

UNIVERSITY OF CAPE COAST

CHILDHOOD OBESITY AMONG PRIMARY SCHOOL PUPILS IN THE
TEMA METROPOLIS

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TEMA METROPOLIS

BY

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Social Sciences of the College of Humanities and Legal Studies, University of
Cape Coast, in partial fulfilment of the requirements for the award of Master
of Philosophy degree in Population and Health

MAY 2020

DECLARATION

Candidate's Declaration

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

Candidate's Signature Date

.....

Name: Yvette Dede-Terbi Akornor

Supervisor's Declaration

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

Supervisor's Signature Date

Name: Prof. Akwasi Kumi-Kyereme

ABSTRACT

Childhood obesity has been established to be a major public health concern globally. Children who are obese are more likely to stay obese into adulthood and to develop non communicable diseases (NCDs) at a younger age. The study sought to investigate childhood obesity and its associated factors among primary school pupils within Tema Metropolis. A cross-sectional study was carried out among 363 upper primary school pupils in the Tema Metropolis. Both inferential and descriptive statistics were used to examine the associations between background characteristics and childhood obesity. The results provide evidence that the overall combined prevalence of obesity among school pupils in the Tema Metropolis was 15.43%. Pupils who consumed less fruits and vegetables but consumed more sweetened drinks or substituted fruits and vegetables with high fat and refined cereals were more likely to be obese. Furthermore, those who ate breakfast consistently were less likely to become obese. Also, the results from the study showed that more than half (51.24%) of the pupils who watch television each day were more likely to be obese. Additionally, pupils who performed less physical activities were more likely to become obese compared to those who engaged in more physical activities. The findings of this study also showed that pupils (15.91%) who were obese were from low economic stratum. To sustain a healthy dietary habit and physical activity among primary school pupils in the Tema Metropolis, the Ghana Education Service (GES) must strengthen Physical Education activities and make it compulsory to pupils in the basic schools. GES and Ghana Health Service (GHS) must also develop policies to ensure cooks or venders at the school canteen sell healthy foods to the school pupils. GHS must provide information on healthy active lifestyle and dietary habits to parents in order to ensure their children also embrace it and improve upon their health.

KEY WORDS

OBESITY

OVERWEIGHT

CHILDHOOD

PREVALENCE

HEALTH

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DEDICATION

To my mother, Patience Wesu,

LIST OF ABBREVIATION

BMI	Body Mass Index
NCD	Non Communicable Disease
WHO	World Health Organization
CDC	Centre for Disease Control and Prevention
NHANES	National Health and Nutrition Examination Survey
IOTF	International Obesity Task Force
SES	Socio Economic Status

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CHAPTER ONE

INTRODUCTION

Background to the Study

The increase of childhood obesity is a global health challenge (De Onis, Blossmer & Borghi, 2010; Wang. & Lobstein, 2006; World Health Organisation [WHO], 2018a). The prevalence of childhood obesity has increased worldwide from 32 million in 1990 to 41 million in 2016 and it is expected to reach 70 million in 2025 (WHO, 2018b) even though it varies from one country to another depending on the lifestyle, kind of diet and environmental factors (Amidu et al., 2013).

Childhood obesity is noted as a disorder with multiple causes (Sahoo, Sahoo, Choudhury, Sofi, Kumar, & Bhadoria, 2015). Obesity is as a result of an imbalance between energy intake and expenditure (Sahoo et al., 2015). Various reasons can be given for childhood obesity. According to the United States Department of Health and Human Services (DHHS, 2012), some of the causes of childhood obesity include genetic factors, physical inactivity, hormonal growth, unhealthy eating habits (which may be as a result of behavioral or socioeconomic factors), cultural or a combination of these causes.

In developed countries, obesity is considered to be more common among poorer communities where heads of family influence food choices and physical activity levels are limited (McCormack, Hawe, Perry & Blackstaffe, 2011) which lead to patterns of food consumption being affected (Lobstein, Baur & Uauy, 2004) and an increasingly sedentary lifestyle. Another cited reason for childhood obesity is the increasing long working hours of parents

which reduce their ability to supervise children's sedentary behavior as well as family indulging in energy-dense processed or restaurant food for convenience (Ebbeling, Ludwig & Pawlak, 2002; (Rivera, Barquera, Campirano, Campos, Safdie, & Tovar, 2002; Rivera, Barquera, González Cossío, Olaiz, & Sepulveda, 2004)

A cross-sectional, nationally representative school-based survey in 1997-1998 was conducted to compare the body mass index and overweight among children in 13 European countries, Israel and the United States and the results indicated the highest prevalence of overweight in the United States, Ireland, Greece and Portugal (Lissau, Overpeck, Ruan, Due, Holstein, & Hediger, 2004).

The prevalence of obesity in Africa increased from 4 million in 1990 to 9 million in 2016 (WHO, 2018) and it is expected to reach 12.7% in 2020 (De Onis et al., 2010). The alarming increasing rate of obesity has also been cited in other studies conducted in sub-Saharan Africa (Agyeman, Boatemaa, Frempong, & Aikins, 2015; Biadgiligni, Mgutshini, Haile, Gebremichael, Moges, & Tilahun, 2017). With these concerns raised it behooves on sub-Saharan African countries like Ghana to start putting measures in place to help minimize this epidemic. Yet there is paucity of data when it comes to childhood obesity and its related health implications in Ghana. Conducting this study would add to the limited literature when it comes to childhood obesity in Ghana and as a result there is the need to investigate the prevalence of childhood obesity among primary schools in the Tema Metropolis of Ghana.

Statement of the Problem

According to WHO (2014a), children who are overweight and obese are more likely to stay obese into adulthood and develop non-communicable diseases (NCDs) at a younger age (WHO, 2014a). All the same, even when the disorders do not present themselves in childhood, obesity or overweight among children increases the risk of them developing in adulthood (Daniels, 2006).

According to WHO (2018b), many low and middle-income countries are now burdened with diseases such that they are challenged with the problems of infectious diseases and under nutrition; they are also faced with rapid upsurge in non-communicable disease risk factors such as obesity and overweight. Overweight and obesity weighed down on the body (Center for Disease Control & Prevention[CDC], 2012a), leads to cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders and some cancers (endometrial, breast, and colon) (WHO, 2014), affects academic outcomes (Schwartz & Puhl, 2003; Taras & Potts- Datema, 2005) and mental health (Davison & Birch, 2001) and is linked to deprived employment and relationship outcomes (Viner & Cole, 2005). Also, an obese child is associated with higher chance of adulthood obesity (Biro & Wien, 2010).

The issue of childhood obesity in developing countries is less acknowledged and hence, less information is available (McCormack, Hawe, Perry, & Blackstaffe, 2011). This might be the case in Ghana, where there is paucity of data when it comes to childhood obesity and its associated factors.

According to the Ghana Demographic Health Survey (2014), the prevalence of overweight and obesity among children under five years old as

well as men and women between the ages of 15-49 was five percent, forty percent and sixteen percent respectively. The current WHO data reveal that there is prevalence of obesity in urban settings in developing countries (WHO, 2018b). Also, some studies conducted in Ghana focused more on the prevalence of childhood obesity (Aryeetey, Brown, Colecraft, Lartey, Marquis & Nti, 2017; Mogre, Gaa, Abukari, 2013; Mohammed & Vuvor, 2012; Oppuni-Frimpong, 2015) while other studies also focused more on the determinants of childhood obesity (Kwabla, Gyan & Zotor, 2018; Mogre, Aneyire & Gyamfi, 2013).

As a result, this study seeks to investigate not only the prevalence of childhood obesity but also more on its associated factors in order to add on to existing knowledge of the prevalence of childhood obesity and its associated factors among primary school pupils in Ghana. .

Objectives of the study

The purpose of this study is to investigate childhood obesity among primary school pupils within Tema Metropolis.

The specific objectives are to:

1. Assess the prevalence of obesity among primary school pupils in the Tema Metropolis.
2. Examine the behavioral factors associated with obesity among primary school pupils in the Tema Metropolis.
3. Analyze the demographic factors associated with obesity among primary school pupils in the Tema Metropolis.
4. Explore the economic factors associated with obesity among primary school pupils in the Tema Metropolis.

Research Questions

The study is guided by the following research questions.

1. What is the prevalence of obesity among primary school pupils in the Tema Metropolis?
2. Is there an association between the social factors and obesity among primary pupils in the Tema Metropolis?
3. Is there an association between demographic factors and obesity among primary school pupils in the Tema Metropolis?
4. What is the relationship between socio economic status and obesity among primary school pupils in the Tema Metropolis.

Hypotheses of the Study

H₀1: There is no statistically significant difference between prevalence rate of obesity and type of school (private or public) attended by primary school pupils in the Tema Metropolis.

H₀2: There is no statistically significant difference between the prevalence rate obesity and economic status of school pupils in the Tema Metropolis.

H₀3: There is no statistically significant difference between prevalence rate of obesity and sex of pupils in the Tema Metropolis.

H₀4: There is no statistically significant difference between prevalence rate of obesity and physical activities among pupils in the Tema Metropolis.

Significance of the Study

Due to the fact that, children who are obese are likely to remain obese into adulthood and the long-term consequences it has on the health of an individual (WHO, 2019), it is therefore important to give high priority to the

prevention of obesity or address the growth of obesity as it begins rather than it being allowed to develop among children. In order to determine various strategies in the prevention of childhood obesity and its associated factors, there is the need to execute comprehensive studies on its prevalence and associated factors. Although there have been few studies conducted on childhood obesity in major cities of Ghana and it is known to be common in urban areas (Abukari, Gaa, Mogre & Nagumsi, 2013; Aryeetey, Brown, Colecraft, Lartey, Marquis & Nti, 2017; Frimpong, 2015; Mohammed & Vuvor, 2012), there is paucity of data available on the prevalence of childhood obesity and its associated factors. Due to the scanty data on childhood obesity in the Tema Metropolis and the close proximity to the Accra Metropolis, the Tema Metropolis was selected for this study.

The results of this study, therefore, intend to add on to existing knowledge of the prevalence of childhood obesity and its associated factors among primary school pupils. Thus, it will reveal the current state of the school and home environment with respect to the various policies and facilities provided for feeding and physical activities of pupils. Also, findings of this study will be essential and useful for stakeholders (heads of schools, health workers and policy makers) in reshaping strategies and interventions that will be beneficial for controlling and preventing childhood obesity in schools. This study will also inform heads of schools as well as parents on their responsibilities in the prevention and management of obesity among school-aged pupils.

Limitations of the study

This study is a cross-sectional study and may not be appropriate to establish a causal relationship. This means that the findings will be associative and not causative. Schools that were selected randomly for the study were located in the urban sector of the Tema Metropolis. Also, the variables that were used in assessing the levels of physical activities were scanty and this may account for the fact that the levels of physical activities do not anticipate childhood obesity. In addition, not all selected schools permitted me to collect the data reducing the expected sample size of the study (from 450 to 396).

Definition of Terms

Childhood –is defined as a state or period of being a child (Merriam-Webster Online Dictionary, 2018).

Health –is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 2018).

Lifestyle - Lifestyle is a particular way that a person or group of people live and the values and ideas supported by that person or group (Cambridge dictionary, 2018)

Non-Communicable Disease (NCD): These are diseases of long time duration and generally slow progression (WHO, 2013)

Obesity - is defined as the accumulation of abnormal or excessive fat that poses health risk to an individual. An individual is regarded as overweight or obese when the Body Mass Index (BMI) is measured. BMI is calculated by dividing a person's weight in kilograms by the square of his or her height in meters (kg/m²) (WHO, 2018).

Overweight –is defined as weight that is higher than what is considered as a healthy weight for a given height (Centre for Disease Control and Prevention, 2016).

Physical activity – is defined as any bodily movement produced by skeletal muscles that need the expenditure of energy (WHO, 2018).

Prevalence – refers to the degree at which something is prevalent especially the percentage of a population that is affected with a particular disease at a specific time (Merriam-Webster Online Dictionary, 2018).

Organisation of the Study

This study was divided into five chapters, Chapter one addressed the background to the study, statement of the problem, objectives of the study, hypothesis, significance of the study and limitation of the study. Chapter Two reviewed literature related to this study. Chapter Three described the research methods that was used for the study. Chapter Four presented analysis of collected data. Chapter Five comprised of summary of findings, discussions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Childhood obesity has become a global health challenge (De Onis, Blossmer & Borghi, 2010) and it is considered as a disorder with multiple causes (Sahoo, Sahoo, Choudhury, Sofi, Kumar, & Bhadoria, 2015). This chapter comprises the empirical and theoretical literature and the conceptual framework. The empirical literature outlines the definition of obesity by different organisations, the prevalence rate of childhood obesity and factors associated with childhood obesity. The theoretical literature reviews the socio-ecological model (SEM) and the social influence theory and also presents the conceptual framework.

The chapter defines the various ways in which obesity can be measured at different ages according to three different organisations. The prevalence section discusses the prevalence of childhood obesity under global and local headings. Concerning factors associated with childhood obesity, some of the leading causes of childhood obesity are discussed. The theoretical framework section discussed theories relating to the behavior and activities contributing to the weight status of a child. The conceptual framework of this study describes how the policies and practices at home and school contribute to the weight status of a child.

Concept of Obesity

Generally, the accumulation of abnormal or excessive fat that poses health risk to an individual is termed as obesity (WHO, 2018). An individual is regarded as overweight or obese when the Body Mass Index (BMI) is

measured. BMI is calculated by dividing a person's weight in kilograms by the square of his or her height in meters (kg/m^2) (WHO, 2018). The likelihood of this condition developing is as a result of how an individual's lifestyle (eating high-calorie, low-nutrient foods and beverages, not getting enough physical activity, sedentary activities) outweighs the way in which the bodily part functions (Centers for Disease Control and Prevention [CDC], 2016). All through the history of humans, weight gain and the storage of fat in our body have been examined as signs of health and prosperity (WHO, 2000). In recent times, as the living standards are on the rise, obesity presents an increasing threat to health in countries worldwide (WHO, 2000). Obesity is therefore a chronic disease prevalent in both developed and developing countries, which is affecting children as well as adults (WHO, 2000).

There are several ways that can be used to measure or determine obesity; the basic and most common method used is the body mass index (Harvard T. H. Chan School of Public Health, Obesity Prevention, 2019). Other researchers, on the other hand also use the more sophisticated methods such as, magnetic resonance imaging or dual energy X-ray absorptiometry and these methods are used based on the measurement of body fat (Harvard T. H. Chan School of Public Health, Obesity Prevention, 2019).

Overweight and obesity among children and adolescents at different ages have been defined by three different organisations. The World Health Organization (WHO), the U.S. Centers for Disease Control and Prevention (CDC) and the International Obesity Task Force (IOTF) and these organisations to some extent give different estimates of the prevalence of overweight and obesity (Harvard T. H. Chan School of Public Health, Obesity

Prevention, 2018). Table 1 gives the different definitions of childhood obesity by different organizations.

Table 1: Definition of Childhood Obesity

Organization	Definition of Childhood Obesity
World Health Organization	<p>WHO Child Growth Standards (birth to the age of 5 years)</p> <p>Obese: Body mass index (BMI) > 3 standard deviations above the WHO growth standard median</p> <p>Overweight: BMI > 2 standard deviations above the WHO growth standard median</p> <p>Underweight: BMI < 2 standard deviations below the WHO growth standard median</p> <p>WHO Reference 2007 (ages 5 to 19)</p> <p>Obese: Body mass index (BMI) > 2 standard deviations above the WHO growth standard median</p> <p>Overweight: BMI > 1 standard deviation above the WHO growth standard median</p> <p>Underweight: BMI < 2 standard deviations below the WHO growth standard median.</p>
U.S. Centers for Disease Control and Prevention	<p>According to CDC Growth Charts</p> <p>In children ages 2 to 19, BMI is assessed by age- and sex-specific percentiles:</p> <p>Obese: BMI > 95th percentile</p> <p>Overweight: BMI > 85th and < 95th percentile</p> <p>Normal weight: BMI > 5th and < 85th percentile</p> <p>Underweight: BMI < 5th percentile</p> <p>In children from birth to age 2, the CDC uses a modified version of the WHO criteria.</p>
International Obesity Task Force	<p>Provides international BMI cut points by age and sex for overweight and obesity for children age 2 to 18.</p> <p>The cut points correspond to an adult BMI of 25 (overweight) or 30 (obesity)</p>

Source: Harvard T. H. Chan School of Public Health, Obesity Prevention, (2018).

Prevalence of Childhood Obesity Worldwide

The World Health Organization indicates in its report that obesity has tripled between 1975 and 2016 (WHO, 2018d). According to the report, 39% of adults aged 18 years and above were overweight, 13% of whom were obese worldwide (WHO, 2018d). In this same report, 41 million children under age 5 were overweight or obese in 2016 and over 340 million children and adolescents between the ages of 5 and 19 were overweight or obese in the same year (WHO, 2018d). Obesity and overweight have increased greatly in economically developed countries and among urbanized populations (Wang & Lobstein, 2009). Also, the prevalence rate of childhood obesity and overweight has increased to a significant extent in less than one generation (Lobstein et al, 2015). Additionally, globally, the prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010 and this trend is expected to reach 9.1% in 2020 (De Onis, 2010).

A study conducted in 2010 to quantify the worldwide prevalence and trends of overweight and obesity among pre-school children reported an estimation of 43 million children (35 million in developing countries) to be overweight and obese and 92 million were at risk of overweight (De Onis, Blössner & Borghi, 2010).

Wang and Lim (2012) conducted a study to describe the prevalence and time trends of obesity among children. It was indicated that western and industrialized countries had the highest prevalence whilst some developing countries had low prevalence rate. It was also indicated in this same study that the WHO Americas (comprising the totality of the continents of North and South America) and Eastern Mediterranean regions had higher prevalence rate

of overweight and obesity (30-40%) than the European (20%-30%), South-East Asia, Western Pacific and African regions (10-20% in the latter three) (Wang & Lim, 2012).

