENDENT VARIABLES

Variables that showed to have significant association with food environment in the review of relevant literature and information were included in this study. The predictor variables of this study include the following:

- Traditional market attributes.
Food price

Food promotion (yes/no)

Food Quality (acceptable/unacceptable)

Food Availability (yes/no)

Nutrition information (present/absent)

Food types retailers advertise in front of shops or market exits.

Healthy foods: whole grain, fat free or low fat dairy, fruits, vegetables.

Unhealthy food: soda, sweets and salty snacks

Retailers sell at least two fresh produce (yes/no)

Existence of food assistance programs and policies and retailer awareness.

3.14 DATA ENTRY AND ANALYSIS.

Data were entered, coded and analyzed using SPSS version 21 (mac version). Frequencies, percentages, bar charts and tables were used to summarize and describe categorical variables (eg availability, promotion etc). Continuous variable (price) was summarized using medians and ranges.

Frequencies were generated in order to detect errors and missing values during data cleaning. The availability, promotion, quality, prices and nutrition information of healthy foods were assessed using NEMS stores instrument which assessed 17 items in five categories of healthy food items. The NEMS Stores measure tool scoring system was modified. Instead, items were rated based on a ‘yes/no’ response for availability and promotion measures. Absolute figures were recorded for prices of items. Nutrition information was characterized as either ‘present’ or ‘absent’ while quality of fresh and vegetables was characterized as either ‘acceptable’ or ‘unacceptable’. In this study, I report on the availability, promotion, quality, nutrition information and prices of only
key healthy food products in a range of food categories: fresh fruits (banana, apple, orange), fresh vegetables (yam, pepper, carrot, cucumber, lettuce, tomatoes), whole grain (maize, millet, beans), dairy products (skim/fat free milk, low fat yogurt/cottage cheese) and snacks (candy/chocolate, cookies/cakes/sweets, chips), types of foods advertised in front of retailer shops display and market exits and the existence of policies and programs that support or incentivize healthier retail

Of the study sample, 400 participated in the study while the remaining 21 retailers declined to participate in the study. Common reasons that may have resulted in non response are research fatigue, “I am busy”, “I don’t have time”. The fact that data collection was not carried out at the leisure time of the participants due to the setting may have also contributed to the reasons why some retailers declined the study.

3.15 ETHICAL CONSIDERATIONS

In order to maintain respect for the rights of respondents, ethical clearance was obtained from the Ethics Review Committee of Ghana Health Service (GHS-ERC) with a unique number GHS-ERC103/12/17 (Certificate is enclosed; see Appendix 4). Written permission was also sought from the Tamale Metropolitan Assembly authorities, market chairmen and other opinion leaders in the traditional markets through letters that explained the purpose and benefits of the study as well as survey criteria. Verbal permission was also obtained from the office of the Market Chief of Tamale (Dakpema).

The data were protected by password on principal investigator’s personal computer and accessible only to him. The principal investigator funded the study with his own resources.
3.15.1 INFORMED CONSENT

Permission and verbal consent were obtained from each respondent in either English Twi or Dagbani before questionnaires were administered. Study purpose and benefits were explained to participants in clear simple terms for their better understanding and to gain their trust and cooperation. They were informed about their right to discontinue the study when they desired to do so in the course of the study without losing any benefits.

3.15.2 PRIVACY/CONFIDENTIALITY

Voluntary consent was sought from respondents. All interviews were conducted at places deemed comfortable to respondents. These locations were devoid of third parties unless the respondents duly consented to their presence. Data collection tool was anonymised and data collected were coded. Completed questionnaires were kept under seal and lock and used only for study purposes.

3.15.3 COMPENSATION

No form of compensation was given to respondents. This was made known to all respondents before questionnaires were administered. However, their concerns were duly acknowledged during data collection.

3.15.4 CONFLICT OF INTEREST

Aside the academic and public health importance of this study, principal investigator has no any conflict of interest to declare.

3.15.5 POTENTIAL RISKS/BENEFITS

The study had no identified risks to the study population beyond the daily risk participants are exposed to in the markets. However, there are envisaged benefits to both
study population and general public. The general population will understand the attributes of the food items in the traditional markets in Tamale. Findings from this study will serve as a guide for stakeholders who are interested in addressing diet related non-communicable diseases through environmental modification.
CHAPTER FOUR

4.0 RESULTS.

The study was carried out in the traditional markets of the Tamale Metropolis in the Northern Region. The respondents were retailers who were randomly selected from strata that were created by PI in the traditional markets. The study was carried out in four (4) retail sites (main traditional markets in the Tamale), namely: the Tamale central, Aboabo, Lamashegu and Kukuo markets.

Results are presented according to the objectives of the study. It includes; attributes of the traditional markets, types of food retailers advertise in front of shops or market exits, the sale of at least two fresh produce and finally, the existence of food retail assistance programs and policies that incentivize or support healthier retail and whether retailers are aware of their existence.

4.2 BACKGROUND AND SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RETAILERS

A total number of 400 retailers took part in the study representing 95% response. Five percent declined to take part in this study. Of the number that took part in the study, 61.8% of the respondents were within the age bracket of 31-50 years and majority (96%) was females. Slightly over three quarters (79.8%) of the respondents were married, 12% were single, 5.8% were widowed and the remaining 2.5% were divorced. Almost all respondents (95.3%) practiced the Islamic religion and slightly over half (53.8%) of the respondents did not have any formal education, 27.8% had primary education, 17% had secondary education while the remaining 1.5% had tertiary education.

The income level of majority (78.3%) of the respondents was less than 1000 Ghana GHC. While more than half (63.5%) of the respondents had spent <10 years in the food
retail, about 69% of the respondents reported to have spent less than 10 years in their current market of retail.