In 2013, a systematic analysis for the Global Burden of Disease Study, reported that the prevalence of obesity among children has increased substantially in developed countries. The report of this study indicated 23.8% (22.9-24.7) of boys and 22.6% (21.7-23.6) of girls were obese or overweight (Fleming et al., 2014). Developing countries on the other hand in the same year (2013) were reported by the Global Burden of Disease to have an increased prevalence rate of obesity from 8.1% (7.7-8.6) to 12.9% (12.3-13.5) among boys and from 8.4% (8.1-8.8) to 13.4% (13.0-13.9) among girls (Fleming et al., 2014).

In an analysis carried out to determine the prevalence of overweight and obesity among children within 34 countries, the results ranked countries according to their prevalence rate of overweight and obesity, indicating three countries with the highest prevalence of overweight and obesity respectively, and the ranking was as follows: Malta (25.4% & 7.9%), the United States (25.1% & 6.8%) and England (21.2% & 5.1%). Countries with the lowest prevalence of overweight and obesity were also indicated and these countries were Lithuania (5.1% and 0.4%), Russia (5.9% and 0.6%), and Latvia (5.9% and 0.5%) (Janssen et al., 2005). The National Health and Nutrition Examination Survey (NCHS) conducted a study between 2015 and 2016 on the prevalence of obesity among United States (U.S) youths. The report indicated that obesity among U.S. youth was 18.5% and the overall prevalence

of obesity among school aged children between 6 -11 years was 18.4% in that same year (Center for Disease Control and Prevention [CDC], 2016).

In addition, Ogden and colleagues, indicated that 17% of youth in the United States are obese although the prevalence remained stable between 2003 - 2004 and 2009 - 2010 (Ogden, Carroll, Kit & Flegal, 2014). In 2014, a study was conducted in the United States to analyze trends in childhood obesity between 2003 and 2012 and according to the report, 8.1% of infants and toddlers in 2011 and 2012 had high weight for recumbent length, 16.9% of 2-19 years old were obese (Ogden et al., 2014). However, the overall result indicated that there have been no significant changes in the prevalence of obesity in youth between 2003 and 2004 and 2011 – 2012, meaning prevalence of obesity remains high (Ogden et al., 2014).

An estimation of obesity and extreme prevalence of obesity among children and adolescents in the United States between 2011 and 2014 was investigated and the results stipulated was 17.0% of obesity prevalence in 2011 to 2014 and an extreme prevalence of obesity among children to be 5.8% (Ogden, Carroll, Lawman, Fryar, Kruszon-Moran, Kit & Flegal, 2016).

A report presented by National Health and Nutrition Examination Survey [NHANES] (2008) conducted among U.S children between 2007 and 2008 indicated that 16.9% of children and adolescents aged 2-19 years were obese (Karnik & Kanekar, 2012). In the same report, the prevalence of childhood obesity among pre-school children between 2-5 years old (boys and girls) has increased from 5.% to 10% between 1979-1980 and 2007-2008 and it has increased from 6.5% to 19.6% among age group 6-11 years old (Karnik, & Kanekar, 2012). It has also been recorded that, in the USA a child's

average weight has risen by more than 5kg within three decades, to an extent where a third of the country's children are overweight or obese (Lobstein et al., 2015).

An examination was made in China to determine the prevalence of and trends in obesity among children and adolescents (1985-2010) (Sun, Ma, Han, Pan & Xu, 2014). The overall age-adjusted prevalence of obesity was established to be 8.1% among children and overweight was 19.2% among adolescents aged 7-18 years. However, during this period (1985- 2010), there was a significant and continuous rise in the prevalence of obesity in children as well as adolescents (sun et al., 2014).

The changes in the population's prevalence of overweight and obesity among Australian children age 7-15 years from 1969 to 1985-1997 were determined and the results for 1985-1997 indicated an increase by 60%-70% of the population prevalence of overweight and 2-4 fold increase of obesity, making the combined overweight and obesity categories double. For 1969-1985, the prevalence of obesity trebled and the combined prevalence of overweight and obesity increased by 60% (Booth, Chey, Wake, Norton, Hesketh, Dollman, & Robertson, 2003).

In a representative sample of Portuguese youth aged 10-18 years, the World Health Organization (WHO) and the International Obesity Task Force's (IOTF) cut-offs were used to categorize overweight and obese participants and the result indicated the prevalence of overweight and obesity to be 17.0% and 4.6% in girls, and 17.7% and 5.8% in boys, respectively (Luis et al., 2011).

According to WHO (2017a), due to the up-and-coming economies of developing countries, the increased rate of childhood overweight and obesity

is 30% higher than that of developed countries (WHO, 2017a). Although childhood obesity is on the rise globally (De Onis, Blössner & Borghi, 2010), an estimation of 65% of the world's population live in countries where overweight and obesity kill more people than underweight (WHO, 2014a).

The childhood obesity epidemic in Africa has reached an alarming state (WHO, 2016). The prevalence of childhood obesity on the continent of Africa has spewed from 4.8 percent to 6.1 percent in the last 25 years (Conway-Smith, 2016). Low-and middle-income countries have the greatest number of obese children, with a quarter living in Africa (WHO, 2018e).

Similarly, a quantitative synthesis among four regions (West, Central, East, and South) in sub-Saharan Africa revealed an increasing proportion of obesity over time among school- aged children in this region and the average weight of obesity that was captured the entire period of time was 2.5% (Muthuri, Francis, Wachira, LeBlanc, Sampson, Onywera & Tremblay, 2014).

In the eastern part of Africa, a cross-sectional comparison study was conducted in Dodoma and Kinondoni municipalities in Tanzania to determine the prevalence of obesity among school children aged 6-12 years. With the use of anthropometric and body composition measurements for all respondents, the prevalence rate of obesity among children aged 6-9 years in Dodoma and Kinondoni were 5.6% and 6.3% respectively. For school children aged 10-12 years in Dodoma, 3.9% were obese compared to 5.8% of their peers in Kinondoni (Mosha & Fungo, 2010). Findings from an analytical cross-sectional research study to determine the prevalence of obesity among primary school children aged 8-13 years in another area of Tanzania called Dar es Salaam showed that the prevalence of obesity was 6.7% and it was significant

among the primary school children in that area of Tanzania (Pangani, Kiplamai, Kamau & Onywera, 2016).

In the urban setting of Nairobi, Kenya a cross-sectional study was conducted in two divisions in Nairobi province to determine the prevalence rate of obesity among school children aged 9-14 years and it was established that the prevalence of combined overweight and obesity was 19.0% (Kyallo, Makokha, Mwangi, 2013).

It has also been established that obesity among primary school children is on alarming increase in dire dawa, eastern Ethiopia (Desalew, Mandesh & Semahegn, 2017). This school based cross-sectional study conducted in dire dawa, Ethiopia aimed to assess the prevalence of obesity and its associated factors among primary school children and the results indicated a prevalence rate of 5.8% (Desalew, Mandesh & Semahegn, 2017). In addition, in the Bahir Dar City, Northwest Ethiopia, the prevalence rate of overweight/obesity among school children aged 6-12 years was revealed as high with an overall prevalence of 11.9% (8.8% were overweight and 3.1% were obese) (Mekonnen, Tariku and Abebe, 2018).

Narrowing the prevalence rate of childhood obesity to the western part of Africa, a cross-sectional study was conducted among primary school children and adolescents aged 5-18 years in four urban towns (Lagos, Port Harcourt, Nsukka and Aba) in Southern Nigeria. The results indicated a prevalence rate of overweight and obesity to be 11.4% and 2.8% respectively and it was established that the prevalence rates of overweight and obesity are increasing among urban Nigerian children and adolescents (Ene-Obong, Ibeanu, Onuoha & Ejekwu, 2012).

In another cross-sectional school based study conducted in Lagos, Nigeria which aimed at determining the prevalence of obesity and the associated risk of high blood pressure among Nigerian adolescents. The results showed the prevalence of overweight and obesity to be 13.8% and 9.4% respectively among the school children in Lagos (Oduwole, Ladapo, Fajolu, Ekure, & Adeniyi, 2012).

Looking at the prevalence rates of obesity in Ghana, there are differences both in the urban areas as well as the rural areas. The prevalence rate of obesity in Ghana is at 15% (Ghana School Survey, 2012); however, it varies by region. For instance, in a cross-sectional study conducted in Urban Ghana (Accra and Kumasi) to determine the prevalence of obesity among school-aged children, the results showed that 17% of children were obese (Aryeetey, Brown, Colecraft, Lartey, Marquis & Nti, 2017). Two other studies conducted in the Accra and Tema Metropolis indicated an overall prevalence of 10.9% (Mohammed & Vuvor, 2012) and 15.4% respectively (Mohammed, 2014).

Another conducted in Accra, Ghana, among Junior high school children aged 11-15 years from six basic schools reported a prevalence of 26.5% and 26% of obesity among girls and boys respectively (Annan-Asare, Asante & Amoah, 2017).

On the other hand, in the northern part of Ghana, it appears the prevalence rate is lower than that of the Greater Accra Region. For instance, a study conducted in the Northern part of Ghana also reported a childhood obesity prevalence of 7.5% (Amidu, Owiredu, Saaka, Quaye, Wanwan, Kumibea, Zingina & Mogre, 2013). Therefore, comparing the prevalence rate

of obesity in the Greater Accra Region to that of the Northern Region, one can say the prevalence rate in the Greater Accra Region is higher than that of the Northern Region.

Factors Associated with Childhood Obesity

The development of childhood obesity is less understood, however it is believed to be a disorder with multiple causes. Thus, there is not a single determinant of obesity (Sahoo, Sahoo, Choudhury, Sofi, Kumar & Bhadoria, 2015). From the literature the factors are; demographic factors (genetics, family and parental factors), behavioral factors (diet, physical activities, sedentary lifestyle) and economic factors (occupation of parents and residence).

Research has also shown that obesity is derived from the changes that occur in individual behavior, thus, feeding practices and physical activities, (Darmon & Drewnowski, 2015; Carlin, Murphy & Gallagher, 2015), which is influenced by the environment. Some of the causes of childhood obesity include genetic factors, physical inactivity, hormonal growth, unhealthy eating habits (which may be as a result of behavioral or socioeconomic factors), cultural or a combination of these causes (United States Department of Health and Human Services [DHHS], 2012).

It has also been established that the weight status of a mother and grandmother, the intake of excess fat and energy foods and less physical activities are known to be strong predictors of childhood obesity in a country like Algeria (Saker, Merzouk, Merzouk, Ahmed & Narce, 2011).

For example, a study was conducted among Hispanic children to examine the factors that influence childhood obesity and six themes emerged

as eating habits, cultural perceptions of weight, acculturation, perceptions people have about childhood obesity, economic issues and generational differences. The results indicated that the disagreeing perceptions about unhealthy eating emerged and adults also expressed lack of knowledge in terms of nutrition and lack the skill to prepare healthy meals. Adolescents on the other hand, stressed the fact that there were unrestricted parenting styles, and lack of discipline led to unhealthy lifestyle in Hispanic families (Garcia, Gatlula, Bonilla, Frank, Bird, Rascón & Rios-Ellis, 2019). Additionally, in South Asia, a systematically narrative review was conducted to assess and synthesize evidence on risk factors associated with childhood obesity and overweight that have been published and the results indicated eleven final reviewed studies, all of which were conducted in school settings in India, Pakistan and Bangladesh. The key risk factors per the results showed a statistically significant association with childhood obesity and overweight and these included: lack of physical activities in six studies, long hours of watching TV/playing computer games in four studies, consumption of fast food/junk food frequently were reported in four studies, consumption of calorie dense food items frequently in two studies, higher socioeconomic status in four studies and families history of obesity were also reported in three studies (Mistry & Puthussery, 2015).

The various causes outlined above will be under three main headings in this study: demographic factors (genetics, family and parental factors), behavioral factors (dietary habits and physical activities) and economic factors.

Demographic Factors

Genetics

The genetic factors associated with obesity from the literature are genes, age and sex and they are addressed respectively.

Genetic factors regulate body weight and they are a key factor in determining individual responses to environmental factors such as diet and exercise (Farooqi, 2011). Genetic factors are known to give accounts for less than 5% of cases relating to childhood obesity (Anderson & Butcher, 2006). Hence, whilst genetics play a vital role in the growth of obesity, it is not the cause of the sudden increase in childhood obesity (Sahoo, Sahoo, Choudhury, Sofi, Kumar & Bhadoria, 2015). There is an evidence indicating BMI and abdominal adiposity to be strongly influenced by Genetics (Waedle, Carnell, Haworth, & Plomin, 2008). However, 40% adiposity is attributable to genetic influences independently (Carnell, et al., 2008).

It has also been established that genetic factors are known to play an important role in the pathogenesis of obesity (Zhao & Grant, 2011). Beyerlein and colleagues have also established the fact that genetic factors of childhood obesity seem to have greater influence on fatter children (Beyerlein, von Kries, Ness, & Ong, 2011). It also reported that fat mass heritability and energy dense disorders arise from genetic defects (Farooqi & O'Rahilly, 2000). Various studies have indicated genetics to be one of the factors of childhood obesity (Bircan, 2009; Marti'nez-Herna'ndez, Enri'quez, Moreno-Moreno, & Marti', 2007).

It may be impossible to fully explain the definite proportion at which childhood obesity is being caused by genes; however, it is most likely that the

link between obesity in a mother and her child may be through the effect of the genes they both share (Hollis & Robinson, 2019). Maternal obesity is also known to have a direct impact on the nature of their children's dietary patterns and levels of physical activities through the postnatal environment which they share as well as the modeling of health behaviors (Hollis & Robinson, 2019). Obesity results from the influence of several genes in most people that encode peptides by transmitting hunger and satiety signals and regulating the growth of adipocyte as well as controlling the expenditure of energy (Farooqi, 2011). The weight status of a person (obesity or overweight) is co-determined by genes whereas the environment determines how many become obese or overweight (Veerman, 2011).

Age of a child is known to have a significant effect on Body Mass Index (Li & Hooker, 2010). In a systematic review, previous twin and adoption studies among Caucasian populations were collected on childhood and adolescent obesity up to the age of 18 years and relative weight was used as an indicator of obesity. It was, therefore, discovered that genetic factors had a strong effect on the variation of body mass index (BMI) at all ages (Silventoinen, Rokholm, Kaprio, & Sørensen, 2010) Also, reports from the USA national survey of children's health discovered that the age of a child has a significant effect on BMI (Li & Hooker, 2010).

The sex of a child has also been discovered to be a determinant of obesity among children (Li & Hooker, 2010). In a cross-sectional twin study conducted in four countries (Canada, Sweden, Denmark and Australia) to examine the genetic and environmental influences on variances in weight, height, and BMI, in boys and girls, the results indicated that genetics play an

increasingly significant role in explaining weight, height and BMI variation, especially in boys (Dubois et. al, 2012). It has been suggested that obesogenic environments (environment that promotes weight gain) leads to the development of an obese phenotype (Albuquerque, Nobrega, Manco & Padez, 2017). Nevertheless, not every person from the same population who shares the same obesogenic environment, develops obesity (Albuquerque et al., 2017).

In Ghana, Mogre et al (2013) conducted a study to assess the associated factors and one of the findings was that the prevalence of obesity was higher among girls than boys (18.9% vs. 15.4%). Annan-Asare et al (2017) are also of the same view that there is a significant association between BMI, age and sex.

Family and parental factors

The prevalence of childhood obesity is reported to be heavily affected by family and parental factors such as BMI of parents as well as the lifestyle of parents (Uyamasi, Zheng & Strasser, 2018). From the literature, the factors are; Body Mass Index of parents, the structure of the family and how it influences the BMI of their children and also how the lifestyle of parents and family influences the weight status of their children.

Maternal BMI and the structure of the family (single-parent or two-parent families) are known to be one of the predictors of higher BMI in children or childhood obesity (Blair, Byrne, Davis, Gibson, Jacoby & Zubrick, 2007). It has been reported that the likelihood of a child being overweight or obese may be as a result of having an overweight mother and a single-parent family (Blair, Byne, Davis, Gibson, Jacoby & Zubrick, 2007). In Ireland,

parental weight appears to be the most influential. It has also been established that parental characteristics (such as the weight status and the educational level) are known to be a risk factor of obesity among children (Moraes, Lissner, Yngve, Poortvliet, Al-Ansari & Sjöberg, 2012).

Some studies have reported that children's lifestyle is essentially controlled by their parents and childhood obesity is related to family variables such as family structure or size, the number of obese persons living at home as well as weight status of parents (Fiese, Donovan, Musaad, Paige & Teran-Garcia, 2013; Shirasawa et al, 2012).

Parents are known to play a vital role when it comes to the development of their child's food preferences and the intake of energy (Scaglioni, Salvioni, & Galimberti, 2008). Research has shown that certain feeding practices of children (such as utilizing immoderate control over what and the quantity of food consumed by children); may give rise to childhood overweight (Scaglioni et.al., 2008). A paper reviewed the available data on the effects of how parental feeding attitudes and styles have on a child's nutritional behavior and the results showed notable correlations on the reported nutritional behavior between parent and a child such as; the consumption of food, eating motivations and body dissatisfaction and satisfaction (Scaglioni et.al., 2008). Parents are, therefore, known to create the necessary environment for their children and this may foster the development of healthful eating habits and weight or may promote overweight and certain features of eating disorders (Scaglioni et. al, 2008). Additionally, the food habits of parents as well as the strategies they use in feeding their children are the most influential determinants of a child's eating behavior and their choices

of food. It is, therefore, important for parents to expose their children to a wide range of healthy food choices while they practice that lifestyle with their children (Scaglioni, De Cosmi, Ciappolino, Parazzini, Brambilla & Agostoni, 2018).

A policy addressing the implications for childhood obesity reported that there are variety of child-feeding behaviors used by parents and they include monitoring, pressure to eat and restrictions (Clark et al., 2007). However, these practices, especially parental restrictions, are associated with childhood obesity (Clark et al., 2007).

It has been established that among Chinese American families, grandparents are often the caretakers of children (Lau, Au, Chao, Elbaar & Tse, 2019). For this reason, Lau and his colleagues conducted a study to examine how grandparental care is associated with the weight status of Chinese American children and adolescents aged 2-19 years. The results indicated that approximately 12% of Chinese American children within this age bracket had grandparents as caretakers. It was also indicated that children with grandparents as caretakers are more likely to be overweight than their counterparts with no grandparent as caretakers at the ages between 6-11 years (Lau, Au, Chao, Elbaar & Tse, 2019).