Almost 36% of respondents reported that the foods they sold change with seasons while the remaining 95.3% said change in seasons did not affect the types of food items they sell. The results are as shown in table 1 below.
Table 1. Background & socio-demographic characteristics of retailers (N=400 unless otherwise stated) in the traditional markets in the Tamale Metropolis, 2018.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (N)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>133</td>
<td>33.3</td>
</tr>
<tr>
<td>31-50</td>
<td>247</td>
<td>61.8</td>
</tr>
<tr>
<td>&gt;50</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Female</td>
<td>384</td>
<td>96</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>Married</td>
<td>319</td>
<td>79.8</td>
</tr>
<tr>
<td>Divorced</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>Widowed</td>
<td>23</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christianity</td>
<td>19</td>
<td>4.8</td>
</tr>
<tr>
<td>Islam</td>
<td>381</td>
<td>95.3</td>
</tr>
<tr>
<td><strong>Educational status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>215</td>
<td>53.8</td>
</tr>
<tr>
<td>Primary</td>
<td>111</td>
<td>27.8</td>
</tr>
<tr>
<td>Secondary</td>
<td>68</td>
<td>17</td>
</tr>
<tr>
<td>Tertiary</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Income levels</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1000</td>
<td>313</td>
<td>78.3</td>
</tr>
<tr>
<td>1000-2500</td>
<td>51</td>
<td>12.8</td>
</tr>
<tr>
<td>2501-5000</td>
<td>33</td>
<td>8.3</td>
</tr>
<tr>
<td>&gt;5000</td>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Spent years in food retail business</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10</td>
<td>254</td>
<td>63.5</td>
</tr>
<tr>
<td>10-20</td>
<td>118</td>
<td>29.5</td>
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<tr>
<td>21-30</td>
<td>27</td>
<td>6.8</td>
</tr>
<tr>
<td>&gt;30</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Spent year in current retail market</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10</td>
<td>275</td>
<td>68.8</td>
</tr>
<tr>
<td>1-20</td>
<td>110</td>
<td>27.5</td>
</tr>
<tr>
<td>21-30</td>
<td>15</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>Foods sold change with seasons</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>----------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>143</td>
<td>257</td>
</tr>
</tbody>
</table>

Data are presented as N, %

4.3 ATTRIBUTES OF THE TRADITIONAL MARKETS IN THE TAMALE METROPOLIS.

Table 2 below summarizes the attributes of the traditional markets in Tamale Metropolis. Some retailers sold more than one food group and thus, indicator food items. Food item quality was captured for fresh perishable items, specifically fresh fruits and vegetables. Nutrition information was assessed for only packaged snack food items.

Of the 400 study participants, 45% sold fresh fruits and vegetables, 43.8% sold whole grains, 29.3% sold snack foods and 19% sold dairy foods.

4.3.1 FRESH FRUITS AND VEGETABLES

This study data reported that 45% of the retailers sold fresh fruits and vegetables. The five most frequently available indicator fresh fruits and vegetables were; pepper (46.7%), tomatoes (46.1%), yam (37.2%), cucumber (31.1%) and carrot (30.6%). The least available fresh fruit and vegetable was lettuce (16.1%). All fresh fruits and vegetables were promoted in one way or the other. Oranges were the most highly promoted fresh fruit (67.3%) and the least promoted was lettuce (13.8%).

In terms of quality, all fruits and vegetables had some acceptable level of quality. However, majority of the fresh fruits and vegetables were of high acceptable quality with tomatoes leading (84.3%) and closely followed by pepper (83.3%). Carrot and cucumber had the highest unacceptable quality levels of 49.1% and 35.7% respectively.

For prices, yam had the highest median retail price of 3GHC (3-12 GHC).
4.3.2 DAIRY FOODS

The survey reported that less than one quarter (19%) of the retailers sold dairy products. Of this number, 71.1% had skim/fat free milk was available and 11.1% promoted its sale.

More than half (60.5%) of the respondents had low fat yoghurt/cottage cheese available and 47.8% was on promotion.

The median price of skim/ fat free milk was 2.5GHC (1-47GHC) while the median retail price of low fat yoghurt/ cottage cheese was 1GHC (1-3GHC).

4.3.3 WHOLE GRAIN

Findings of this study reported that less than half (43.8%) of the retailers sold whole grain and of this number, about 77.1% had maize available, 25.7% had millet available and more than half of them (59.4%) had beans available. Beans was the most promoted whole grain (17.3%) followed by millet (15.6%) and the least promoted whole grain was maize (13.3%).

Beans recorded the highest median price among the whole grains with a median retail price of 12 GHC (4-13 GHC), followed by millet with a median retail price of 6GHC (1-9 GHC) and lastly by maize with a median retail price of 3GHC (2-8GHC)

4.3.4 SNACK FOODS

The data from this study show that 29.3% of the retailers sold snack foods of which 41.9% had candy/chocolate available, about 74% of the retailers had cookies/cakes/sweets and chips (fried flour, baked flour and plantain) available.
About 79% of the retailers were promoting the sale of chips, 73.3% were promoting the sale of cookies/cakes/sweets while 46.9% were promoting the sale of candy/Chocolate food. Almost all (98.8%) respondents selling cookies/cakes/sweets or chips did not have any nutrition information on their packaged food items. Only 50% of the retailers selling candy/chocolate had nutrition information displayed on their packaged items. The median price (R) of cookies/cakes/sweets and candy/chocolate are the same (med=1GHC, R=1-12GHC). Chips varied in price with a median retail price of 1GHC (1-8 GHC).
Table 2. Summary statistics of the attributes of the traditional markets in the Tamale Metropolis, 2018 (N=400) unless otherwise stated.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Availability</th>
<th>Promotion</th>
<th>Acceptable</th>
<th>Unacceptable</th>
<th>Nutrition information</th>
<th>Price (GHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>Median (med.)</td>
</tr>
<tr>
<td>Fresh fruits &amp; vegetables</td>
<td>180</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Banana</td>
<td>34</td>
<td>18.9</td>
<td>21</td>
<td>61.8</td>
<td>73.5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>26.5</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Apple</td>
<td>34</td>
<td>18.9</td>
<td>11</td>
<td>32.4</td>
<td>82.4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>17.6</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Orange</td>
<td>52</td>
<td>28.9</td>
<td>35</td>
<td>67.3</td>
<td>69.2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>30.8</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>83</td>
<td>46.1</td>
<td>50</td>
<td>60.2</td>
<td>84.3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Carrot</td>
<td>55</td>
<td>30.6</td>
<td>20</td>
<td>36.4</td>
<td>50.9</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>49.1</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Food</td>
<td>Calories</td>
<td>Fat (%)</td>
<td>Carbohydrate (%)</td>
<td>Protein (%)</td>
<td>% RDA</td>
<td>Servings</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
<td>---------</td>
<td>------------------</td>
<td>-------------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>Yam</td>
<td>67</td>
<td>37.2</td>
<td>19</td>
<td>28.4</td>
<td>77.6</td>
<td>22.4</td>
</tr>
<tr>
<td>Lettuce</td>
<td>29</td>
<td>16.1</td>
<td>4</td>
<td>13.8</td>
<td>66.5</td>
<td>33.5</td>
</tr>
<tr>
<td>Cucumber</td>
<td>56</td>
<td>31.1</td>
<td>10</td>
<td>17.9</td>
<td>64.3</td>
<td>35.7</td>
</tr>
<tr>
<td>Pepper</td>
<td>84</td>
<td>46.7</td>
<td>48</td>
<td>57.1</td>
<td>83.3</td>
<td>17.7</td>
</tr>
<tr>
<td><strong>Dairy products</strong></td>
<td><strong>76</strong></td>
<td><strong>19</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skim/fat free milk</td>
<td>54</td>
<td>71.1</td>
<td>6</td>
<td>11.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Low fat yoghurt/cottage cheese</td>
<td>46</td>
<td>60.5</td>
<td>22</td>
<td>47.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Whole grain</strong></td>
<td><strong>175</strong></td>
<td><strong>43.8</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>135</td>
<td>77.1</td>
<td>18</td>
<td>13.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Millet</td>
<td>45</td>
<td>25.7</td>
<td>7</td>
<td>15.6</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Beans</td>
<td>104</td>
<td>59.4</td>
<td>18</td>
<td>17.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Snack foods</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>----------------------</td>
<td>----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
</tr>
<tr>
<td>Candy/chocolate</td>
<td>49</td>
<td>41.9</td>
<td>23</td>
<td>46.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cookies/cakes/sweets</td>
<td>86</td>
<td>73.5</td>
<td>63</td>
<td>73.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chips</td>
<td>86</td>
<td>73.5</td>
<td>68</td>
<td>79.1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Data are presented as N, %. -: indicates variable is inapplicable to food item. Quality definition: A=acceptable, A=unacceptable. Med. =median price of indicator food items, R=price range of indicator food items.
4.4 FOOD PRODUCT TYPES RETAILERS ADVERTISED AT MARKET EXIT AREAS OR IN FRONT OF THEIR SHOPS

Seventeen indicator food items which were split into four food groups were included in the survey in order to address this objective.

Some retailers advertised more than one food group, thus, indicator food item in front of their shops or market exits.

The findings reported that more than half (58.8%) of the retailers were advertising various food items in front of their shops or market exit areas. Of this number, about half (50.6%) of the advertisement displays were on fresh fruits and vegetables, 46.40% retailers were advertising snack foods, 20% were advertising whole grain and 15% were advertising low or no fat dairy foods.
Figure 2. Percentage of foods advertised at market exits or in front of shops by retailers.
ASSOCIATION BETWEEN FOOD ADVERTISEMENT AND BACKGROUND CHARACTERISTICS AND OTHER VARIABLES INCLUDED IN THE TABLE.

Table 2 below shows the results of chi square analysis and binomial logistic regression analyses of factors associated with retailers’ advertising of items in front of their shops or market exit areas. Factors such as educational status of retailers, retailers years in food retail, retailers years in current market, retailers sell fresh fruits and vegetables, dairy foods, whole grain, snack foods were cross tabulated with advertising in front of shops or market exits.

The chi square analysis revealed that educational status, years in food retail business, years of retail in current market, sale of fresh fruits and vegetables, sale of dairy products, sale of whole grain, sale of snack foods were significantly associated with advertising in front of shops or market exits (p<0.05 in each case; see table 3).

Further analysis using binary logistic regression also, showed that there was a significant association between advertising in front of shop or market exits and the sale of snack. Compared to retailers who did not advertise, those who advertised had a significantly higher chance of selling snacks (AOR=18.110, 95% CI=7.239-45.304). This implies that retailers who advertised food in front of their shops or market exits are 18.110 times more likely to sell snack foods compared to those who did not advertise food in front of their shops or market exits.