Behavioral factors

Diet

Globally, nations are undergoing change in nutrition where diets have begun to shift towards high dependence upon foods that have been processed, increased intake of away-from-home foods and increased use of edible oils,

consumption of sugar-sweetened beverages (Popkin, Adair & Ng, 2012) as well as skipping breakfast.

Eating at “fast foods” restaurants is known to be positively associated with children having a high fat diet as well as high Body Mass Index (BMI) (Jeffery, Baxter, McGuire & Linde, 2006). Additionally, foods that are consumed out of home (takeaway, take-out and fast foods) have become increasingly popular in modern times and are known to be a key factor in the increasing levels of overweight and obesity as a result of their unfavorable nutritional value (Janssen, Davies, Richardson, & Stevenson, 2018). A cross-sectional study conducted among junior high children aged 11-15 years to determine the prevalence of obesity and its correlates reported that obesity was relatively high among Ghanaian adolescents and very frequent consumption of fast foods was associated with higher BMI (Annan, Amoah & Asante, 2017) and it has been reported that children who consumed fast foods are more likely to consume “empty calories” and use up fewer calories through physical activity are at higher risk of being obese than other children (Anderson, Butcher & Patricia, 2018). Also, reports from some studies in Ghana have indicated that there is an association between the prevalence of childhood obesity or higher BMI and the frequent consumption of fast foods and foods from local staples (Adamu, Adjei & Kubuga, 2012; Amidu et al., 2013; Anto, Gyamfi, Ngala & Obirikorang, 2015).

Skipping of breakfast among children is directly associated with overweight/obesity (Smetanina, Albaviciute, Babinska, Karinauskiene, Albertsson-Wikland, Petrauskiene & Verkauskiene, 2015). Results from the WHO-Collaborative Health Behavior in School-aged Children (HBSC) cross-

sectional study in France indicated that overweight/obesity was not associated with school age children who consumed breakfast daily (Dupuy, Godeau, Vignes & Ahluwalia, 2011). However, the results, in this study does not differ from that of the study conducted in the United States. Thus, the prevalence of obesity among school-aged children remained high and one of the primary factors linked to obesity was breakfast consumption (Huang et al., 2010). A commentary by the ESPGHAN Committee on Nutrition indicated that children who consume at least four healthy meals including breakfast, everyday are at a lower risk of developing obesity (Agostoni et al., 2011). Consuming breakfast can affect BMI positively whereas breakfast skipping can affect BMI negatively (Deshmukh-Taskar, Nicklas, O'niel, Keast, Radcliffe, & Cho, 2010). Thus, children who skip breakfast are reported to have a higher BMI as compared to those who consume breakfast (Deshmukh-Taskar et al., 2010). A study conducted among children in the United States to determine the association between breakfast habits, nutritional status, body weight and academic performance in children reported that children who eat breakfast generally consumed more calories daily yet were less likely to be obese (Rampersaud, Pereira, Girard, Adams, & Metz, 2005). Additionally, breakfast consumption as part of a healthy diet and lifestyle can impact positively on the health and well-being of children (Rampersaud et al., 2005).

According to literature, children who consume more fruits and vegetables are less likely to be obese, compared to those who eat less fruits and vegetables (Beddome, Epstein, Gordy, Raynor, Kilanowski & Paluch, 2012). However, a study conducted to assess overweight and obesity and, its associated factors in school-going adolescents in two low-income countries

found no association between overweight status and fruit and vegetable intake among school-age adolescents (Peltzer & Pengpid, 2011).

A community-based cross-sectional study was conducted in Gondar City, Northwest Ethiopia to determine how dietary habits that contribute to the weight status of pre-school children and the results stipulated that the age group between 36-47 months has high dietary diversity and consume sugary foods. The study, therefore, established that these factors were associated with overweight/obesity among preschool children (Sorrie, Yesuf, & GebreMichael, 2017). In another 30-month longitudinal study conducted among three to six years old children in order to identify risk factors for childhood overweight, it was indicated that high soft drinks consumption appeared to be positively associated with the development of childhood overweight (De Coen, De Bourdeaudhuij, Verbestel, Maes & Vereecken, 2014).

Additionally, dietary fat may also play a vital role in the spread of Non- Communicable Diseases (NCDs) with regard to both the amount of fat and the composition of fats (Popkin, Adair & Ng, 2012). According to the STRIP study in Finland, the intake of lower total and saturated dietary fat in infancy results in lower serum cholesterol, LDL-c and triglycerides (as well as lower blood pressure) in children up to 14 years, even without it affecting the height, weight or BMI (Hakanen et al., 2010). However, the global increase in plant oil consumption has intensified the intake of omega-6 fatty acids (processed snacks, fast foods, cakes and fatty meats) and the ratio of omega-6 to omega-3 fatty acids (salmon, herrings and mackerel) leading to an increase in obesity (Popkin, Adair & Ng, 2012).

The prevalence of obesity in sub-Saharan African countries is significantly high as a result of over nutrition than under nutrition, thus making obesity a growing problem (Gebremedhin, 2015). The intake of food is an important factor which influences childhood obesity (Huang & QI, 2015). However, various foods and nutritional components such as calcium and dietary fiber are reported to be inversely related to obesity whereas other nutritional components and foods such as vitamin B and sugar-sweetened beverages play a positive role in the development of obesity (Huang & QI, 2015).

In the western part of Algeria, a school-site retrospective cohort study among school children aged 6-8 years was conducted to determine the risk factors of obesity among these children and out of 1,520 participants, 99 (6.5%) were obese. One of the contributing factors to this prevalence rate was as a result of early introduction of solid foods as well as total energy, fat and saturated fatty acid (SFA) intakes (Saker, Merzouk, Merzouk, Ahmed & Narce, 2011).

Sagbo et al., (2018) conducted a cross-sectional survey in Lomé, Togo to ascertain the prevalence rate of overweight and obesity among Togolese school children and their association with eating habits and other behavioral factors. The prevalence of overweight and obesity among these school children were linked with sedentary lifestyle and the consumption of non-optimal foods (Sagbo et al., 2018).

A cross-sectional study conducted among school-age children in Ghana to determine the association between dietary patterns and obesity indicated energy dense pattern to be significantly associated with childhood

obesity (Alangea, Aryeetey, Gray, Laar & Adanu, 2018). A report from the Ghana School Survey also suggests that most of Ghanaian diets of unprocessed cereal meals, fresh fruits and leafy vegetables is being substituted by high fat diets and refined cereals which sets the stage for the development of childhood obesity (Lartey, 2012).

Physical activities

Physical activity is defined as any movement of the body which is produced by skeletal muscles needed to expend energy (WHO, 2018f). There are common ways to be active and they include walking, cycling, sports and recreation and these activities can be performed at any level of skill and for enjoyment (WHO, 2018f). The daily activities of children in schools must include physical activities and high intensity exercises must be increased where each student should be encouraged to get involved in some type of fitness class during the day in school (McBride, 2010). One of the contributing factors for the increased rate or high prevalence of overweight and childhood obesity is physical inactivity (Micklesfield, Pedro, Kahn, Kinsman, Rettifor, Tollman & Norris, 2014).

According to the data collected from about 105 countries worldwide, 80.3% of 13-15 years old adolescents failed to reach the necessary 60 minutes of moderate to vigorous daily physical activity where girls are less active than boys (Hallal et al., 2012). Also, the Qatar National School Survey (2018) reported that children who perform high intensity activity regularly tend to be physically fit, as compared to those who perform less physical activities. However, Malhotra, Noakes and Phinney (2015), on the other hand, are of the view that the practice of physical activity must go hand in hand with healthy

eating in order to control obesity. Thus, if an individual exercises and still eat junk foods, weight gain is likely to be developed leading to obesity (Malhotra, et al., 2015).

Other studies have also reported that physical inactivity contributes to childhood obesity. For instance, a study conducted in the United States to measure the physical activity level of children, out of the 133 children sampled, 65% were obese and were less active on weekends as compared to those who were not obese (McBride, 2010). Changes in the built environment have caused children of today to do less physical activities as compared to the last four decades. Thus, children nowadays seem less likely to walk to school and travel more in cars and instead of playing outdoors to expend energy, they rather spend much more time viewing television and using computers (Anderson & Butcher, 2006). Also, Pietilainen et.al. are of the view that physical activity begins to decrease in adolescence with a naturally associated increase in weight. Therefore, they sought to determine how physical inactivity predicts total belly fat among adolescents in Finland. The results of their study showed that insufficient physical activity among youth is therefore public health issues where school children are known perform 60 minutes of physical Activity ≥ 3 days per week (Al-Thani et al., 2018). In the rural part of South Africa, a study was conducted to examine physical activity among children and the results specified that less physical activity performed by the children contributes to higher prevalence of overweight and obesity (Micklesfird et. al, 2014).

A comparative study was conducted in Ghana among basic school pupils from selected schools and it was reported that public school pupils had

higher physical activity levels as compared to private school pupils (Opuni-Frimpong, 2015). However, this study concluded that generally, physical activity levels among both groups were low (Opuni-Frimpong, 2015). Also, it has been reported that physical inactivity is a modifiable independent determinant of overweight or obesity among Ghanaian school-aged children (Aryeetey, Lartey, Marquis, Nti, Colecraft, & Brown, 2017). Additionally, a cross-sectional study was conducted within the Kumasi Metropolis to determine the risk factors associated with childhood obesity and it was discovered that central adiposity (accumulation of fat in the lower torso around the abdominal area) was associated with children who were physically inactive (Obirikorang, Anto, Ngala & Gyamfi, 2015).

Sedentary Behavior

The relationship between sedentary behavior and body composition has been established (Tremblay, LeBlanc, Kho, Saunders, Larouche, Colley, Goldfield & Gorber, 2011). Watching of television is known to be the most common measure of sedentary behavior and the body composition of a child is the most common outcome measure (Tremblay et. al., 2011). It has, therefore been suggested that viewing TV daily in excess 2 hours is associated with reduced physical and psychosocial health and the reduction of sedentary time leads to reductions in BMI (Tremblay et al., 2011). The consistent viewing of television is known to be associated with childhood obesity (Borghese, 2014). It has been proposed that the link between television viewing and obesity among children may be best explained when energy intake is higher than energy expended (Borghese, 2014). As a result of these facts, Borghese (2014) conducted a study to determine if obese children consume food more often

while watching television than the normal weight children and also examine which of television viewing or total sedentary time better predicts dietary patterns in children. The results, therefore, reiterated the notion that television viewing is associated with obesity, even though physical activity plays a role in this.

Some studies have proved that sedentary behaviors contribute to childhood obesity. For instance, a 5-year longitudinal baseline study was conducted in 1999 to assess developmental trends in physical activity and sedentary behavior among British adolescents and 36 London schools were sampled. According to the results, children and adolescents between the ages of 11-12 and 15-16 years marked a reduction in physical activity and an increase in sedentary behavior leading to overweight among these school children (Brodersen, Steptoe, Boniface & Wardle, 2007). Also, a cross-sectional study was conducted among 9-11 years old children from Ottawa, Ontario, Canada to determine which of self-reported time for viewing television or objectively measured sedentary time correlates better with the frequency of consumption of healthy and unhealthy foods and how these lifestyles contribute to childhood obesity (Borghese, Tremblay, Leduc, Boyer, B elanger, LeBlanc, Francis, Chaput, 2015). The results indicated that time spent on viewing television is strongly associated more with unhealthy dietary patterns than is total sedentary time and these lifestyles contribute to childhood obesity (Borghese et al., 2015).

Additionally, a study was conducted among European adolescents to examine the association between the time spent on the various sedentary behaviors and consumption of specific foods and beverages. The result of the

study indicated that the increased rate of television viewing and the use of computer and internet during adolescence is associated with higher odds of sweetened beverage consumption and lower odds of fruit consumption (Santaliestra-Pasías et al, 2012). More than one hour screen time on weekdays is, therefore, known to be positively associated with the development of childhood overweight (De Coen, De Bourdeaudhuij, Verbestel, Maes & Vereecken, 2014). Evidence from a study conducted among Togolese school children in Lomé, Togo to ascertain overweight and obesity prevalence rate and their correlation with physical activity indicated that the prevalence of overweight and obesity were linked with sedentary behavior (Sagbo et.al, 2017).

Economic factors

The prevalence of overweight among children has been established to be associated with the economic status of the neighborhood in which one lives (Oliver & Hayes, 2005). The economic factors guided by the literature are the household income and residence.

The living conditions, therefore, have enormous impact on the weight status of a child (Wee, Poh & Ismail, 2014). Globally, the prevalence of childhood obesity has been established to be associated with socioeconomic status [SES] (Aryeetey et al., 2018; Dinsa, Goryakin, Fumagalli, & Suhrcke, 2012; Mohammed & Vuvor, 2012). In Canada, it has been established that children who lived in a neighborhood with lower economic status had higher odds of being overweight as compared to those from higher economic status neighborhood (Oliver & Hayes, 2005). A systematic review was also conducted among 39 studies to investigate the relationship between residential

neighborhood (in terms of their economic status) and childhood obesity. Of the reviewed studies, 60% was shown to have an inverse association between higher neighborhood economic status and obesity (Kim, Cubbin, & Oh, 2018). Johnson et al. (2019) also conducted a study among Black and Hispanic children to systematically review the evidence relating to the neighborhood in which people live and how urban and low socioeconomic status contributes to childhood obesity. The results indicated Body Mass Index (BMI) to be related to people living in lower income neighborhood or have easy access to stores (Johnson, Showell, Flessa, Janssen, Reid, Cheskin, & Thornton, 2019).

It has also been established that, children from families with lower income have a higher risk for obesity and have less healthy physical fitness status (Wang, 2001). Some studies have reported that economic status influences people's risk of developing obesity, both in adults and children (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Wang, Liang, Tussing, Braunschweig, Caballero, & Flay, 2007). In recent decades, the real price of food (thus the price of food that have been adjusted for inflation on all goods and services) has significantly declined whilst the prices of fruits and vegetables continue to rise (Cawley, 2009). Proof from the USA indicates 17% of price increase on fruits and vegetables from 1997 to 2003 is associated with increased BMI among children and adolescents (Auld & Powell, 2009). As a result of the present-day structure of the prices on food, it puts foods high in fats and sugars at the cheapest costs for calorie provision and families with limited income will in turn purchase or select these energy dense foods in order to save money which will lead to poor dietary habits as well as subsequent poorer weight outcomes (Auld & Powell, 2009).

In the United States, a study was conducted to determine the relationship between obesity and economic status of children and adolescents reported obesity to be higher among children in low income families than in high income families (Carroll, Flegal, Ogden & Lamb, 2010). On the other hand, in China, the prevalence rate of obesity is higher among children who reside in urban areas than children living in rural areas (Cai, Zhu & Wu, 2017). In a study conducted to determine which economic factors influence inequalities in obesity prevalence among Chinese primary school children living in an urban setting, the findings indicated that the prevalence of overweight/obesity was 20.0% in resident, compared with 14.3% in migrant children and it increased with an increasing rate per capita household income (in highest vs lowest quartile) (Liu et al., 2016). It was also stipulated in this same study that the incline rate of socioeconomic factors for childhood obesity in China is the opposite of the patterns recognized in countries at more advanced stages of the obesity epidemic (Liu et al, 2016). Additionally, using the 2014 Child Well-Being study of Shanghai, China to explore the income difference in childhood obesity in Shanghai, China, it was specified that district aggregate income increases the odds of child overweight/obesity (Martinson, Chang, Han & Wen, 2018).

There is a relationship between economic status and obesity and it is known to vary across countries (Wang, 2001). In low-income countries or countries with low human development index (HDI), there seems to be a positive association between economic status and obesity for both men and women (Dinsa, Fumagalli, Goryakin & Suhrcke, 2012). However, there seems to be a mixed association between economic status and obesity among men

and women and is mainly negative for women from Middle-income countries or countries with medium HDI (Dinsa et al., 2012). Obesity among children is therefore a predominant problem of the rich in low and middle income countries (Dinsa et al., 2012).

Lifestyles may be affected by economic status, thus, the population's access to healthy food and patterns to physical activity, which in turn affects their energy balance (Beydoun & Wang, 2009; Shrewsbury & Wardle, 2008). In most cases, economic status groups (thus, low economic status in industrialized countries and high economic status in developing countries) with prominent access to energy-dense diets are at higher risks of being obese (Wang & Lim, 2012).

Further studies also conducted by Wee, Poh and Ismail (2014) concluded that children from low economic families and high economic families in industrialized and developing countries respectively are at a higher risk of developing obesity because they have easy access to energy-dense food.

One of the factors influencing the prevalence rate of childhood obesity in sub-Saharan Africa is the socio-economic factors and some of these indicators of socio-economic status influencing the weight status of children include the educational level of a child's mother, the occupation of mother and the household income (Keino, Plasqui, Ettyang & Borne, 2014). A systematic review was conducted among school-age children in sub-Saharan Africa to examine the association between socio-economic status and childhood obesity and the report showed the risk of overweight or obesity in children from higher economic status to be 5.28 times higher than children from lower

economic status households. Similarly, it was also shown that children who attended private schools were at risk of overweight or obesity by 15.94 times higher than children who attended public schools (Fruhstorfer, Mousoulis, Uthman & Robertson, 2016). In another reviewed data of school-age children from sub-Saharan African countries, it was reported that high household economic status was associated with higher body composition measures (Muthuri et al., 2014). In this study, the authors discovered 19 out of 24 studies that reported significant associations between higher economic status and higher body composition measures, the remaining on the other hand found no significant associations (Muthuri et al., 2014).

In Zimbabwe, the risk factors associated with childhood obesity are less established (Kambondo & Sartorius, 2018). A study was therefore conducted to identify important risk factors for overweight/ obesity among primary school children of Mashonaland West Province in Zimbabwe. One of the most important risk factors indicated by the results was that children from higher economic households were at risk of being obese/ overweight (Kambondo & Sartorius, 2018). Also, in Cameroon, a study was conducted to investigate whether obesity in children is affected by their socioeconomic background and it confirmed that indeed children from a high socioeconomic background are at particular risk of becoming obese (Navti, Ferrari, Tange, Bechtold-Dalla Pozza, & Parhofer, 2014).