Significant associations were also observed between advertising and the sale of at least
two fresh produce using the binary logistic modeling, with retailers advertising having a greater odds of selling at least two fresh produce compared to their counterparts who were not advertising (AOR= 5.332, 95% CI=2.582-11.014). Retailers advertising food in front of their shops or market exits are 5.332 times more likely to sell at least two fresh produce compared to those who did not advertise food.
Table 3. Association between food advertisement in front of shops or market exits and selected background characteristics, and other selected variables included in the table.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Retailers advertising in front of shop or market exit</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>P value</td>
<td>AOR (95% CI)</td>
</tr>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Educational status</strong></td>
<td>0.004*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>123(66.5)</td>
<td>62(33.5)</td>
<td>0.974(0.563-1.683)</td>
<td></td>
</tr>
<tr>
<td>Not educated</td>
<td>112(52.1)</td>
<td>103(47.9)</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td><strong>Years in retail</strong></td>
<td>&lt;0.001*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>174(68.5)</td>
<td>80(31.5)</td>
<td>1.172(0.479-2.867)</td>
<td></td>
</tr>
<tr>
<td>&gt; Or = 10 years</td>
<td>61(41.8)</td>
<td>85(58.2)</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td><strong>Retail years in current market</strong></td>
<td>&lt;0.001*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>183(66.5)</td>
<td>92(33.5)</td>
<td>1.930(0.770-4.839)</td>
<td></td>
</tr>
<tr>
<td>&gt; Or = 10 years</td>
<td>52(41.6)</td>
<td>73(58.4)</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td><strong>Sells fresh fruits and vegetables</strong></td>
<td>0.001*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>122(67.8)</td>
<td>58(32.2)</td>
<td>1.698(0.711-4.839)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>113(51.4)</td>
<td>107(48.6)</td>
<td>Ref</td>
<td></td>
</tr>
</tbody>
</table>
### Sells dairy foods

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63(83.9)</td>
<td>172(53.1)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13(17.1)</td>
<td>152(46.9)</td>
<td>1.959(0.830-4.620)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Whole grain

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>66(37.7)</td>
<td>169(75.1)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>109(62.3)</td>
<td>56(24.9)</td>
<td>1.882(0.537-2.179)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Sells snack foods

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>106(90.6)</td>
<td>129(45.6)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>11(9.4)</td>
<td>154(54.4)</td>
<td>18.110(7.239-45.304)**</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sells at least two fresh produce

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>110(76.4)</td>
<td>125(48.8)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34(23.6)</td>
<td>131(51.2)</td>
<td>5.332(2.582-11.014)**</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P values are significant at <0.05. P values are generated from Pearson chi square analysis.

**OR=odds ratio are significant at <0.05. OR are generated from the binary logistic regressions.

Educational status of retailers, number of years in food retail of retailers, number of years of food retail in current market, sale of fruits and vegetables, the sale of dairy food
products, the sale of whole grain, the sale of snack foods, the sale of at least two fresh produce and the advertising of food items in front of retailers’ shops or market exits were the variables that were fed into the model to generate the odds ratio and corresponding 95% confidence intervals.

R²=0.324, this coefficient of determination explains that the model was able to explain about 32% variability in the dependent variable (retailers advertising in front of retailers’ shops or market exit areas)

4.6 PERCENTAGE OF RETAILERS WHO SELL AT LEAST TWO FRESH PRODUCE.

Ten food items representing three food groups (staples and fresh fruits and vegetables) were included in the survey instrument to address this objective.

The data show that of the 400 respondents, only 36% sold at least two fresh produce and of this number, 99.3% of retailers sold at least two fresh fruits and vegetables while only 1 retailer sold at least two fresh staple foods.
4.7 ASSOCIATION BETWEEN SALE OF AT LEAST TWO FRESH PRODUCE AND BACKGROUND CHARACTERISTICS.

Table 3 below shows the chi square analysis and binary logistic regression analysis of factors associated with the sale of at least two fresh produce.

Background characteristics; age of retailers, marital status of retailers, educational status of retailers, income levels of retailers, retailer years in food retail, retailer years in current market, food retailed changes with seasons were cross tabulated with the selling of at least two fresh produce. The results show that there are statistically significant relationships between the income levels of retailers; food-retailed changes with seasons and the sale of at least two fresh produce (p<0.05). The results are as shown in table 3 below.

Further binary logistic regression analysis showed that there is a significant association between income levels and the sale of at least two fresh produce (p<0.05), OR (95% CI) =2.204(1.207-4.026). This implies that retailers who sell at least two fresh produce were 2.204 times more likely to earn income of <1000 GHC than their counterparts who did not sell at least two fresh produce.

The binary logistic regression analysis also revealed that there is a statistically significant association between food changes with seasons and the sale of at least two fresh produce, OR (95% CI)= 2.485(1.512-4.084). This depicts that retailers who sell at least two fresh produce are 2.485 times more likely to have the foods they retail change with seasons than their counterparts who do not sell at least two fresh produce.
Table 4. Association between the sale of at least two fresh produce and background characteristics of retailers (N=400 unless otherwise stated) adjusted for background characteristics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sells at least two fresh produce</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>P value</td>
<td>AOR (95% CI)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.506</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>51(38.6)</td>
<td>81(61.4)</td>
<td>0.967(0.581-1.609)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;= 30</td>
<td>93(34.7)</td>
<td>175(65.3)</td>
<td>Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>0.154</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>109(34.2)</td>
<td>210(65.8)</td>
<td>0.691(0.402-1.189)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not married</td>
<td>35(43.2)</td>
<td>46(56.8)</td>
<td>Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational status</td>
<td>0.676</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>69(37.3)</td>
<td>116(62.7)</td>
<td>0.945(0.587-1.522)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not educated</td>
<td>75(34.9)</td>
<td>140(65.1)</td>
<td>Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income level</td>
<td>0.011*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1000 GHC</td>
<td>123(39.3)</td>
<td>190(60.7)</td>
<td>2.204(1.207-4.026)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=1000 GHC</td>
<td>21(24.1)</td>
<td>66(75.9)</td>
<td>Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in retail</td>
<td>p value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>100(39.4)</td>
<td>154(60.6)</td>
<td>2.121(0.926-4.860)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=10 years</td>
<td>44(30.1)</td>
<td>102(69.9)</td>
<td>Ref</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years in current market</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 years</td>
<td>105(38.2)</td>
</tr>
<tr>
<td>&gt;=10 years</td>
<td>39(31.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Foods change with seasons</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>62(43.4)</td>
</tr>
<tr>
<td>No</td>
<td>82(31.9)</td>
</tr>
</tbody>
</table>

*P values significant at <0.05. P values are generated from Pearson chi square.

** OR= odds ratio are significant at <0.05.OR are generated from binary logistic regression. Variables that were fed into the model to generate odds ratio and corresponding 95% confidence intervals include the following: age of retailers, marital status of respondents, educational status of retailers, the income levels of retailers, retailers’ years in food retail business, retailers years in food retail in current market and the change in foods retailed with seasons.

R²=0.058, this coefficient of determination depicts the model was able to explain 5% of variability in the outcome variable (sells at least two fresh produce)
4.8 FOOD RETAIL ASSISTANCE PROGRAMS AND POLICIES EXISTENCE AND RETAILER AWARENESS.

This section presents findings on the existence of food retail assistance programs and policies in the Tamale Metropolis and whether retailers in the traditional markets in the Tamale Metropolis are aware of the food retail assistance programs and policies that incentivize healthier retail. An interview with the coordinating director of Tamale Metropolitan Assembly reported that food retail assistance programs and policies that support or incentivize healthier retail were non-existent in the traditional markets in Tamale (direct communication with coordinating director, 2018).

Only 5.3% indicated they were aware of food retail assistance programs and policies that incentivized healthier retail. Of this number, majority (42.9%) of them reported Internet (42.9%) as their source of awareness, colleagues (33.3) or friends (19%). These are shown in figure 4 below.
Figure 3. Percentage of retailers who are food retail assistance programs and policies aware
CHAPTER FIVE

5.0 DISCUSSION

Study findings are discussed in this chapter in the context of existing literature.

The main objective of the study was to examine the food retail environment in the Tamale metropolis. The discussion is done in themes, namely; attributes of traditional markets in Tamale, types food advertised in front of retailers’ shops displays and/or market exits, percentage of retailers who sell at least two fresh produce, and the existence of food retail assistance programs and policies that incentivize healthier retail and whether retailers were aware of their existence.

5.2 ATTRIBUTES OF TRADITIONAL MARKETS.

The survey findings indicate that healthy foods are significantly less available- fresh fruits & vegetables (45%), dairy foods (19%), whole grains (43%) and snack foods (29%), and rarely promoted in all food categories in the traditional markets in Tamale. These findings have been confirmed by other investigators in several other studies elsewhere (Jetter et al., 2005; Gittelsohn et al., 2008; Cavanaugh et al., 2013; Gosliner et al., 2018). These findings point to the fact that the traditional markets may be an important venue for nutrition related interventions aimed at improving the food retail environment and dietary choices in urban populations. The traditional markets are of particular concern because it is the main outlet for purchasing food for household consumption in Ghana (Meng et al., 2014; Aryeetey et al., 2016). Availability, promotion, nutrition information of healthy foods could be improved. Lower prices for
healthy foods could be emphasized. However, there may be serious barriers hindering the stocking of such healthy foods, including the physical structure (ability for refrigeration), policies, support and food suppliers’ procedures (return unsold goods). Perhaps, the strongest barrier is low consumer demand for healthy foods which has been strongly established in previous researches (Gittelsohn et al., 2008; Andreyeva et al., 2011; Kim et al., 2016). Additionally, the involvement of food producers and suppliers in food retail environment interventions may improve the availability and promotion of healthy foods. Suppliers per se make independent decisions about what foods should be restocked and when new products should be tried.

5.3 TYPES OF FOOD ITEMS RETAILERS ADVERTISE IN FRONT OF STORES OR MARKET EXIT AREA

This survey findings reported that fresh fruits and vegetables, snacks, whole grain and no or low fat dairy products were the most commonly advertised types of food in front of retailers’ shops displays and market exits which is inconsistent with industry findings (Collier, 2015; Cameron et al., 2017; Vandevijvere et al., 2017; Mah et al., 2018) except the snacks. Healthy advertising in front of retailers’ shops and market exits campaigns are growing in popularity and such interventions could positively impact the food retail environment through the use of placement techniques, which are less burdensome to implement than revising stocking. In some countries, firm policy actions and monitoring on advertising of less healthy foods at market exits has significantly reduced the sale and the purchasing of less healthy foods in those areas (Ejlerskov et al., 2018). Some industry players have suggested that there is a need to clean our food environment like the way
environmentalists clean the physical environment and market exits are a major points to start with. People do impulsive buying and end up consuming what they never intended to buy at market exits (Collier, 2015).

The outdoor advertisement of food items lead to increased consumption of those foods especially of the unhealthy (snack foods) and a resultant risk for obesity (Andreyeva, Kelly & Harris, 2011; Lesser, Zimmerman & Cohen, 2013). Food advertisement trigger impulsive purchases by consumers especially those who go to such retail outlets with their children.

5.6 SALE OF AT LEAST TWO FRESH PRODUCE

Analysis of the context specific sample showed that 36% of retailers sold at least two fresh produce of which 99.3% sold at least two fresh fruits and vegetables while the remaining 0.7% sold at least two fresh staples. This suggests that there are varieties of fresh fruits and vegetables in the traditional markets than there are fresh staples and thus, consumers can access different types of fresh fruits and vegetables than the staples. if consumers adapt a habit of eating these fresh produce, it can reduce the risk for nutrition related non-communicable diseases (NR-NCDs).