Various studies conducted in Ghana have also reported that obesity among children is associated with economic status (Amidu et al., 2013; Amoah-Yeboah, 2017; Aryeetey, Lartey, Marquis, Nti, Colecraft, & Brown, 2017; Obirikorang, Anto, Ngala, & Gyamfi, 2015). A report from Amidu et al.

(2013) indicated that the prevalence of overweight and obesity as determined by BMI was higher among children from high economic status and from private schools than children from public schools. Amoah-Yeboah, (2017) also conducted a study in Ghana. It specified that a combined prevalence of overweight and obesity was found significantly higher among children in private schools (44.5% vs. 13.9%), with mothers with formal education, mothers with tertiary level of education and being in the middle economic status (Amoah-Yeboah, 2017). These results do not differ from Aryeetey, Lartey, Marquis, Nti, Colecraft, and Brown's (2017) and Obirikorang, Anto, Ngala and Gyamfi's (2015) report from a cross-sectional study they conducted in urban Ghana. They reported that children from higher household economic status and attending private school were associated with elevated risk of overweight and obesity (Aryeetey, Lartey, Marquis, Nti, Colecraft, & Brown, 2017). Additionally, a study conducted in the Kumasi Metropolis to determine the prevalence of childhood obesity and its associated factors indicated that children who were from high income families and attended private schools were more likely to be obese as compared to those in public schools (Obirikorang, Anto, Ngala, & Gyamfi, 2015).

Gaps In The Study

Reviewing the various literature, it shows that majority of the studies conducted on childhood obesity were done in Europe and less has been conducted in Africa especially in Ghana. Also, there is scanty literature on childhood obesity in the Tema Metropolis. The results of this study, will therefore add on to existing knowledge of the prevalence of childhood obesity and its associated factors among primary school pupils in Ghana.

Theoretical Frameworks

This study will be guided by the Socio Ecological model (SEM) and Social Influence theory.

Socio Ecological Model (SEM)

The Social Ecological Model (SEM), originally developed by Bronfenbrenner (1979), is a theory-based framework for understanding the multiple and interactive effects of personal and environmental factors that determine the nature of people’s transactions with their physical and socio-cultural surroundings (Figure 1). Bronfenbrenner’s theory defines multiplex “layers” of environment, each having an effect on a child’s development (Paquette–John Ryan). This multiplex environment comprises microsystem, mesosystem, exosystem and macrosystem and their interactions play a pivotal role in behaviors and development of humans.

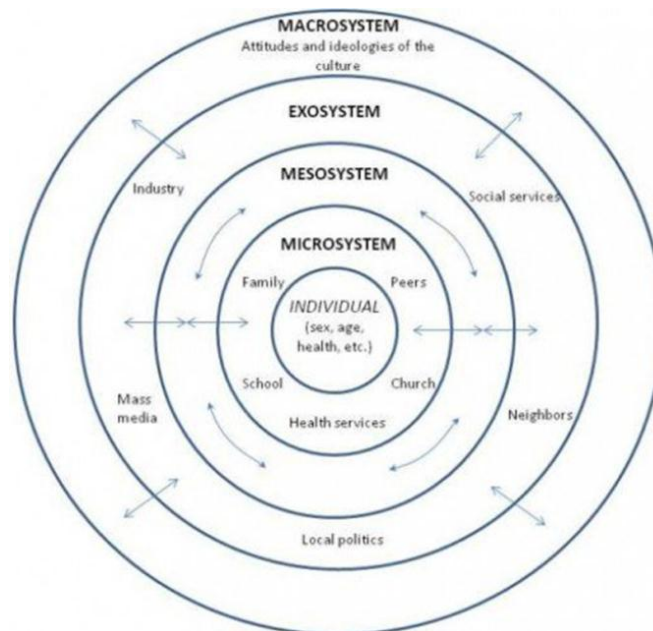


Figure 1: Socioecological Model

Source: Bronfenbrenner, (1977)

The microsystems include a child's relationship and the interactions he or she has with the existing environment (Berk, 2000). The family, school, neighborhood or childcare environments are the structures considered to be in the microsystem (Bronfenbrenner, 1977). For example, the behavior and beliefs of parents can affect the child, and the child, on the other hand, may also affect the behavior and beliefs of the parents (Paquette & Ryan, 2001). The mesosystem gives a description of the linkages and development process of a person in two or more environments (Bronfenbrenner, 1977). The exosystem gives a description of a larger social system where the child functions indirectly (Bronfenbrenner, 1977). It describes the linkages and activities of a person in two or more settings where one setting might influence the immediate development of the person (Bronfenbrenner, 1977). An example is the working schedules of parents or community-based family resources. The child may not be directly involved at this level, but maybe positively or negatively affected and the macrosystem encompasses the microsystem, mesosystem and exosystem (Bronfenbrenner, 1977).

Bronfenbrenner's human development systems approach has been used as a framework which has served as the foundation of other works (Sincero, 2012). McLeroy and colleagues (1988) used this model for the promotion of health in their study of interpersonal, organisational, community and public policy factors contributions to unhealthy human behaviors (McLeroy, Bibeau, Steckler, & Glanz, 1988). The approach was also employed by Skotols (1992), who in characterizing the environment and the interaction between individuals and, collective health problems gave a description of health promotion as a broad transaction between individuals and, groups in their social and physical

settings. A study conducted on environmental and individual determinants of physical activity and the Bronfenbrenner's work was used to examine the relative influence of individual, social and physical environment on physical activity (Giles-Corti & Donovan, 2002). The results suggested that access to a supportive physical environment was important.

Social Influence theory

Social influence theory proposes that the attitudes, beliefs and subsequent actions or a behavior of an individual are influenced by others (Kelman, 1958). The social influence theory presumes that changes in attitude and actions of people is as a result of social influence and these changes may occur at different levels (Kelman 1958). The differences in the level of change can be credited to the differences in the processes through which individuals accept the influence (Kelman, 1958). Venkatesh and Brown (2001) described social influence as the behavior of an individual being influenced by another person in a social network in order to conform to community behavior patterns. There are two types of social influence: informational and normative (Deutsch & Gerard, 1955).

Informational social influence can be defined as an influence under which an individual accepts information obtained from another as evidence of reality whilst normative social influence is described as the influence to conform to the expectations of another person to group (Kaplan & Miller, 1987). An example is, the home being the first social network a child finds his or herself picks up or accepts any information being passed unto him or her by parents or family members and practice it. Whether it is the dietary patterns, physical activities performed by the family or not has a great influence on the

child's lifestyle. A child's behavior of choosing which type of meal outside the home, especially in school, may also be influenced by their peers. Thus, the meals or snacks their friends consume influence their eating patterns at school. Also, information children obtain from the mass media may greatly influence their choice of meals outside the home and also, a child's social network in school (peers/friends) may also influence how active he or she will be in sports or any other physical activity

An individual is considered to be under normative influence when he/she perceives higher levels of pressure from the society to perform or not to perform behavior, irrespective of their beliefs and attitudes toward the behavior (Kaplan & Miller, 1987). Social influence can also be considered as perceived pressures from networks in the society in order to make or unmake certain decisions (Lu, Yao & Yu, 2005). It is therefore suggested that if an individual obtains enough information, there is greater chance that the individual will possess enough confidence to guide the formation of future behavior or attitudes (Spreng & Page, 2001). In this subsection, if parents are able to let their children know how unhealthy eating habits can influence their weight and practice a healthy active lifestyle at home with their children, it will guide the future behavior or attitudes of their children positively. The social influence is therefore known to be a learning process where individuals observe successful experiences acquired by their social groups before deciding whether to accept it or not.

Conceptual Framework

The socio ecological model by Bronfenbrenner (1977) was adapted as the conceptual framework for this study. The model identifies the multiple and

interactive effects of personal and environmental factors that determine the nature of people's transactions with their physical and socio-cultural surroundings.

In order to precisely replicate the variables of interest of the study in the adapted model, the framework uses the individual, family and school as the microsystem and how they influence weight status of the child. The next is the mesosystem of inter-relationships which deals with relationships between contexts in the microsystem (e.g., how families link to schools). Some variables (church, health services, local politics, neighborhood and social services) were excluded because they do not replicate the variables of interest of the study.

The exosystem, which is considered as the larger social system, gives a description of how the community-based systems and activities, where the child functions indirectly such as the work schedules of parents (Berk, 2000), may contribute to the weight status of the child. The final environment, the macrosystem, includes the cultural ideologies and attitudes within which parents and children operate. The relationships between these environmental contexts (Microsystem-family, individual and school), exosystem (community) and macrosystem (society) determine the possible influences on a person.

The home as a microsystem can be considered the closest to the child and therefore has great influence on the weight status of children in terms of their dietary habits and well as the active lifestyle performed by the family. The rest of the environments, including the wider societal system (exosystem), are anticipated to complement main role of parents and other adult members within the system. For instance, the school system and peers are expected to

provide part of the knowledge and education of the child (Berk, 2000). The final system or environment, the macrosystem, includes the cultural ideologies and attitudes within which parents and children operate and how it influences the weight status of the child.

SOCIO-ECOLOGICAL MODEL

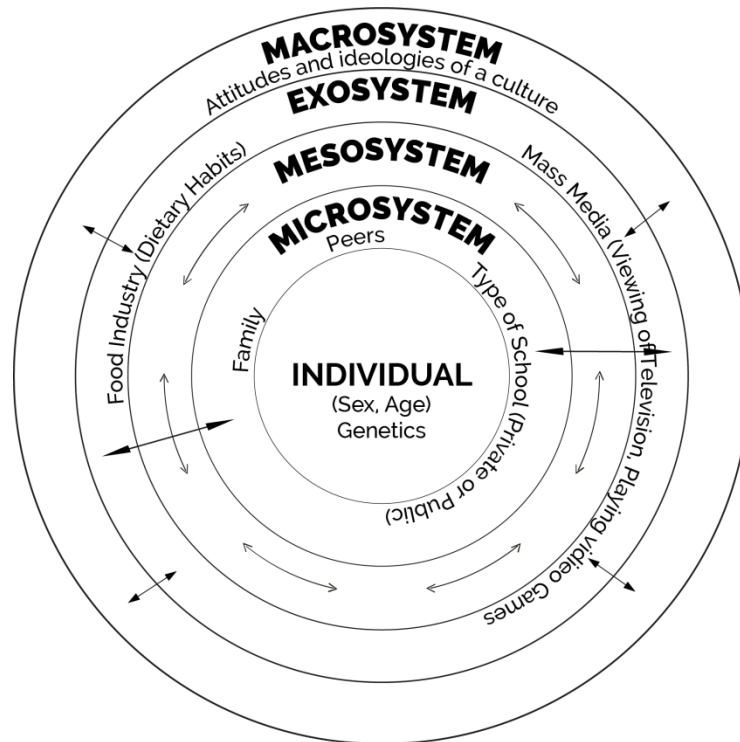


Figure 2: Conceptual Framework based on the socioecological model.

Source: Adapted from Bronfenbrenner, (1977).

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter presents the methods that were used in conducting the study. It gives a description of the research design, the study area, sources of data and the target population. It further explains the study sample determination, sampling procedures/ techniques, data collection methods, research instruments and the procedures followed in data collection, processing and analysis.

Research Design

A quantitative research design was used to explain the numerical observations of the study (Sukamolson, 2007). The quantitative research design was considered to guide this study primarily due to the objectives guiding the study. The advantages of quantitative study design are: results are valid, reliable and generalizable to a larger population. It is also advantageous for studies that involve numbers. The study design was cross-sectional which was carried out among upper primary school pupils in selected private and public schools in the Tema Metropolis. It entails administration of questionnaire which will help obtain current demographic, behavioral, economic and anthropometric information on a sample represented by the study population.

Study Area

Location and Size

Tema Metropolis is a coastal district situated about 30 kilometers East of Accra, the capital city of Ghana. The Tema Metropolis has three Sub-

Metropolitan Councils namely; Tema West, Tema East and Tema Central. It shares boundaries in the northeast with the Dangme West District, southwest by Ledzokuku Krowor Municipal, north-west by Adentan Municipal and Ga East Municipal, north by the Akuapim South District and south by the Gulf of Guinea. The Ashaiman Municipal is an in-lock enclave within the Tema Metropolis. The Metropolis covers an area of about 87.8 km² with Tema as its capital. The metropolis lies in the coastal savannah zone (Ghana Statistical Service [GSS], 2014). The population of Tema Metropolis, according to the 2010 Population and Housing Census, is 292,773. Males constitute 47.8 percent and females represent 52.2 percent. Also, 100 percent of the population live in urban localities. The Metropolis has a sex ratio of 91.6. The Metropolitan area serves as the industrial hub of Ghana with over 500 industries that produce chemicals, clothing, consumer electronics, electrical equipment, furniture, machinery, refined petroleum products, steel and tools. The country's biggest port and harbour facilities are located in Tema. The Metropolis has many public and private tertiary and pre-tertiary educational institutions. Out of the 338 schools in the Metropolis, 185 are private and 153 are public schools. In the Metropolis, of the 3 years and older population who are currently attending school, 51.1 percent are females and 48.9 percent are males. The proportions of males currently in school are higher in nursery (50.5%) and kindergarten (50.9%) than their female counterparts, with 49.5 percent and 49 percent, respectively. Higher proportions of females are in primary (51.8%), JSS/JHS (52.7%) and tertiary institutions (51.5%) than males, with 48.2 percent, 47.3 percent and 48.5 percent, respectively (Ghana Statistical Services, 2014). Figure 3 shows the map of Tema Metropolis.

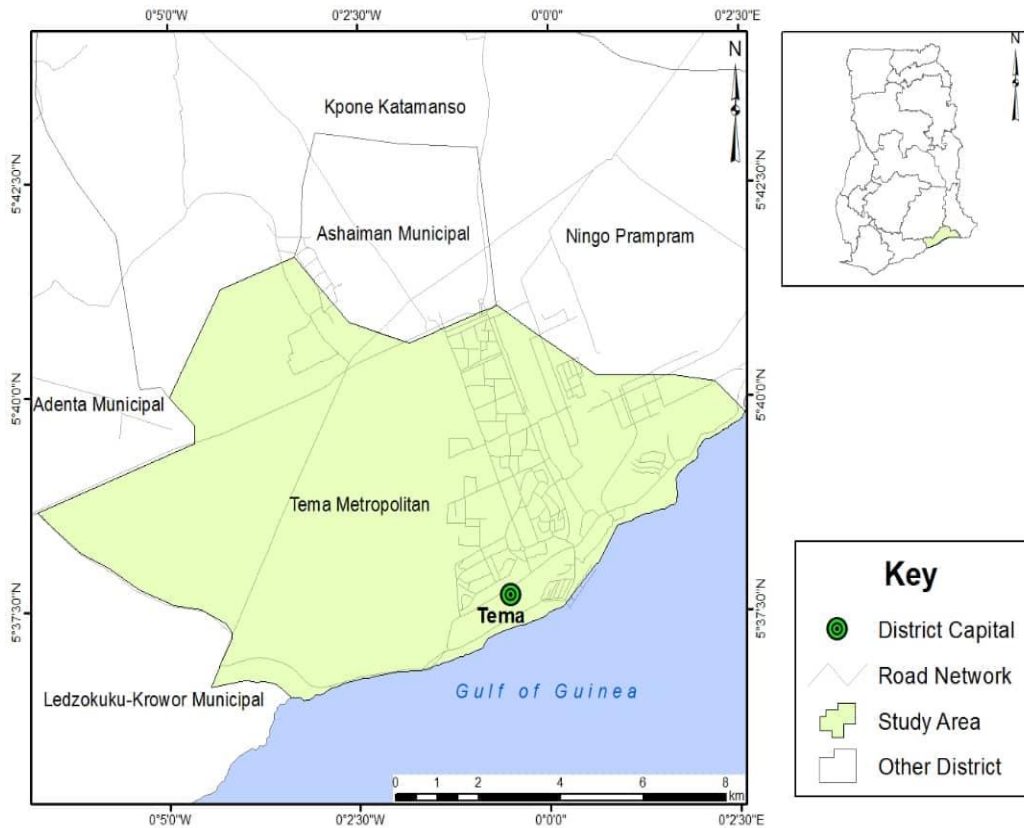


Figure 3: Map of Tema Metropolis showing the study setting.

Source: GIS Unit of Department of Geography and Regional Planning, UCC (2019)

Target Population

The target population of a study comprises a group of persons, objects or institutions that define the objects of the investigation (Creswell, Plano, Clark, Gutmann, & Hanson, 2003). These elements of the population are potential cases. The study population particularly consisted of upper primary pupils (class 4, 5 &6) in the selected schools of the study area. These pupils were chosen because they are the best people to give accurate information that will be needed for this study.

Sample size calculation

According to Mohammed and Vuvor (2012), the overall prevalence of overweight and obesity was recorded to be 26.7% among basic school children in University primary, Legon-Ghana and based on this report, the Cochran's formula (Cochran, 1977) was used to calculate the sample size of this study. The expected prevalence was therefore set at 25% with a margin of error set at 4% for the whole Metropolis.

Based on the following values, the sample size (N) was calculated:

- Expected prevalence=19%
- Z= 1.96 at 95% confidence level
- d= margin of error of 4% (for a greater precision)

$$N = \frac{Z^2 * p * q}{d^2}$$

$$N = \frac{1.96^2 * 0.19 * 0.81}{0.04^2}$$

$$N = \frac{3.84 * 0.15}{0.04^2} = 0.58$$

$$N = 363$$

The estimated sample size at 95% confidence level is 363.

Sampling Procedure

A multistage sampling technique was used in this study. At the first stage, the schools were categorized into public and private owned, after a list of all primary schools in the Tema Metropolis had been obtained from the Municipal Directorate of Education. Eight (8) private and eight (8) public primary schools were randomly selected using the balloting system (Table 2).

twenty two(22) pupils were selected in each of the eight (8) public schools that were chosen which summed up to 176 pupils and twenty three (23) pupils were selected from each of the eight (8) private schools that were chosen, summing up to 184, however a class in one of the private schools were more, therefore extra three pupils were added to make up of the 363 sample size. Class registers for classes 4 to 6 were obtained and compiled into a list of males and females in the schools that were selected. Only pupils in classes 4, 5 & 6 were included in the study because they were considered upper primary pupils and were more likely to understand the questions posed. Using the balloting system in each school, 11 males and 11 females from the list of combined classes were drawn from public schools and 11 males and 12 females were drawn from private schools till the required sample size were obtained from each school. More female pupils were selected than the males in private school because the females listed in the class registers were more than the males. Three hundred and sixty three (363) pupils from both private and public schools were drawn from the Metropolis.