5.8 EXISTENCE OF FOOD RETAIL ASSISTANCE PROGRAMS AND POLICIES AND RETAILER AWARENESS.

Findings from this study indicate that food retail assistance policies and programs that support or incentivize healthier retail do not exist in the traditional markets in the Tamale Metropolis. Similar findings have been reported in Ghana (Laar et al., 2019) and in
another study elsewhere (FAO & WHO, n.d). Healthy food availability increases significantly with the acceptance and use of food retail assistance programs and policies (Hillier et al., 2012), which unfortunately has not been reported in Tamale although the government of Ghana has the full authority to implement policies and programs that can limit the availability of unhealthy foods and support or incentivize healthier retail (Laar et al., 2019)

This may be contributing to the limited availability of healthy foods in Tamale. Consumers in this food environment may be exposed to the high risk of nutrition related non-communicable diseases (NR-NCDs) as they may become exposed to unhealthy foods in their diet.

Effective national food control systems are important protectors of the health and safety of domestic consumers. They also enable countries to assure the safety and quality of their foods entering international trade and to ensure that imported foods conform to national requirements. Consumers are taking unprecedented interest in the way food is produced, processed and marketed, and are increasingly calling for their governments to accept greater responsibility for food safety and consumer protection (FAO & WHO., n.d). The existence and acceptance of food retail policies and programs in retail outlets increases access to affordable healthy foods in urban populations (Cavanaugh et al., 2012; DeWeese et al., 2016), thus, creating healthy dietary practices. In LMICs, there is a total disconnect between nutrition related non-communicable diseases (NR-NCDs) and national polices to control the rising prevalence of these NR-NCDs (Lachat et al., 2016). Challenges still exist in the implementation of such policies and programs. Evidence point to lack of monitoring and evaluation system, funding and resources, effective multi-
sectoral platforms, clear policy content, organizational culture and structure, the influence of the food industry and change in policy priorities as leading barriers to the implementation of healthy retail policies and programs (Phulkerd et al., 2017).

5.9 STRENGTH AND LIMITATIONS OF STUDY

As far as I am aware, this study is the first to undertake stepwise objective measurement of the food retail environment in Ghana and Tamale Metropolis.

The study has several limitations; despite the large sample, findings may not be generalized to other communities, particularly those that are not urban, densely populated and highly poor. Cross sectional data collection is a limitation since almost all measures—availability, promotion, quality and prices may vary seasonally. Additionally, the study was quantitative in nature thereby creating a barrier in probing to unravel the true state of the food retail environment in the Tamale Metropolis. Also, the study was carried out in the traditional markets thus; conclusion cannot be drawn on the entire food environment in the Tamale Metropolis. The adapted instrument was translated in local languages, which could affect the outcome of the study even though stringent efforts were made at minimizing that.

In spite of these limitations, this study makes a significant contribution to the growing literature on the micro level food retail environment, particularly in Ghana. The study has the following strengths: a standardized, validated tool (NEMS-S) which has high reliability was used, a large sample size was used and several factors aside availability were assessed.
CHAPTER SIX

6.0 CONCLUSIONS

The study sought to assess the attributes of the traditional markets in the Tamale Metropolis, the types of food advertised at market exits or in front of retailers’ shops, the percentage of retailers who sell at least two fresh produce and the existence of food retail assistance programs and policies that incentivize healthier retail and whether retailers were aware of food retail assistance programs and policies.

This survey finding highlights an important opportunity for intervention to improve the micro level food retail environment and dietary choices of urban populations. Availability, promotion and nutrition information of certain healthier foods could be improved.

6.1 RECOMMENDATIONS

Based on the findings of this study, it is important to adapt approaches that will help improve the healthfulness of the food retail environment in Tamale. The following have been suggested for consideration.

6.1.1 PRACTICE

1. Given that food retail assistance and programs do not exist, the Tamale Metropolitan Assembly (TMA) and other stakeholders should endeavor to design and implement food retail assistance programs and policies in the traditional markets as evidence suggests it promotes healthier retail.
2. Following the findings from this survey, food types sold in front of shops or market exits should consistently be monitored for healthfulness scores.

3. There should be consistent campaign by the Tamale Metropolitan assembly and other stakeholders about the increase in the availability, quality and promotion of healthy food items.

6.1.2 POLICY

1. Government should introduce policies that will limit the advertisement of snack foods at market exits or in front of shops.

2. Owing to lack of nutrition information on packaged snack foods, government should implement regulations that will compel manufacturers to include nutrition information on packaged snack foods so as to inform consumer decisions.

6.1.3 RESEARCH

1. Since this study used a relatively small sample, more research works should be conducted using a much larger sample in order to draw generalizations on larger populations.

2. Qualitative or mixed methods research should be carried out to unravel more information about the food retail environment since the cross sectional quantitative research could not do so.
REFERENCES


Bart Minten, "The Food Retail Revolution in Poor Countries: Is It Coming or Is It Over?," Economic Development and Cultural Change 56, no. 4 (July 2008): 767-789. https://doi.org/10.1086/588168


DeWeese, R. S., Todd, M., Karpyn, A., Yedidia, M. J., Kennedy, M., Bruening, M., … Ohri-Vachaspati, P. (2016). Healthy store programs and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), but not the
Supplemental Nutrition Assistance Program (SNAP), are associated with corner store healthfulness. *Preventive Medicine Reports, 4*, 256–261.

https://doi.org/10.1016/j.pmedr.2016.06.018


https://doi.org/10.1017/S1368980014002742


https://doi.org/10.1017/S1368980015001524


Glanz, K., & Hoelscher, D. (2004). Increasing fruit and vegetable intake by changing
https://doi.org/10.1016/j.ypmed.2004.03.002

https://doi.org/10.1016/j.ypmed.2004.01.004


https://doi.org/10.1016/j.jneb.2015.11.006


https://doi.org/10.1371/journal.pmed.1001253

Karen M. Jetter and Diana L. Cassady (2005) Availability and prices of healthier food items, University of California Agricultural Issues Center


Mad Nasir Shamsudin and Jinap Selamat (2005) CHANGING RETAIL FOOD SECTOR IN MALAYSIA, Universiti Putra Malaysia

Mah, C. L., Pomeroy, S., Knox, B., Rynard, V., Caravan, M., Burgess, L., … Minaker, L.


Health, 16(1), 1239. https://doi.org/10.1186/s12889-016-3901-4


https://doi.org/10.1017/S1368980017003792


Tatiana Andreyeva, Ann E Middleton, Michael W Long, Joerg Luedicke and Marlene B
Schwartz (2011) Food retailer practices, attitudes and beliefs about the supply of healthy foods, Public Health Nutrition: 14(6), 1024–1031
doi:10.1017/S1368980011000061


https://doi.org/10.1186/1471-2458-12-194


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APPENDICES

APPENDIX A: INFORMED CONSENT FORM

Project Title

Assessment of the food retail environment in the Tamale Metropolis

Principal investigator: MATTHEW YOSAH KONLAN

Address: School of public health, university of Ghana

General information

I am MATTHEW YOSAH KONLAN, a student of the school of public health, university of Ghana. I’m conducting a study titled: “assessment of the food retail environment in the Tamale Metropolis”. I am interested in finding out your awareness of the existence of food retail assistance programs and policies that support healthier food retail, the types of food you display in front of your shop or corner for sale and whether you sell at least two fresh produce as well as prices, availability, quality and promotion of selected food items. The information I seek to gather are geared towards gentrifying the food environment in this current market.

The survey will take an average of 15 minutes

Why the study

Food retail environment has been implicated in nutrition related non-communicable diseases (NR-NCDs) and related inequalities as many populations are incorporating what
is accessible, affordable and aspirational to them. NCDs account for over 50% of global deaths especially in developing countries.

Possible risks and discomforts

There are no known risks associated with this work. However, if you become uncomfortable about any of the questions asked, you have the right not to answer or seek for clarification.

Possible benefits

Information given will help the researcher to know and understand the needs of food retailers in this environment and to make recommendations.

Compensation

There would be no form of compensation to study participants. However, concerns raised in the course of the study will be used a medium to address them

Right to Refuse

Participation is completely voluntary and you have the right to refuse participation or withdraw from the study at any point in time or refuse to answer any question you feel uncomfortable about.

Confidentiality

Any information given would be respected and kept confidential and used only for research purposes.
I hope that you will participate fully since information from you is vital for this study.

N/B: Are there any questions you wish to ask before consenting to the study?

If yes…………………………………………………………………………………………
………………………………………………………………………………………………

Contacts for additional information:

MATTHEW Y.KONLAN:0200843667,0240382679, matthewykonlan@gmail.com

DR AMOS LAAR: 0244982176,amos.laar@gmail.com

MS. HANNAH FRIMPONG: 0243235225/0507041223

Please confirm your acceptance by ticking in the box (  )

By ticking in this box, I give my consent to be interviewed, with full awareness of the purpose, terms and conditions of the information given

Signature/thumbprint: -------------- Date: ___ / ___ / ___

D D MM YY

PI/Research Assistant’s name: ------------- Sign-------- Date: ___ / ___ / ___

D D MM YY
CONSENT:

I…………………………………………….declare that the purpose, benefits and other aspects of this research has been fully explained to me. All questions and doubts have been answered and I have understood. I hereby agree to participate.

………………………………..                                     __ __/ __ ___
(Signature /thumbprint of participant)                                     (Date)

I verify that the purpose, risk and benefits have been fully explained to the participant. All questions and doubts have been answered to the understanding of respondent. The participant has willingly agreed to take part in the study.

_________________________                                __ __/  __ __/ __ __
(Signature of PI/research assistant)                                      (Date)
APPENDIX 2 VOLUNTEER AGREEMENT

The document above describing the benefits, risks and procedures for the research titled ‘assessment of the food retail environment in the Tamale Metropolis’ 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)

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

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

_________________             _________________________________

(Date)(Name and signature of witness)

I certify that the nature and purpose, the benefits and procedures of the study associated with participating in this research have been fully explained to the above individual.

_________________             _________________________________

(Date)(Name/sign of person who obtained consent)
APPENDIX 3: STUDY QUESTIONNAIRE

FACESHEET

Interview number:____________ Food Distribution
Location:__________________

Date & Time Surveyed: Date:____________ Day:____________
Time:____________

INTRODUCTION AND CONSENT

Hello. My name is Matthew Yosah Konlan. I am a Master of Public health student of the University of Ghana, School of Public Health. As part of the requirement for graduation at the university of Ghana, I am conducting a survey on the food retail environment in Tamale titled “Assessment of the food retail environment in the Tamale Metropolis”. The information I will collect will be used for my academic purposes and also to help government and other stakeholders to plan on how to assist you depending on the outcome of the survey. I would like to ask you some questions about yourself and the entire food retail environment. The questions usually take about 10 to 15 minutes. All of the answers you give will be confidential and will not be shared with anyone other than school authorities, research assistants and scientific journals. I hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time. In case you need more information about the survey, you may contact the persons listed;(Matthew Yosah Konlan, 0200843667),(Dr Amos Laar),
Please, do you have any questions? Can I begin the interview now?