Table 2: Table showing the selected schools by number of pupils selected broken into males and females.

List of primary schools	Number of Males	Number of females	Overall total in each school
1. Community 5 NO.3 basic school	11	11	22
2. T.I Ahmadiyya basic school	11	11	22
3. Community 8 NO. 3 primary school	11	11	22
4. Community 8 NO. 4 primary school	11	11	22
5. Redemption Valley '1' primary school	11	11	22

Table 2 continued

6. Redemption Valley '2' primary school	11	11	22
7. Star primary school	11	11	22
8. Community 5 NO.1 primary school	11	11	22
9. First Star Academy	11	12	23
10. Tema International school	11	12	23
11. Tema Parents' Association School	11	15	26
12. Dek's Educational Institute-Montessori	11	12	23
13. SOS Hermann Gmeiner International School	11	12	23
14. Tema Royal School	11	12	23
15. Datus International School	11	12	23
16. Tema Ridge School	11	12	23
Total	176	187	363

Source Data collection Method

Through surveys, the data were collected using a questionnaire. The type of survey questions included close-ended (thus selecting an option for a feasible answer) as well as open-ended (thus allows respondents to answer questions in their own words for a wider understanding) question (Farrell, 2016).

The questionnaire had an introduction part that explained the purpose of the survey and assured respondents of its confidentiality. It laid out an estimated duration for completion, with understandable and concise instructions, ending with thanking respondents for their participation. The questionnaire was a standardized one, which increases the reliability of the study since all respondents were asked the same questions in the same pattern and they all received the same questionnaire (Boynton & Greenhalgh, 2004). The questionnaire was therefore designed in order for respondents to answer the questions on the questionnaire provided to them and also gave room for self-administration.

Data Collection Instruments

A researcher generated questionnaire was used as the data collection instrument. The instrument was developed from literature. A thorough literature review on research related to childhood obesity and its associated factors was performed prior to the development of the questionnaire to identify the prevalence of childhood obesity and its associated factors that have been identified by other researchers. This instrument was used as the main tool for data collection as it sustains greater assurance of confidentiality and anonymity to respondents (Sarantakos, 2005). It is a very effectual way for securing factual information about practices and conditions of which the respondents are presumed to have knowledge.

The questionnaire was made up of five main sections. Section one focused on the demographic factors such as; name and type of school, sex of respondent, class of respondent and who the pupils live with. Section two dealt with the economic background of the pupils such as; occupation of

parents, the residence in which they live in, amount of money sent to school, possessions owned by the household. The section three focused on the behavioral factors associated with childhood obesity and it had two sub headings: dietary patterns and physical and leisure activity. Section Five focused on the anthropometric measures such as; weight, height and Body Mass Index (BMI). In all, thirty nine (39) questions were on the questionnaire. To ensure validity, the instrument was tested through construct validity, face validity and content validity. With face validity, the instrument was developed based on literature, focusing on the main findings of previous studies. Face and content validity was determined through inspection by the supervisor. After concluding on the face and content validity, the questionnaire was pre-tested using 50 primary school pupils in the Accra Metropolis. This was done to validate the instrument by verifying the viability of the data collection instrument and to identify problems with the instrument. All the questions on the questionnaire had variables measured under the nominal and ordinal scales.

Data Collection Procedure

Before the period of data collection, the questionnaire, together with the consent form was sent to the University of Cape Coast Institutional Review Board for approval. After this, an introductory letter with the instrument was sent to the Ethical Review Board of the Ghana Educational Service for approval. Upon approval, the letter and the instrument were given to the Metropolitan Education Directorate of the Tema Metropolis for review.

After the review, an introductory letter was sent to the selected schools in the municipality to seek permission to conduct the study. When permission

was granted, the date for data collection was set. Consent forms were signed on behalf of parents since study was conducted during school hours. On the first day of data collection, the purpose of the study was explained to respondents for them to get clear understanding of the study and also to ensure voluntary participation.

Data Processing and Analysis

Questionnaire was scored using the Statistical Program for the Social Sciences (SPSS) version 23. SPSS was used for analysis of the data. Data were analyzed using both inferential and descriptive statistics. The inferential statistics was used to make generalization concerning the associations or factors associated with childhood obesity. The descriptive statistics on the other hand was used for describing the background characteristics of the selected pupils.

Descriptive Statistics

Frequency distribution was summarized in tables and charts for nominal and ordinal data. Central tendency measures (mean, median and mode) for continuous variables were determined. Standard deviation was used to measure the spread of selected key continuous variables (e.g. BMI and income).

Inferential Statistics

The relationship between main outcome variable (BMI) and other independent variables were examined using bivariate and/ or partial correlations (e.g. child BMI versus behavioral related variables such as dietary habits and physical activities as well as economic variables and demographic variables).

Summary

This chapter discussed the methods that was used in carrying out the study. It covered the research design, study area, population, sampling procedure, data collection instruments, data collection Procedures, data processing and analysis, and Chapter summary.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the findings and discussion of the results of the study. It provides an overview of the demographic characteristics of the respondents comprising age, sex, type of school and who they live with. The chapter also discusses the economic factors that influence childhood obesity and behavioral factors which comprise the eating habits of these respondents as well as their level of physical activities.

Results

Background Characteristics of Respondents

The demographic characteristics of the respondents are requisite in grasping the dynamics among the selected group and an in-depth understanding of these characteristics help in explaining the results of the study (Barnard, 2013). This section, therefore, covers the background characteristics of the respondents which include: BMI status, sex, age, type of school, class and who they live with, the occupation of parents, the means of the pupils getting to school, the amount of money sent to school every day and economic status. Less than half (42.98%) of the pupils had BMI within underweight. Also about 41.60% of the pupils had BMI within normal weight. Overall combined prevalence of overweight/obesity among school pupils was 15.43% (See Table 3).

Table 3: Background Characteristics of Respondents

Variable	Frequency	Percentage
<i>BMI Status</i>		
Underweight	156	42.97
Normal	151	41.60
Overweight/obese	56	15.43
<i>Sex</i>		
Male	185	50.96
Female	178	49.04
<i>Age</i>		
5-9	55	15.15
10-14	304	83.75
15+	4	1.10
<i>Type of school</i>		
Public	53	14.60
Private	310	85.40
<i>Class</i>		
4	119	32.78
5	122	33.61
6	122	33.61
<i>Who do you live with</i>		
Mother	43	11.85
Father	15	4.13
Both parents	266	73.28
Grandparents	20	5.51
Other relatives	19	5.23
<i>Mother's Occupation</i>		
Artisan	71	19.67
Professiona	87	24.10
Office work	63	17.45
Trading	132	36.57
Not employed	8	2.22
<i>Father's occupation</i>		
Artisan	35	10.00
Professional	144	10.00

Table 3 continued

Office work	118	41.14
Trading	46	33.71
Not employed	7	13.14
<i>How do you usually get to school?</i>		
Parent's car	171	47.11
Friend's car	17	4.68
Public transport	80	22.04
Walk	95	26.17
<i>Do you take money to school everyday?</i>		
Yes	335	47.11
No	28	4.68
<i>How much did you take to school everyday?</i>		
1.00	113	33.73
5.00	171	51.04
10.00	33	9.85
15.00	18	5.37
<i>Economic status</i>		
Low	44	12.12
High	319	87.88

Source: Field Survey (2019)

Out of 363 respondents, more than half were males and forty-nine percent were females. The highest portion of the respondents was aged between 10 and 14 years (see Table 3). Eighty five percent of the respondents were in private schools while 14.60% of the respondents were in public schools. The results also show that 33.61% in class six and the same percentage (33.61%) was applicable to pupils in class five while 32.78% of respondent were in class four (see Table 3). The results also show that majority of the respondents (73.28%) live with both parents, 11.85% of respondents live with only their mother, 4.13% of respondents live with only their father. Also, the number of respondents living with only their grandparents was equivalent to 5.51% and respondents living with other relatives only was 5.23% (See Table 3).

It is also shown in the results that, about 36.57% of the mothers of the pupils work in the informal sector (trading) while 41.14% of the fathers of the pupils work in the formal sector (professionals) (see Table 3). Regarding the means of transportation to school, 47.11% of school pupils were transported to school by the parent's cars every day as compared to those who walk to school every day (26.17%) (see Table 3). The results also show that more than half (51.04%) of pupils take Ghc5.00 to school every day (see Table 3). With regard to economic status of the pupils, higher proportion of pupils (87.88%) belonged to the high economic group compared to those from the low economic group (12.12%) (See Table 3).

Background Characteristics and Childhood Overweight/Obesity

Among the three BMI status categories (underweight, normal and overweight), about 50.81% of male respondents were underweight whereas 34.83% of female respondents were underweight. Female respondents who had normal weight were 48.88% whilst male respondents who had normal weight were 34.59%. female respondents who were overweight/obese were 16.29% whereas 14.59% of male respondents were overweight/obese. Seventy five percent of pupils who were 15 years and above were underweight, compared to 54.55% of those aged 5-9. Pupils aged between 5 and 9 who had normal weight were 41.82% as compared to 25 % of pupils who were 15 years and above Whereas 17.7% of those aged 10-14 were overweight/obese, none of the persons aged 15 years and above were overweight/obese (see Table 4).

Table 4 Background Characteristics by Childhood Obesity

Variables				X ²	P value
	Underwei ght %	Normal %	Overweight Obese %		
<i>Sex</i>				10.0076	0.007
Male	50.81	34.59	14.59		
Female	34.83	48.88	16.29		
<i>Age</i>				10.03	0.040
5-9	54.55	41.82	3.64		
10-14	40.46	41.78	17.7		
15+	75.00	25.00	0.00		
<i>Types of school</i>				18.26	0.000
Public	69.81	22.64	7.55		
Private	38.39	44.84	16.77		
<i>Class</i>				9.73	0.05
4	47.90	39.50	12.61		
5	45.90	43.44	10.66		
6	35.25	41.80	22.95		
<i>Who do you live with?</i>				6.19	0.63
Mother	37.21	48.84	13.95		
Father	40.00	46.67	13.33		
Both parents	41.73	41.73	16.54		
Grandparents	65.00	25.00	10.00		
her relation	52.63	36.84	10.53		

In relation to the type of school, 69.81% of pupils from public schools were underweight whereas 38.39% from private schools were also underweight. About 44.84% of pupils from private had normal weight compared to 22.64% of those from public schools. Whereas 16.77% of pupils from private school were overweight/obese, 7.55% of public school pupils were overweight/obese (see Table 4). Forty eight percentage of pupils in class 4 were underweight compared to 35.25% of pupils in class 6. (see Table 4). Whereas 43.44% of

class 5 pupils had normal weight, 41.80% of class 6 pupils also had normal weight. Sixty five percent of pupils who live with their grandparents were underweight compared to 37.21% of pupils who live with only their mothers. Pupils who live with only their mother and had normal weight were 48.84% compared to 25% of pupils who live with their grandparents. Whereas 16.54% of pupils who live with both parents were overweight/obese, 10% of pupils who live with their grandparents were overweight/obese. The chi-square analysis therefore showed that sex ($X^2=10.00$, $P=0.007$), age ($X^2 =10.0$, $P=0.04$) and the type of school ($X^2=18.3$, $P=0.000$) are statistically significantly associated with childhood obesity among primary school pupils in the Tema Metropolis.

Behavioral Characteristics of Respondents

This section covers the behavioral characteristics of the respondents which include their eating habits and physical activities they perform in a week and proportions of meals they consumed per day both at home and school.

Dietary Habits/Patterns of Pupils

Majority (68.59%) of the pupils had between one and three meals per day and 31.41% of them ate 4 or more times per day (see Table 5). More than half (71.3%) of the pupils bought their food from vendors/sellers at school and 13.50% brought their food from home to school (see Table 5). The results indicated that about 38.84% of the pupils considered lunch to be their favorite meal time per day (see Table 5). It also shows that 33.3% of the pupils skip breakfast and more than half (53.55%) of the pupils indicated they skipped breakfast because they are not hungry during breakfast hours (see Table 5).

All the pupils in the study consumed some of all the different food items within the week preceding the study. Therefore, their levels of consumption of the various food items were classified according to the number of days. Generally, about 61.98% of the pupils consumed sweetened drinks within 1-3 days per week, 34.44% of the pupils consume at least 1 bottle of sweetened drink in a day per week (see Table 5). The results also show more than half (50.96%) of the pupils eat foods high in fat between 1-3 days per week and about 61.71 % of the pupils eat fruits and vegetables about 4 or more days per week (see Table 5).

Table 5: Behavioral Characteristics of Respondents

Variables	Frequency	Percentage
	N = 363	
<i>How many times do you eat per day?</i>		
1-3 time	249	68.59
4 or more	114	31.41
<i>Where do you usually Get your food whenever</i>		
<i>You are in school?</i>		
Vendors/sellers at school	259	71.3
Vendors/sellers outside school	15	4.13
School feeding program	40	11.02
Home	49	13.50
<i>What is your favourite meal time?</i>		
Breakfast	70	19.28
Lunch	141	38.84
Supper	85	23.42
Snacks	67	18.4
<i>Which of the following meals do you usually skip?</i>		
Breakfast	121	33.3
Lunch	49	13.5
Supper	40	11.02
Snacks	72	19.8
None	81	22.31
<i>Why do you skip the above meal?</i>		
Not hungry	151	53.55
Lack of time	97	34.40

Table 5 Continued

Don't like food served	24	8.51
Food is inadequate	10	3.55
<i>How many days in a week do you drink sweetened drinks?</i>		
Never	16	4.41
1-3 days	225	61.98
4 or more days	122	33.61
<i>How many bottles/packs of sweetened drinks did you take in a week?</i>		
½ bottle	22	6.06
1 bottle	125	34.44
2 bottles	84	23.14
3 bottles	34	9.37
4 bottles	28	7.71
5 bottles	23	6.34
6 bottles	11	3.0
7 bottles	20	5.51
<i>How many days in a week do you eat foods high in fat?</i>		
Never	20	5.51
1-3 days	185	50.96
4 or more days	158	43.53
<i>How many days in a week do you eat fruits and vegetables?</i>		
Never	17	4.68
1-3 days	122	33.61
4 or more days	224	61.71
<i>How many days in a week do you walk to or from school?</i>		
Never	207	57.02
1-2 days	38	10.47
3-4 days	27	7.44
5-7 days	91	25.07
<i>How many days in a week are you transported to school?</i>		
Never	72	19.83
1-2 days	25	6.89
3-4 days	28	7.71
5-7 days	238	65.56

Table 5 Continued

<i>How often were you active during physical education class in a week?</i>		
Never	46	12.67
Hardly ever	23	6.34
Sometimes	120	33.06
Quite often	50	13.77
Always	124	34.16
<i>What do you do most of the time at recess?</i>		
Sit down	83	22.87
Stand around	37	10.16
Play a little	130	35.81
Run and play	53	14.60
Run and play hard	60	16.53
<i>What do you normally do at Lunch time?</i>		
Sit down	150	41.32
Stand around	58	15.98
Play a little	93	25.62
Run and play	39	10.74
Run and play hard	23	6.34
<i>How many days right after school do you play?</i>		
Never	125	34.44
Once	65	17.91
2-3	82	22.59
4 times	18	4.96
5 times	73	20.11
<i>How many days per week do you watch TV?</i>		
Never	23	6.34
1 day	29	7.99
2 day	42	11.57
3 day	35	9.64
4 day	22	6.06
5 day	16	4.41
6 day	10	2.75
Each day	126	51.24

Table 5 Continued

<i>Which of the following describes you best in the last 7 days?</i>		
All or most of the time	102	28.1
I sometimes	147	40.5
I often	53	14.6
I quite often	26	7.2
I very often	35	9.6
<i>Were you sick last week or did anything prevent you from doing your normal physical activities?</i>		
Yes	32	8.82
No	331	91.18

Source: Field Survey (2019).

Physical Activity of Pupils

This section describes the frequency of physical activity that the pupils were involved in 7 days preceding the study. These activities involved number of days in a week they walked to or from school, number of days in a week they were transported to school, how often pupils are active during physical education class in a week, activities performed by pupils most of the time at recess, activities performed by pupils during lunch time, number of days right after school pupils play, number of days per week pupils watch television, how the activities performed by pupils describe them best in the last 7 days and if anything prevented them from performing their normal physical activities (see Table 5).

Some pupils walked to school during the week. More than half (57.02%) of the pupils in the study never walked to or from school in a week. However, out of those who walked, 25% walked to or from school in all 5 school days, 7.44% walked to/from school between 3-4 school days, 10.47% walked between 1-2 school days (see Table 5). Out of those transported to school, 65.56% were transported to school all the 5 school days, 7.71% were

transported between 3-4 school days, 6.89% were transported between 1-2 school days and 19.83% were never transported to school on school days (see Table 5). During physical education class in a week, about 34.16% of the pupils are active, 13.77% are active during physical education class quite often. Also, about 33.06% are active during physical education class sometimes. Less than 10% (6.34%) of the pupils are hardly ever active during physical education class and 12.67% of the pupils never participate in physical education class (see Table 5). During recess time, about 35.81% of the pupils play a little and 22.87% sit down without performing any activity, out of the total, about 16.53% of the pupils run and play hard.

Those who stand around and run and play are about 10.19% and 14.60% respectively (see Table 5). Out of the total number of pupils, 41.32% sit down during lunch time per day within a week and about 15.98% of the pupils stand around, also 25.62% of the pupils play a little during lunch time. The number of pupils who run and play are about 10.74% while those who run and play hard are about 6.34% as shown in table 5. Some of the pupils are known to play after schools hours before going home. Therefore from the results shown in Table 5, a few (20.11%) of the pupils play after school in all 5 school days. Less than 5% (4.96%) of the pupils play after school in all 4 school days. Within 2-3 days in all school days 22.59% of the pupils play after school before going home. Again, the results show that 17.91% of the pupils play just once per week after school and 34.44% of the pupils never play after school before going home (see Table 5). More than half (51.24%) of the pupils watch television each day in a week out of six days in the week, 2.75% of the

pupils watch television. Within 5 days in a week, 4.41% of the pupils watch television and 6.06% of the pupils watch television within 4 days per week.

The results also indicate that others also watch TV in less than 4 days in a week, thus 9.64% of the pupils watch TV within 3 days per week while 11.57% of the pupils watch TV within 2 days per week. Within the whole week, it is shown in table 5 that 7.99% of the pupils watch television just once and about 6.34% of the pupils never watch TV within the whole week (see Table 5). Results shown in Table 5 indicate that 40.5% of the pupils sometimes (1-2 times last week) did physical activities in their free time (see Table 5).

Economic Characteristics by Childhood Overweight/Obesity

Fifty percent of pupils whose mothers were not employed were underweight compared to 48.48% of pupils whose mothers were trading. Fifty percent of pupils whose mothers were not employed had normal weight whereas 48.28% of pupils whose mothers were professionals had normal weight. Whereas 19.05% pupils whose mothers worked in an office were overweight/obese. Sixty percent of pupils who walked to school were underweight whilst 41.18% who were underweight joined their friend's parents' cars to school. Pupils who joined public transport and had normal weight were 56.25% compared to normal weight pupils (43.27%) who joined their parents' cars to school.

Nineteen percent of pupils who get to school by their parents' cars were overweight/obese compared to overweight/obese pupils (17.65%) who joined their friends' parents' cars to school. Pupils who were underweight and did not take money to school every day were 57.14% whereas those who were

underweight and took money to school every day were 41.79%. Pupils who had normal weight and took money to school every day were 42.09% whereas those who had normal weight and did not take money to school every day were 35.71%. Pupils who take money to school every day and were considered overweight/obese were 16.12% whereas those who were overweight/obese and did not take money to school every day were 7.14%. Pupils who were considered underweight according to the results and took Ghc1.00 to school every day were 53.98% whereas those who were underweight and took Ghc10.00 to school every day were 27.78%.

Pupils who had normal weight and took Ghc10.00 to school every day were 51.52% compared to those (33.63%) who had normal weight and took Ghc1.00 to school every day. Pupils who were considered overweight/obese and took Ghc15.00 to school every day were 27.78% compared to those (12.39%) who took Ghc1.00 to school every day. Pupils who were from low economic stratum and were underweight were 61.36% compared to underweight pupils who were from high economic stratum (40.44%). Pupils from high economic stratum who had normal weight were 44.20% compared to pupils (22.73%) from low economic stratum. Pupils who were from low economic stratum and were overweight/obese were 15.91% compared to overweight/obese pupils who were from high economic stratum (15.36%) (see Table 6). This results therefore shows how the economic factors above influences the weight status of each pupil positively or negatively.

Table 6: Economic status by Childhood Obesity

Variable	Underweight %	Normal %	Overweight Obese %	X ²	P value
<i>Mother's Occupation</i>				6.86	0.55
Artisan	43.66	38.03	18.31		
Professional	35.63	48.28	16.09		
Office work	39.68	41.27	19.05		
Trading	48.48	39.39	12.12		
Not employed	50.00	50.00	0.00		
<i>Father's occupation</i>				8.85	0.36
Artisan	54.29	37.14	8.57		
Professional	40.97	42.36	16.67		
Office work	42.37	40.68	16.95		
Trading	36.96	52.17	10.87		
Not employed	28.57	28.57	42.86		
<i>How do you usually get to school?</i>				22.62	0.00
Parents	37.43	43.27	19.30		
Friends	41.18	1.18	17.65		
Public transport	35.00	56.25	8.75		
Walk	60.00	26.32	13.68		
<i>Do you take money to school everyday?</i>				0.02	0.22
Yes	41.79	42.09	16.12		
No	57.14	35.71	7.14		
<i>How much do you take to school everyday?</i>				13.29	0.04
1	53.98	33.63	12.39		
5	38.01	45.61	16.37		
10	27.27	51.52	21.21		
15	27.78	44.44	27.78	8.23	0.02
<i>Economic status</i>					
Low	61.36	22.73	15.91		
High	40.44	44.20	15.36		

Source: Field Survey (2019)

Likelihood of Underweight among Primary School Pupils

Logistic regression models were used to estimate the demographic, economic and behavioral characteristics of underweight school pupils. The three models considered in the analyses were model I (demographic factors), model II (demographic and economic factors) and model III (demographic, economic and behavioral factors). The pseudo R² values for the three models considered

for the analyses were model I (0.072), model II (0.121) and model III (0.242). It could be seen that the pseudo R^2 increased steadily with each succeeding model (see Table 7). Sex, age, type of school, means of getting to school, number of days transported to school and living with both parents as well as grandparents had a relationship with likelihood of being normal in weight.

The study found that females were less likely to be underweight than males. This was significant in the first model only. In the complete model, pupils between the ages of 10 and 14 were less likely to be overweight/obese than those who were between 5 and 9. However, there was a significant relationship between being in the ages of 10 and 14 and overweight/obesity. The likelihood of being underweight also varied by the type of school attended by pupils and it was significant in all the models. For instance, in the complete model, pupils who attended private school were less likely to be underweight as compared to pupils who attend public school (OR=0.34** $p<0.01$). It was also shown that pupils who lived with their grandparents were more likely to be underweight compared to those who lived with their mothers. Pupils who walked to school every day were more likely to be underweight compared to those who went to school by means of their parents cars (OR=9.60** $P<0.01$). Being transported to school all days did not show any significant relationship in the first and second models, however, it was statistically significant in the model model (see Table 7).

Table 7: logistic Regression Model showing Demographic, Economic and Behavioural characteristics of Underweight School Pupils

Variable	Model I OR (CI)	Model II OR (CI)	Model III OR (CI)
Age			
5-9	Ref	Ref	Ref
10-14	0.443*(0.21-0.93)	0.323**(0.14-76)	0.244*(0.07-0.81)
15+	0.44(0.04-5.28)	0.31(0.02-4.35)	0.09(0.00-2.26)
Sex			
Male	Ref	Ref	Ref
Female	0.25***(0.12-0.49)	0.49(0.18-1.29)	0.26(0.06-1.10)
Type of school			
Public	Ref	Ref	Ref
Private	0.47**(0.29-0.74)	0.45**(0.27-074)	0.34**(0.15-0.75)
Class			
Class 4	Ref	Ref	Ref
Class 5	1.14(0.61-2.11)	1.23(0.61-2.49)	0.76(0.27-2.13)
Class 6	0.93(0.49-1.77)	0.88(0.42-1.83)	0.96(0.32-2.91)
Who do you live with?			
Mother	Ref	Ref	Ref
Father	-	1.66(0.35-7.77)	1.28(0.14-11.97)
Both parent	-	2.66*(1.09-6.48)	3.43(1.10-10.65)
Grandparent	-	5.24*(1.23-22.40)	9.78*(1.50-63.90)
Other relations	-	3.03(0.66-13.93)	4.16(0.54-32.20)
Mother's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	0.79(0.37-1.68)	0.96(0.35-2.66)
Office work	-	0.79(0.35-1.78)	0.49(0.17-1.47)
Trading	-	1.21(0.61-2.41)	1.35(0.53-3.44)
Not employed	-	1	1
Father's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	0.61(0.22-1.69)	0.39(0.10-1.48)
Office work	-	0.87(0.32-2.39)	0.61(0.16-2.31)
Trading	-	0.58(0.18-1.80)	0.43(0.09-1.97)
Not employed	-	0.43(0.06-3.07)	0.22(0.02-2.58)
How do you usually get to school?			
Parents	Ref	Ref	Ref
Friends	-	1.73(0.51-5.82)	0.84(0.37-1.89)
Public transport	-	0.52(0.19-1.43)	1.01(0.45-.227)
Walk	-	1.85(0.91-3.77)	9.60**(2.22-41.62)

Table 7 Continued

<i>How much do you take to school everyday?</i>			
1.00	Ref	Ref	
5.00	-	0.69(0.39-1.24)	0.81(0.33-1.99)
10.00	-	1.37(0.54-3.47)	0.74(0.20-2.71)
15.00	-	0.56(0.16-1.91)	0.50(0.09-2.69)
<i>Economic status</i>			
Low	Ref	0.88(0.37-2.08)	0.77(0.23-2.59)
High	-		
<i>How many times do you usually eat per day?</i>			
1 day	Ref	Ref	Ref
2 day	-	-	0.09(0.01-1.22)
3day	-	-	0.21(0.02-2.44)
4 day	-	-	0.24(0.02-2.86)
5 day	-	-	0.9(0.06-13.89)
<i>Where do you usually get your food whenever you are in school?</i>			
Venders/sellers at school	Ref	Ref	Ref
Venders/sellers outside school	-	-	0.34(0.04-2.55)
School feeding programme	-	-	0.97(0.30-3.14)
Home	-	-	1.83(0.60-5.51)
<i>What is your favourite meal time?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	0.69(0.26-1.83)
Supper	-	-	1.20(0.39-4.72)
Snacks	-	-	1.48(0.47-4.72)
<i>Which of the following meals do you usually skip?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	0.51(0.17-1.53)
Supper	-	-	1.11(0.36-3.41)
Snacks	-	-	0.44(0.166-1.19)
None	-	-	1.10(0.42-2.91)

Table 7 Continued

<i>How many days in a week do you drink sweetened drinks?</i>			
Never	Ref	Ref	1.56(0.12-20.53)
1 day	-	-	1.54(0.11-21.96)
2 day	-	-	2.85(0.18-44.34)
3day	-	-	0.86(0.04-17.07)
4 day	-	-	0.231(0.01-5.36)
5 day	-	-	5.27(0.19-148.2)
6 day	-	-	1.98(0.13-30.89)
Each day			
<i>How many bottles/packs did you take in a week?</i>			
½	Ref	Ref	Ref
1 bottle	-	-	0.80(0.20-3.16)
2 bottles	-	-	0.70(0.16-3.07)
3 bottles	-	-	0.59(0.11-3.23)
4 bottles	-	-	0.31(0.053-1.81)
5 bottles	-	-	1.17(0.17-7.92)
6 bottles	-	-	0.082(0.01-1.29)
7 or more	-	-	0.33(0.04-2.55)
<i>How many days in a week do you eat foods high in fat?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	0.44(0.06-3.02)
4 or more days	-	-	0.514(0.07-3.56)
<i>How many days in a week do you eat fruits & vegetables?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	0.44(0.06-3.02)
4 or more days	-	-	0.514(0.07-3.56)

Table 7 continued

<i>How many days in a week do you walk to or from school?</i>			
1-2 days	Ref	Ref	Ref
3.-4 days	-	-	1.08(0.29-4.02)
3-4 days	-	-	0.69(0.17-2.80)
5-7 days	-	-	1.03(0.28-3.76)
<i>How many days in a week are you transported to school?</i>			
Never	Ref	Ref	Ref
1-2 days	-	-	2.56(0.49-13.40)
3-4 days	-	-	5.73(0.86-38.17)
<i>How often were you active during physical education class in a week?</i>		-	6.36*(1.19-34.12)
Never	Ref	Ref	Ref
Hardly ever	-	-	1.75(0.29-10.51)
Some times	-	-	0.97(0.27-3.49)
Quite often	-	-	0.53(0.12-2.29)
Always	-	-	0.99(0.25-3.87)
<i>What do you do most of the time during recess?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	1.25(0.34-4.59)
Play a little	-	-	1.07(0.39-2.95)
Run and play	-	-	2.04(0.58-7.11)
Run and play hard	-	-	0.66(0.19-2.31)
<i>What do you normally do at lunch time?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	0.64(0.22-1.81)
Play a little	-	-	0.74(0.31-1.79)
Run and play	-	-	1.19(0.36-3.97)
Run and play hard	-	-	0.62(0.13-2.90)
<i>How many days right after school do you play?</i>			
Never	Ref	Ref	Ref
Once	-	-	1.54(0.53-4.44)
2-3 times	-	-	1.03(0.39-2.73)
4 times	-	-	0.57(0.13-2.56)
5 times	-	-	0.88(0.29-2.60)

Table 7 continued

How many days per week do you watch TV?

Never	Ref	Ref	Ref
1 day	-	-	0.67(0.12-3.71)
2 days	-	-	0.97(0.16-5.72)
3 days	-	-	1.02(0.18-5.85)
4 days	-	-	1.38(0.20-9.47)
5 days	-	-	3.57(0.43-29.83)
6 days	-	-	1.59(0.14-18.06)
Each day	-	-	1.39(0.33-5.90)

Which of the following describes you best for the last 7 days?

All or most	Ref	Ref	Ref
1 sometimes	-	-	1.07(0.29-3.84)
1 often	-	-	0.79(0.24-2.67)
1 quite often	-	-	1.23(0.29-5.17)
1 very often	-	-	3.29(0.57-18.86)

Were you sick last week or did anything to prevent you from doing your normal physical activities?

Yes	Ref	Ref	Ref
No	-	-	1.99(0.63-6.29)

Exponentiated coefficients; 95% confidence intervals in brackets* p<0.05, ** p<0.01, *** p<0.001

Source: Field Survey (2019).

Likelihood of Normal Weight among Primary School Pupils

Logistic regression models were used to estimate the demographic, economic and behavioral characteristics of normal weight school pupils. The three models considered in the analyses were model I (demographic factors), model II (demographic and economic factors) and model III (demographic, economic and behavioral factors). The logistic regression results are presented in Table 8. The pseudo R² values for the Model I, Model II and Model are III

0.039, 0.086 and 0.230 respectively, which showed an increase from Model I to Model III. Sex, type of school, means of getting to school, number of days transported to school and how often pupils are active in physical education class had a relationship with likelihood of being normal in weight.

The study found that females were five times more likely to be normal in weight than males. This was significant in the first and third models. The likelihood of being normal in weight also varied by the type of school attended by pupils and it was significant in all the models. For instance, in the complete model, pupils who attended private schools were 2.98 times more likely to be normal in weight as compared to pupils who attended public schools (OR=3.98p<0.01). It was also shown that pupils who walked to school every day were less likely to be normal in weight compared to those who went to school by means of their parents' cars (OR=0.09**P<0.01). Being transported to school all days did not show any significant relationship in the first and second models, but, it was significant in the complete model. It was observed in the complete model that, there was a significant relationship with always being active in physical education class (see Table 8).

Table 8: logistic Regression Model showing Demographic, Economic and Behavioural characteristics showing the likelihood of being Normal weight school pupils

Variable	Model I OR (CI)	Model II OR (CI)	Model III OR (CI)
Age			
5-9	Ref	Ref	Ref
10-14	1.08(0.52-,2.24)	1.32(0.52-3.08)	2.56(0.75-8.73)
15+	2.06(0.17-24.60)	3.13(0.22-45.21)	15.51(0.45-539.8)
Sex			
Male	Ref	Ref	Ref
Female	3.09**(1.49-6.39)	1.784(0.65-4.90)	6.57*(1.32-32.77)
Type of school			
Public	Ref	Ref	Ref
Private	1.95**(1.49-6.39)	2.21**(1.35-3.61)	3.98**(1.72-9.19)
Class			
Class 4	Ref	Ref	Ref
Class 5	1.29(0.70-2.39)	1.31(0.65-2.61)	1.89(0.66-5.47)
Class 6	0.97(0.52-1.82)	0.96(0.47-1.95)	0.99(0.02-3.07)
Who do you live with?			
Mother	Ref	Ref	Ref
Both parent	-	0.51(0.22-1.17)	0.35(0.12-1.09)
Grandparent	-	0.38(0.088-1.62)	0.30(0.04-2.11)
Other relations	-	0.55(0.13-2.41)	0.24(0.03-1.83)
Mother's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	1.37(0.66-2.85)	2.07(0.75-5.73)
Office work	-	1.26(0.58-2.76)	2.27(0.79-6.52)
Trading	-	1.13(0.58-2.22)	1.17(0.48-2.88)
Not employed	-	1	1
Father's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	0.81(0.29-2.22)	0.97(0.25-3.83)
Office work	-	0.69(0.25-1.89)	0.77(0.19-3.02)
Trading	-	1.23(0.40-3.76)	1.42(0.31-6.54)
Not employed	-	0.44(0.06-3.09)	0.25(0.02-4.14)
How do you usually get to school?			
Parents	Ref	Ref	Ref
Friends	-	0.26(0.19-2.25)	0.79(0.16-4.02)
Public transport	-	1.61(0.88-2.94)	1.82(0.83-4.00)
Walk	-	0.58(0.28-1.21)	0.09**(0.019-0.42)

Table 8 Continued

<i>How much do you take to school everyday?</i>			
1.00	Ref	Ref	Ref
5.00	-	1.32(0.73-2.37)	0.81(0.33-1.99)
10.00	-	1.37(0.54-3.47)	1.59(0.44-5.67)
15.00	-	1.03(0.33-3.21)	0.61(0.13-2.89)
<i>Economic status</i>			
Low	Ref	Ref	Ref
High	-	1.99(0.79-5.04)	2.15(0.59-7.76)
<i>How many times do you usually eat per day?</i>			
1 day	Ref	Ref	Ref
2 day	-	-	19.08(0.77-473.2)
3day	-	-	16.52(0.73.-375.4)
4 day	-	-	27.94(1.26-620.4)
5 day	-	-	18.36(0.72-467.6)
<i>Where do you usually get your food whenever you are in school?</i>			
Venders/sellers at school	Ref	Ref	Ref
Venders/sellers outside school	-	-	3.12(0.43-22.70)
School feeding programme	-	-	0.50(0.14-1.77)
Home	-	-	0.45(0.15-1.35)
<i>What is your favourite meal time?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	2.08(0.80,5.417)
Supper	-	-	1.35(0.45-4.07)
Snacks	-	-	1.26(0.41-3.86)
<i>Which of the following meals do you usually skip?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	2.23(0.724-6.86)
Supper	-	-	0.56(0.19-1.71)
Snacks	-	-	1.59(0.68-4.34)

Table 8 Continued

<i>How many days in a week do you drink sweetened drinks?</i>			
Never	Ref	Ref	Ref
1 day	-	-	0.25(0.02-3.20)
2 day	-	-	0.17(0.012-2.32)
3day	-	-	0.16(0.01-2.46)
4 day	-	-	0.20(0.01-3.84)
5 day	-	-	0.41(0.02-7.90)
6 day	-	-	0.05(0.20-1.42)
Each day			0.19(0.01-,2.92)
<i>How many bottles/packs did you take in a week?</i>			
½	Ref	Ref	Ref
1 bottle	-	-	1.23(0.31-4.83)
2 bottles	-	-	1.66(0.37-7.41)
3 bottles	-	-	1.78(0.33-9.73)
4 bottles	-	-	3.21(0.59-17.49)
5 bottles	-	-	
6 bottles	-	-	2.51(0.39-16.32)
7 or more	-	-	2.15(0.180,25.60)
<i>How many days in a week do you eat foods high in fat?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	0.39(0.06-2.53)
4 or more days	-	-	0.35(0.05-2.36)
<i>How many days in a week do you eat fruits & vegetables?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	2.14(0.28-,16.71)
4 or more days	-	-	2.34(0.30-18.20)
<i>How many days in a week do you walk to or from school?</i>			
1-2 days	Ref	Ref	Ref
3.-4 days	-	-	0.70(0.19-2.63)
3-4 days	-	-	2.78(0.70-11.03)
5-7 days	-	-	0.38(09-1.54)

Table 8 Continued

<i>How many days in a week are you transported to school?</i>			
Never	Ref	Ref	Ref
1-2 days	-	-	0.49(0.08-2.89)
3-4 days	-	-	0.28(0.04-2.01)
5-7 days	-	-	0.084**(0.013-0.55)
 <i>How often were you active during physical education class in a week?</i>			
Never	Ref	Ref	Ref
Hardly ever	-	-	0.41(0.07-2.36)
Some times	-	-	0.29(0.08-1.09)
Quite often	-	-	0.39(0.09-1.68)
Always	-	-	0.195*(0.05-0.78)
 <i>What do you do most of the time during recess?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	0.45(0.13-1.65)
Play a little	-	-	1.06(0.40-2.78)
Run and play	-	-	1.43(0.42-4.82)
Run and play hard	-	-	2.58(0.75-8.84)
 <i>What do you normally do at lunch time?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	2.05(0.75-5.60)
Play a little	-	-	1.01(0.43-2.38)
Run and play	-	-	1.29(0.38-4.31)
Run and play hard	-	-	1.82(0.42-7.82)
 <i>How many days right after school do you play?</i>			
Never	Ref	Ref	Ref
Once	-	-	1.23(0.43-3.51)
2-3 times	-	-	1.52(0.56-4.12)
4 times	-	-	1.62(0.37-7.15)
5 times	-	-	0.95(0.34-2.69)
 <i>How many days per week do you watch TV?</i>			
Never	Ref	Ref	Ref
1 day	-	-	1.68(0.29-9.81)
2 days	-	-	1.02(0.18-5.89)
3 days	-	-	0.80(0.15-4.28)
4 days	-	-	0.25(0.04-1.74)

Table 8 Continued

5 days	-	-	0.60(0.07-5.11)
6 days	-	-	135(0.12-14.88)
Each day	-	-	0.61(0.15-2.50)
<i>Which of the following describes you best for the last 7 days?</i>			
All or most	Ref	Ref	Ref
1 sometimes	-	-	1.08(0.30-3.81)
1 often	-	-	2.22(0.67-7.29)
1 quite often	-	-	1.52(0.37-6.22)
1 very often	-	-	1.72(0.32-9.16)
<i>Were you sick last week or did anything to prevent you from doing your normal physical activities?</i>			
Yes	Ref	Ref	Ref
No	-	-	0.66(0.21-2.05)

Exponentiated coefficients; 95% confidence intervals in brackets* p<0.05, ** p<0.01, *** p<0.001

Source: Field Survey (2019).

Likelihood of Overweight/Obese among Primary School Pupils

Logistic regression model were used to further analyse the demographic, economic and behavioral factors related to overweight among school pupils. Model I, shows the background variables, Model II shows the background and economic variables related to overweight/obesity, and model III was used to estimate the combined relationship between the background, economic and behavioral factors and childhood overweight/obesity. The logistic regression results are presented in Table 9. The pseudo R² values for the Model I, Model II and Model III are 0.060, 0.131 and 0.454 respectively which showed an increase from Model I to Model III. The model that best predicts the factors relating to childhood obesity is the model with the highest pseudo R² and that is model III (0.454). It was shown in the model III that living with

grandparents, fathers' occupation, amount of money sent to school, number of times eaten per day, how often pupils participate in physical education (PE) class and activities performed during recess time had a relationship with overweight/obesity. Specifically, living with grandparents which was not significant in the first and second models was significant in the model III. Pupils whose fathers were professionals, worked in an office and were not employed were more likely to be overweight/obese compared to pupils whose fathers were artisans. In relation to the amount of money sent to school, pupils who send Ghc5.00 and Ghc15.00 to school every day were more likely to be overweight/obese compared to those who send Ghc1.00 to school every day. Pupils who ate twice daily were more likely to be overweight/obese compared to those who eat once daily (OR=251.1* P<0.05). The results also show that being on the school feeding program and consuming snacks often had a significant relationship with overweight/obese. In relation to how active pupils are in PE class, participating in PE class sometimes, quite often and always had a relationship with overweight/obesity. Also, pupils who run and play during recess time were less likely to be overweight/obese (OR=0.03* p<0.05) compared to those who sit down doing nothing (see Table 9).

Table 9: Logistic Regression Model showing Demographic, Economic and Behavioural characteristics showing the likelihood of being Overweight/obese school pupils

Variable	Model I OR (CI)	Model II OR (CI)	Model III OR (CI)
Age			
5-9	Ref	Ref	Ref
10-14	7.13*(1.53-33.13)	7.51*(1.49-37.65)	10.35(0.45-240.3)
15+	1		
Sex			
Male	Ref	Ref	Ref
Female	2.23(0.75-6.63)	1.79(0.41-7.70)	2.95(0.09-95.55)
Type of school			
Public	Ref	Ref	Ref
Private	1.10(0.61-1.99)	0.85(0.44-1.64)	0.69(0.18-2.68)
Class			
Class 4	Ref	Ref	Ref
Class 5	0.48(0.21-1.11)	0.41(0.16-1.03)	0.13(0.015-1.14)
Class 6	1.09(0.25-2.32)	1.28(0.55-3.03)	0.39(0.04-3.86)
Who do you live with?			
Mother	Ref	Ref	Ref
Father	-	0.57(0.08-3.86)	2.61(0.02-282.7)
Both parent	-	0.59(0.21-1.74)	1.14(0.17-7.72)
Grandparent	-	0.18(0.01-2.14)	0.01*(0.01-0.99)
Other relations	-	0.43(0.04-4.70)	0.78(0.01-47.25)
Mother's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	0.90(0.35-2.29)	0.12(0.01-1.16)
Office work	-	0.98(0.36-2.65)	1.29(0.22-7.64)
Trading	-	0.21(0.03-1.43)	0.21(0.03-1.43)
Not employed	-	1	1
Father's Occupation			
Artisan	Ref	Ref	Ref
Professional	-	3.72(0.73-19.03)	3.73**(6.40-21.64)
Office work	-	2.87(0.56-14.65)	4.88* (1.69-14.09)
Trading	-	1.81(0.29-11.33)	9.59(0.21-43.97)
Not employed	-	13.45*(1.45-124.5)	4.31**(1.47-12.6)
How do you usually get to school?			
Parents	Ref	Ref	Ref
Friends	-	0.86(0.16-4.56)	1.25(0.072-21.65)
Public transport	-	0.311*(0.12-0.80)	0.36(0.06-2.11)

Table 9 Continued

Walk	-	079(0.31-2.01)	2.75(0.07-11.8)
<i>How much do you take to school everyday?</i>			
1.00	Ref	Ref	Ref
5.00	-	1.28(0.56-2.89)	8.03*(1.05-61.27)
10.00	-	1.75(0.52-2.88)	1.97(0.13-30.4)
15.00	-	2.31(0.58-9.27)	12.2*(2.96-52.9)
<i>Economic status</i>			
Low	Ref	Ref	Ref
High	-	0.73(0.12-1.18)	0.13(0.01-1.52)
<i>How many times do you usually eat per day?</i>			
1 day	Ref	Ref	Ref
2 day	-	-	2.5*(1.41-4.47)
3day	-	-	5.1(0.47-5.4)
4 day	-	-	4.07(0.06-29.0)
5 day	-	-	3.12(0.05-28.5)
<i>Where do you usually get your food whenever you are in school?</i>			
Venders/sellers at school	Ref	Ref	Ref
Venders/sellers outside school	-	-	7.81(0.51-12.8)
School feeding programme	-	-	3.3*(1.80-6.05)
Home	-	-	4.01(0.32-4.9)
<i>What is your favourite meal time?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	0.73(0.12-4.44)
Supper	-	-	0.24(0.03-2.15)
Snacks	-	-	0.045*(0.039-0.63)
<i>Which of the following meals do you usually skip?</i>			
Break fast	Ref	Ref	Ref
Lunch	-	-	1.47(0.12-18.36)
Supper	-	-	7.05(0.64-77.18)
Snacks	-	-	8.02(0.99-64.68)
None	-	-	1.50(0.21-10.81)

Table 9 Continued

<i>How many days in a week do you drink sweetened drinks?</i>			
Never	Ref	Ref	Ref
1 day	-	-	1.57(0.12-20.03)
2 day	-	-	2.37(0.26-21.95)
3day	-	-	0.89(0.06-14.15)
4 day	-	-	1.71(0.29-11.01)
5 day	-	-	5.37(0.24-11.8)
6 day	-	-	7.81(0.05-11.90)
Each day			0.81(0.05-10.90)
<i>How many bottles/packs did you take in a week?</i>			
½	Ref	Ref	Ref
1 bottle	-	-	0.73(0.05-10.06)
2 bottles	-	-	0.55(0.04-7.71)
3 bottles	-	-	0.94(0.05-18.83)
4 bottles	-	-	0.19(0.01-5.11)
5 bottles	-	-	0.05(0.01-1.99)
6 bottles	-	-	1.02(0.97-10.7)
7 or more	-	-	0.19(0.01-29.53)
<i>How many days in a week do you eat foods high in fat?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	4.54(0.54-38.04)
4 or more days	-	-	9.15(0.53-15.8)
<i>How many days in a week do you eat fruits & vegetables?</i>			
Never	Ref	Ref	Ref
1-3 days	-	-	0.07(0.00-2.23)
4 or more days	-	-	0.04(0.00-1.21)
<i>How many days in a week do you walk to or from school?</i>			
1-2 days	Ref	Ref	Ref
3.-4 days	-	-	3.15(0.17-58.92)
3-4 days	-	-	9.13(0.44-19.1)
5-7 days	-	-	3.15(0.17-58.92)

Table 9 Continued

<i>How many days in a week are you transported to school?</i>			
Never	Ref	Ref	Ref
1-2 days	-	-	1.18(0.02-62.82)
3-4 days	-	-	0.12(0.00-28.92)
5-7 days	-	-	11.74(0.13-10.73)
<i>How often were you active during physical education class in a week?</i>			
Never	Ref	Ref	Ref
Hardly ever	-	-	23.56(0.62-89.9)
Some times	-	-	11.8**(4.65-30.3)
Quite often	-	-	25.7**(6.97-95.4)
Always	-	-	23.8**(7.37-77.2)
<i>What do you do most of the time during recess?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	3.44(0.32-37.06)
Play a little	-	-	0.22(0.03-1.64)
Run and play	-	-	0.03*(0.00-0.57)
Run and play hard	-	-	0.26(0.02-3.81)
<i>What do you normally do at lunch time?</i>			
Sit down	Ref	Ref	Ref
Stand around	-	-	1.02 (0.10-10.65)
Play a little	-	-	1.65(0.22-12.55)
Run and play	-	-	0.46(0.02-13.60)
Run and play hard	-	-	0.16 (0.01-2.60)
<i>How many days right after school do you play?</i>			
Never	Ref	Ref	Ref
Once	-	-	0.17(0.03-1.18)
2-3 times	-	-	0.41(0.05-3.06)
4 times	-	-	0.18(0.01-4.12)
5 times	-	-	0.38(0.05-2.90)
<i>How many days per week do you watch TV?</i>			
Never	Ref	Ref	Ref
1 day	-	-	2.58(0.05-141.6)
2 days	-	-	1.58(0.04-67.67)
3 days	-	-	7.91(0.16-395.7)
4 days	-	-	12.81(0.23-728.3)

Table 9 Continued

5 days	-	-	0.004(0.00-1.21)
6 days	-	-	1
Each day	-	-	4.71(0.15-148.7)
<i>Which of the following describes you best for the last 7 days?</i>			
All or most	Ref	Ref	Ref
1 sometimes	-	-	1.07(0.29-3.84)
1 often	-	-	0.79(0.24-2.67)
1 quite often	-	-	1.23(0.29.5.17)
1 very often	-	-	3.29(0.57-18.86)
<i>Were you sick last week or did anything to prevent you from doing your normal physical activities?</i>			
Yes	Ref	Ref	Ref
No	-	-	1.99(0.63-6.29)

Source: Field Survey (2019).

Discussion

Prevalence of Overweight/Obesity Among Study Participants

The prevalence of overweight/obesity among primary school in the Tema Metropolis is 15.43%. Comparing this prevalence rate in the Tema Metropolis with other studies conducted in both urban and rural areas in Ghana, it shows that there are differences in the prevalence rate. For instance, in a cross-sectional study conducted in urban Ghana (Accra and Kumasi) to determine the prevalence of obesity among school-aged children, the results showed that 17% of children were obese (Aryeetey, Brown, Colecraft, Lartey, Marquis & Nti, 2017). Another study conducted in the Accra Metropolis, indicated an overall prevalence of 10.9% (Mohammed & Vuvor, 2012), meaning the prevalence rate among the school pupils in Tema is higher than

that of the Accra Metropolis. The findings on the prevalence of overweight/obesity among primary school pupils in the Tema Metropolis is 7.93% higher than the results reported on prevalence of childhood obesity in the Tamale Metropolis (7.5%) by Amidu and colleagues, (2013). Indeed, there are differences in the prevalence rates of childhood obesity in different parts of Ghana although the levels are lower than the levels in high income countries (Muthuri et al., 2014).

The prevalence of overweight/obesity shown in this study among girls and boys was 16.29% and 14.59% respectively. Various studies conducted in Ghana have also reported similar gender differences in the prevalence of childhood overweight/obesity (Mohammed and Vuvor, 2012; Amidu et al., 2013; Annan-Asare et al., 2017). Reasons for the prevalence rate for overweight/obesity among pupils in this study may be due to the sex (being female), age (10-14), living with grandparent, fathers' occupation, amount of money sent to school, number of times food is eaten daily and performing less physical activities.

People in developing countries who belong to higher economic class were known to be the most affected with overweight/obesity (Caballero, 2007). The findings of this study appear to differ from the report by Caballero (2007). The findings from this study indicate a significant association between low economic stratum and childhood obesity and this may be as a result of parents from high economic stratum being able to purchase and prepare healthier foods for their children at home. However, the findings of this study also indicate that pupils given higher amount of money to spend at school per day were more likely to be overweight/obese. A pupil given more money to spend

at school is more likely to purchase foods high in fat and sweetened drinks which makes the child inclined to higher danger of becoming overweight/obese. The consumption of snacks frequently has been reported to be associated with higher BMI and BMI change (Lee et al, 2012) There was no relationship between the occupation of a mother and the likelihood of school pupils being overweight/obese. However there was a relationship between occupation of fathers and the likelihood of a pupil being overweight/obese. School pupils whose fathers did professional jobs and worked in offices were more likely to be overweight/obese. Findings from this study showed that pupils who were between the ages of 10 and 14 were more likely to be overweight/obesity and this seems to agree with the report from Gupta et al., (2012), indicating that children are more overweight/obese in the pre-pubertal phase compared with post pubertal phase.

Relationship between Behavioral Factors and Childhood

Overweight/Obesity

Dietary habits/patterns

According to the results, there is a relationship between consumption of snacks, and overweight/obesity. Pupils who consumed snacks often in a week were likely to be overweight/obese and those who eat fruits and vegetables between 1 and 3 days in a week were less likely to be overweight/obese than those who never eat fruits and vegetables.

The results showing a relationship between the consumption of snacks often and overweight/obesity agrees with Popkin and colleagues; (2012) report on the fact that globally, nations are undergoing change in nutrition where diets have begun to shift towards high dependence on consumption of

sweetened beverages. Additionally, the results showing a relationship between the consumption of less fruits and vegetables and overweight/obesity agree with the report from the Ghana school survey which suggests that most of Ghanaian diets such as fresh fruits and vegetables have been substituted by high fat diets and refined cereals which sets the stage for the development of childhood obesity (Lartey, 2012). Some of the reasons why these pupils eat less fruits and vegetables may be as a result of fruits and vegetables being expensive, not being sold enough in the canteens of the various schools and also less education given to pupils in terms of the benefits of fruits and vegetables to their health.

Although the findings of this study show high proportion of pupils who skipped breakfast, it is less likely to be related to overweight/obesity at both levels of analysis. However, the consumption of breakfast is known to affect BMI positively whilst skipping of breakfast can affect BMI negatively, thus, children who skip breakfast are reported to have higher BMI as compared to those who consume breakfast (Deshmukh-Taskar et al., 2010). Consuming breakfast consistently is known to have a positive effect against the development of overweight/obesity and it has been affirmed by the Ghana Schools Survey, (2012).

Also, the findings from this study showed that pupils who bought their food outside the school premises and on school feeding program were more likely to be overweight/obese than those who brought food from home. However, the findings showed no relationship between buying food from school and overweight/obesity. The findings may, therefore, present some of the challenges pupils face when buying food from school and some are; less

fruits and vegetables are sold out to pupils or less protein foods but high fat foods are sold to pupils and this may end up affecting the BMI of pupils negatively.

Physical Activity Levels of the School Pupils

The pupils in this study were involved in physical activities one way or the other. This study, however, did not find any relationship between all the physical activities and overweight/obese at the chi-square level but at the logistic regression level some of the physical activities performed by these pupils, such as not being active during physical education class, sitting down and doing nothing during recess had a relationship with overweight/obese. The findings of this study showing a relationship between physical inactivity and overweight/obesity agree with the fact that one of the contributing factors for the increased rate or high prevalence of overweight and childhood obesity is physical inactivity (Micklesfield et. al., 2014). Additionally, a report from the Qatar National School Survey (2018) indicates that children who perform high intensity activity constantly, are more likely to be fit as compared to those who perform less physical activities.

The number of hours spent on watching TV in a week (4 days) shows a relationship with increased BMI of pupils in this study. There is a relationship between viewing of television and overweight/obesity were, pupils who watched television 5 days within a week were more likely to be overweight/obese as compared to those who never watched TV within the week and this fact has been established by some researchers as well (Borghese, 2014; De Coen, De Bourdeaudhuij, Verbestel, Maes & Vereecken, 2014). According to Borghese (2014), television viewing is associated with obesity, even though physical activity plays a role in this association. De Coen

and colleagues (2014) also, reported from their findings that more than one hour screen time on weekdays is known to be positively associated with the development of childhood overweight.

The findings of this study however did not show any relationship between walking to school and the BMI of pupils and this could be due to the fact that some of the pupils walk during the week and those who go to school by public transport may walk few distance to get to the school premises. Active transport such as pupils walking to school has been established to be a main source of physical activities for the youth (Lubans, Boreham, Kelly, & Foster, 2011) and this has an association with their overall physical activity levels.

Economic Status

The findings of this study showed that about 15.91% of the total participants were overweight/obese and were of low economic status while 15.36% were of high economic status. The results showed a relationship between low economic status and overweight/obese at the chi-square level. However, after all the other variables in the logistic regression model were controlled, the findings of the study revealed that there was no relationship between low and high economic status and being overweight/obesity. The results also showed that pupils who sent more money to school were more likely to be overweight/obese than those who sent less money to school, this is because pupils who sent more money to school had access to so many foods which may not be healthy.

The findings of this study go contrary to some studies conducted in Ghana where they indicated that the prevalence of overweight and obesity as

determined by BMI was higher among children from high economic status (Amidu et al., 2013). However it agrees with a study by Amoah-Yeboah (2017) that children who attend private schools are more likely to become obese than children in public schools. There may be several factors contributing for the high prevalence rate of overweight/obesity among pupils from low economic status families. It may be as a result of its relationship with less physical activity among these pupils. Additionally, low economic status may be related to childhood obesity due to less healthy eating habits (Sallis, Prochaska & Taylor, 2000). Another reason for high prevalence rate of overweight/obesity among children from low economic status in this study may be as a result of children being less likely to eat fruits and vegetables and are more likely to eat food high in fats because of how expensive fruits and vegetables are on the market (Rasmussen, Krølner, Klepp, Lytle, Brug, Bere, & Due, 2006).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents a general review of the study, methods of the study, and synopsis of the main findings, and provides conclusions as well as recommendations including areas for further research. This study assessed the prevalence of obesity among primary school pupils in the Tema Metropolis. The specific objectives were to: examine the behavioral factors associated with obesity among primary school pupils in the Tema Metropolis, analyse the demographic factors associated with childhood obesity among primary school pupils in the Tema Metropolis and explore the economic factors associated with childhood obesity among primary school pupils in the Tema Metropolis. Hypotheses were also tested to examine the association between some variables. The conceptual framework for the study was the socio ecological model by Bronfenbrenner (1977). It identifies the multiple and interactive effects of personal and environmental factors that determine the nature of people's transactions with their physical and socio-cultural surroundings.

The study was a cross-sectional study which was carried out among upper primary school pupils in selected private and public schools in the Tema Metropolis. A multistage sampling technique was used in this study. A total number of 363 primary school pupils were used for the study. A researcher generated questionnaire used as the data collection instrument and the instrument was developed from literature. The questionnaire was made up of five main sections which include: demographic, economic, behavioural (dietary patterns and physical activity) and anthropometric factors. SPSS was

used to analyse the data and both inferential and descriptive statistics was used to analyse the data.

Summary of Key Findings

The findings of the study point to the fact that overall combined prevalence of overweight/obesity among school pupils in the Tema Metropolis was 15.43%. The results from this study showed that the females were more likely to be overweight/obese compared to the males. Also, pupils who were aged between 10 and 14 were more likely to be overweight/obese compared to those who were 15 years and above. Further, pupils who attend private schools (16.77%) were more likely to be overweight/obese than pupils who attended public school (7.55%). Also, the results from the study showed that pupils who live with both parents were more likely to be overweight /obese compared to pupils who lived with their grandparents.

Additionally, pupils who consumed less fruits and vegetables but consumed more sweetened drinks or substituted fruits and vegetables with high fat and refined cereals were more likely to be overweight/obese. Furthermore, those who ate breakfast consistently were less likely to become overweight/obese. Also, the results from the study showed that more than half (51.24%) of the pupils watch television each day in a week which makes them more likely to be overweight/obese. Additionally, pupils who performed less physical activities were more likely to be overweight/obese as compared to those who engaged in more physical activities. The findings of this study also showed that 15.91% of the total participants who were overweight/obese were of low economic status while 15.36% were of high economic status.

There may be several factors contributing for the high prevalence rate of overweight/obesity among pupils from low economic status families. It may be as a result of these school pupils performing less physical activities. Additionally, low economic status may have a relationship with childhood obesity due to less healthy eating habits. Another reason for high prevalence rate of overweight/obesity among pupils from low economic status in this study may be as a result of children less likely to eat fruits and vegetables and are more likely to eat food are high in fat.

Conclusions

The following conclusions could be drawn from the study. The observation or conclusion is that, the prevalence of childhood overweight/obesity (15.43%) is high among primary school pupils in the Tema Metropolis. The result from the current study show that there is a statistically significant association between sex and obesity specifically it was found that females (16.29%) are more likely to become obese compared to the males (14.59%). Also, there are some variations with the likelihood of being normal and underweight. For instance, females are less likely to be underweight as compared to males (34.83% vs. 50.81%) whilst males are more likely to be normal in weight as compared to females (34.59% vs. 48.88%). The study revealed that more pupils consumed snacks and foods high in fat and these pupils are more likely to be overweight/obese.

It was also evident that more pupils skipped breakfast daily which made them more likely to be overweight/obese. Also, the occupation of the father (professional jobs, working in the office and not employed) had a relationship with overweight/obesity. Thus, pupils who had fathers as professionals and

not employed were more likely to be overweight/obese compared to pupils whose fathers were artisans. Being in the low economic stratum made pupils more likely to be overweight/obese in this study. Findings from this study revealed that, undernutrition co-exists among school pupils in the metropolis, which shows a little percentage of underweight among some of the pupils. With these results, it means that overweight/obesity is a prominent public health issue of concern in the Tema Metropolis, primarily among private school pupils.

Recommendations

Considering the findings of the study, the following recommendations are being made.

1. The Ghana Education Service should strengthen the Physical Education activities in the various primary schools since it has positive effect on building physical activity-related habits and make it compulsory to pupils in the basic schools especially among girls since they are more likely to be overweight/obese as compared to boys and must ensure that qualified and well trained PE teachers or tutors are recruited to help promote physical activity among pupils especially girls.
2. GES must develop policies to ensure cooks or venders at the school canteen sell foods less in fats, more fruits and vegetables and less sweetened drinks to the school pupils. Also, both parents as well as heads of schools and teachers will require the necessary education and support in order to create healthier surroundings for the school pupils.
3. Ghana Health Service (GHS) must educate parents, especially mothers, on overweight/obesity, since they are mostly in charge of the dietary

habits of their children and how it can negatively affect the health of their children later in life.

4. Parents should ensure their children take healthy breakfast at home before leaving for school, since eating breakfast decreases the risk of becoming overweight/obese.

Areas for Further Research

1. There should be a qualitative study to gain deeper understanding to the economic factors that influence childhood overweight/obesity in Ghana.
2. There should be a qualitative study to assess the views of pupils and school heads on childhood obesity in order to provide insights on prevailing views and how they impact diet and physical activity-related behaviors and this will in turn help inform the implementation of policy strategies directed at the schools.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

Section A: Background Information

Section B: Economic Background

Section C: Eating Habits (School aged child to answer)

Section C.1: Foods Consumed in the Past One Week (7 DAYS)

Section D: Physical Activity

Section E: Anthropometric Measures

UNIVERSITY OF CAPE COAST
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF POPULATION AND HEALTH
A STUDY TO INVESTIGATE CHILDHOOD OBESITY AMONG
PRIMARY SCHOOL PUPILS IN THE TEMA METROPOLIS

A. BACKGROUND INFORMATION **CODE**

1. Date of interview (dd/mm/yy): DATE __ __/__ __/__ __
- Child ID CHILDID
3. Name of school School ID SCHID
4. Type of school: 1= Public 2= Private
5. Sex of respondent 1=Male 2=Female SEXRES
6. Age of respondent (completed years) AGERES
7. Date of birth of respondent (dd/mm/yy) DATBTH __ __/__ __/__
-
8. Which class are you in? 1= Class 4 2= Class 5 3= Class 6
9. Who do you live with? RELCH
- 1=Mother 2= Father 3= Both Parents 4= Grandparents 5= other relation
(Aunty, Uncle and Sibling) 6= others

B. ECONOMIC BACKGROUND

1. Mother/Guardian's occupation OCUMTH
- 1=Artisan (Carpenter, hairdresser, seamstress etc.) 2=Professionals
(Teacher, lawyer, accountant) 3=Office worker (Secretary) 4=Trading
5=Not employed
2. Father/Guardian's occupation OCUMTH

1=Artisan (Carpenter, hairdresser, seamstress etc.) 2=Professionals
(Teacher, lawyer, accountant) 3=Office worker (Secretary) 4=Trading
5=Not employed

3. What is your residence? RES

1= Peri-Urban 2= Urban

4. How do you usually get to school? TRANSP

1= parent's car 2= friend's parent car 3= public transport 4= walk 5=
other

5. Do you take money to school every day? Yes 2= No

6. If yes, how much do you take to school every day? Ghc

1= Ghc1.00-5.00 2= Ghc5.00-10.00 3= Ghc 10.00-15.0 4= Ghc 15.00-
20.00

7. Does your household have any of the following items?

7.1 Electricity 1= Yes 2= No

7.2 A wall clock 1= Yes 2= No

7.3 A radio 1= Yes 2= No

7.4 A black/white television 1= Yes 2= No

7.5 A color television 1= Yes 2= No

7.6 A mobile telephone 1= Yes 2= No

7.7 A landline telephone 1= Yes 2= No

- | | |
|---|-----------------|
| 7.8 A refrigerator
<input type="checkbox"/> | 1= Yes 2= No |
| 7.9 A freezer
<input type="checkbox"/> | 1= Yes 2= No |
| 7.10 Electric generator/ inverter(s)
<input type="checkbox"/> | 1= Yes 2= No |
| 7.11 Washing machine
<input type="checkbox"/> | 1= Yes 2= No |
| 7.12 Computer/tablet computer
<input type="checkbox"/> | 1= Yes 2= No |
| 7.13 Photo camera (NOT ON PHONE)
<input type="checkbox"/> | 1= Yes 2= No |
| 7.14 Video deck/DVD/VCD
<input type="checkbox"/> | 1= Yes 2= No |
| 7.15 Sewing machine
<input type="checkbox"/> | 1= Yes 2= No |
| 7.16 Bed
<input type="checkbox"/> | 1= Yes 2= No |
| 7.17 Table
<input type="checkbox"/> | 1= Yes 2= No |
| 7.18 Cabinet/cupboard
<input type="checkbox"/> | 1= Yes 2= No |
| 7.19 Access to the internet in any device
<input type="checkbox"/> | 1= Yes 2= No |

C. EATING HABITS (School aged child to answer)

1. How many times do you usually eat per day?

TIMEAT

1=Once 2=Twice 3=Thrice 4=Four-five times 5=Greater than five times

6=other (specify)

2. Where do you usually get your food whenever you are in school?

USUFD

1=Vendors/sellers at school 2=Vendors/sellers outside school 3= school feeding program 4- home 5=other (specify)

3. What is your favorite meal time?

FVMT

1=Breakfast 2=Lunch 3=Supper 4=Snacks 5=other (specify)

4. Which of the following meals do you usually skip?

WCSKP

1=Breakfast 2=Lunch 3=Supper 4= Snacks 5= none 6= other (specify)

.....

5. Why do you skip the above meal?

WYSKP

1=Not hungry 2=Lack of time 3=Don't like foods served (taste) 4= Food is inadequate 5=other (specify)

C.1 FOODS CONSUMED IN THE PAST ONE WEEK (7 DAYS)

6. During the past week (7days), how many days did you drink sweetened drinks such as ;Tampico, Kalyppo, Healthylife, , Caprisun etc; Fruit juices (Ceres, Pure Heaven etc);Minerals (Fanta, Coke, Sprite, Malt);Local drinks (asana, sobolo/bissap etc) ?

DRINKMIN

0= I never drink soft drinks/minerals 1= 1day per week 2= 2 days per week 3=3 days per week 4=4 days per week 5=5 days per week 6=6 days per week 8. Each day

7. If you drank soft drinks/minerals, how many bottles/packs did you take on the average? NUMDRINK

0=1/2 bottle 1=1 bottle 2=2 bottles 3=3 bottles 4=4 bottles 5=5 bottles 6=6bottles 7=7 or more bottles 8= N/A

8. How many days per week do you generally eat food high in fat, such as; pastries, fried potatoes/chips/yam with chicken/meat/sausages,

chocolate/ice-cream, Indomie etc.? DAYSBFST

0= I never eat foods high in fat 1= 1day per week 2= 2 days per week 3= 3 days per week 4= 4 days per week 5= 5days per week 6= 6 days per week 7= Each day

9. On average how many days per week do your parents pack/buy such foods for you on school days? days.

10. How many days per week do you generally eat fruits and vegetables such as; Citrus/ Pineapple/ Mango/Watermelon/ Banana/Pawpaw/ Apple, Green Leafy (kontonmire) Carrots/ Cabbage/ Lettuce?

DAYSBFFV

0= I never eat fruits and vegetables 1= 1day per week 2= 2 days per week 3= 3 days per week 4= 4 days per week 5= 5days per week 6= 6 days per week 7= Each day

D. PHYSICAL ACTIVITY

1. How many days during the past week did you walk to/ from school?

WALKSC

0= Never 1=1-2 days 2=3-4 days 3=5-7days

2. How many days during the week are you transported to school?

TRASC

0= Never 1=1-2 days 2=3-4 days 3=5-7days

3. Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Tick only one box per row.)

Activity	Frequency (no. of days within the past 7 days)			
	Never	1-2 days	3-4 days	5-7 days
3.1= Skipping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2= Walking for exercise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3= Bicycling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4= Jogging /Running	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5= Swimming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6= Football	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.7= Basketball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8= Ampe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9= Dance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10= Volley ball	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.11= Other: (Specify)				

4. In the last 7 days, during your physical education/ PE classes, how often were you very active (playing hard, running, jumping, throwing)?

0=I don't do PE 1= Hardly ever 2= sometimes 3=Quite often 4= Always

5. What do you do most of the time at recess/ 1st or 3rd break time?

0= Sit down (talking, reading, doing school work) 1=Stand around or walk around 2= Ran or play a little bit 3= Ran around and play quite a bit 4= Ran and play hard most of the time

6. What do you normally do at lunch time (besides eating lunch)?

0= Sit down (talking, reading, doing school work) 1=Stand around or walked around 2= Ran or play a little bit 3= Ran around and play quite a bit 4= Ran and play hard most of the time

7. How many days right after school, do you play/ do sports, dance or play games in which you are very active?

0= none 1= One time last week 2= Two or Three times last week 3= Four times last week 4= Five times last week

8. How many days per week do you watch TV? TVAFS

0= I never watch TV 1= 1day per week 2= 2 days per week 3= 3 days per week 4= 4 days per week 5= 5days per week 6= 6 days per week 7= Each day

9. Which of the following describes you best for the last 7 days? Read all 5 statements before deciding on one!

- 1= All or most of my free time was spent doing things that involve little physical effort
- 2= I sometimes (1-2 times last week) did physical things in my free time (eg. played sports, run, swim, bike riding, did aerobics)
- 3= I often (3-4 times last week) did physical things in my free time
- 4= I quite often (5-6 times last week) did physical things in my free time
- 5= I very often (7 or more times last week) did physical things in my free time.

10. Mark how often you did physical activity (like playing sports, games, doing dance or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

11. Were you sick last week, or did anything prevent you from doing your normal Physical activities? 1. Yes 2. No

If yes, what prevented you?

.....
.....

E. ANTHROPOMETRIC MEASURES

1. **Weight** _____ **kg**
2. **Height** _____ **cm**
3. **BMI**
kg/m²

APPENDIX B INFORMED CONSENT FORM

Title: Childhood obesity among primary school pupils in the Tema Metropolis.

Principal Investigator: Yvette Dede-Terbi Akornor

Address: Department of Population and Health, University of Cape Coast,
Cape Coast, Ghana.

General Information about Research

The purpose of this study is to investigate childhood obesity among basic school pupils within Tema metropolis. I hope that the findings of this study would be essential and useful for stakeholders (heads of schools, health workers and policy makers) in reshaping strategies and interventions that will be beneficial for controlling and preventing childhood obesity in schools and inform heads of schools as well as parents on their responsibilities in the prevention and management of obesity among school-aged pupils.

Procedures

For this purpose I invite you to be one among other primary school pupils for a self-administered questionnaire. I am trying to learn more about the factors that contribute to unhealthy weights among upper primary school pupils (class 4, 5 and 6). Unhealthful weights among children is a problem in most part of the world and I want to find ways to prevent this because it can lead to some health problems in the future, especially in adulthood. Some of the questions that will be asked may concern you and your household, your eating habits, your physical activity and your height as well as your weight will be measured. The body measurement and answering of questions will take place in your school. The survey will take about one and half hour (3040 minutes). The survey will take place in