SIGNATURE OF INTERVIEWER: ________________

RETAILER AGREES TO BE INTERVIEWED…1 (PROCEED)  RETAILER DOES NOT AGREE TO BE INTERVIEWED…2 (END)

TEL (RESPONDENT): ____________________________

**SOCIODEMOGRAPHIC FEATURES AND EXPERIENCE OF RETAILERS**

<table>
<thead>
<tr>
<th>NO.</th>
<th>QUESTIONS</th>
<th>CODING CATEGORIES</th>
<th>SKIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is your sex?</td>
<td>Male....................................1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female...................................2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>What is your age in completed years?</td>
<td>___ ___</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>What is your marital status?</td>
<td>Single..................................1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Married..................................2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Divorced................................3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widowed..................................4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>What is your religion?</td>
<td>Christianity..........................1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Islam....................................2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>What is the highest level of education you have attained?</td>
<td>No formal education........................1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary.....................................2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary...................................3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tertiary/college..........................4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Monthly income</td>
<td>________(GHC)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>How long have you been in the food retail business?</td>
<td>___ ___</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>How long have you been selling in this current market?</td>
<td>___ ___</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Do the foods you sell change with seasons?</td>
<td>Yes......................................1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No.........................................2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mention the types of food that change with seasons</td>
<td>.........................</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.........................</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.........................</td>
<td></td>
</tr>
</tbody>
</table>
### SECTION B, AWARENESS OF THE EXISTENCE OF FOOD RETAIL ASSISTANCE PROGRAMS/POLICIES THAT SUPPORT OR INCENTIVIZE HEALTHIER RETAIL

<table>
<thead>
<tr>
<th>11</th>
<th>Are you aware of the existence of any food retail assistance program/policy that support the sale of healthy foods?</th>
<th>Yes………………………………………………1</th>
<th>No………………………………………………2</th>
</tr>
</thead>
</table>

### SECTION C

**MARKET ATTRIBUTES, SALE OF AT LEAST TWO FRESH PRODUCE AND TYPES OF FOOD ADVERTISED IN FRONT OF RETAILERS’ SHOPS DISPLAYS AND MARKET EXIT AREAS**

12. **Does retailer sell fresh fruits and vegetables? ( ) yes ( ) no**

If yes, please fill out the following bellow. If no, proceed to the next question

<table>
<thead>
<tr>
<th>Item</th>
<th>Available?</th>
<th>Price per unit/portion (use cheapest price for promotion)</th>
<th>Promotion</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES……1</td>
<td>YES….1</td>
<td>YES….1</td>
<td>Acceptable(A) ..1</td>
</tr>
<tr>
<td></td>
<td>NO……….2</td>
<td>NO……….2</td>
<td>NO…….2</td>
<td>Unacceptable(UA)..2</td>
</tr>
</tbody>
</table>

92
<table>
<thead>
<tr>
<th>Item</th>
<th>Available?</th>
<th>Price per unit (choose cheapest price for item)</th>
<th>Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES……1</td>
<td></td>
<td>YES……1</td>
</tr>
<tr>
<td></td>
<td>NO……2</td>
<td></td>
<td>NO……2</td>
</tr>
</tbody>
</table>

13. Does retailer sell dairy products? Yes ( ) No ( )

If yes, fill out the following below. If no, move to the next question

<table>
<thead>
<tr>
<th>Item</th>
<th>Available?</th>
<th>Price per unit (choose cheapest price for item)</th>
<th>Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim/ fat free milk</td>
<td>1 2</td>
<td></td>
<td>1 2</td>
</tr>
<tr>
<td>Low fat yoghurt/ cottage cheese</td>
<td>1</td>
<td>2</td>
<td>___ ___</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---</td>
<td>---</td>
<td>---------</td>
</tr>
</tbody>
</table>

14. Does retailer sell whole grain? Yes ( )  No ( )

If yes, fill out the following. If no, skip to the next question

<table>
<thead>
<tr>
<th>Type</th>
<th>Available?</th>
<th>Price per unit (Choose cheapest price for item)</th>
<th>Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YES…..1</td>
<td></td>
<td>YES…1</td>
</tr>
<tr>
<td></td>
<td>NO……2</td>
<td></td>
<td>NO…..2</td>
</tr>
</tbody>
</table>

Maize

| 1 | 2 | ___ ___ | 1 | 2 |

Millet

| 1 | 2 | ___ ___ | 1 | 2 |

Beans

| 1 | 2 | ___ ___ | 1 | 2 |

15. Does retailer sell snack foods? Yes ( )  No ( )

If yes, fill out the following. If no, skip to the next question

<table>
<thead>
<tr>
<th>Type</th>
<th>Available?</th>
<th>Price</th>
<th>Promotion</th>
<th>Nutrition information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Quantity</td>
<td>0-----1</td>
<td>≥2….2</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------</td>
<td>---------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Candy / chocolate</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cookies/cakes/sweets</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chips</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Does retailer sell at least two fresh produce? Yes ( ) No ( )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, fill out the following. If no skip to the next question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Quantity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staple food</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Fresh fruits and vegetables</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>17. Is advertising displayed in front of retailer’s shop or corner/ market exit area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes ( ) No ( ) if yes, fill out the following. If no end session</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Advertising?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------</td>
<td>-----</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Fresh fruits and vegetables</td>
<td>?</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Low or no fat dairy</td>
<td>?</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Candy/chocolate/cookies/cakes/sweets/chips</td>
<td>?</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>?</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
ADAPTED FROM NUTRITION ENVIRONMENT MEASUREMENT SURVEYS-CORNER STORES (CS) AND NUTRITON ENVIRONMENT MEASUREMENT SURVEY-STORES (NEMS-S) AND MODIFIED.

END SESSION TIME SESSION ENDED: ___ __(MINUTES)

INTERVIEWER NOTES (IF ANY)

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APPENDIX 4 ETHICAL APPROVAL

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

<table>
<thead>
<tr>
<th>GHS-ERC Number</th>
<th>GHS-ERC103/12/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title</td>
<td>Assessment of the Food Retail Environment in the Tamale Metropolis</td>
</tr>
<tr>
<td>Approval Date</td>
<td>15th May, 2018</td>
</tr>
<tr>
<td>Expiry Date</td>
<td>14th May, 2019</td>
</tr>
<tr>
<td>GHS-ERC Decision</td>
<td>Approved</td>
</tr>
</tbody>
</table>

This approval requires the following from the Principal Investigator:

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED

DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra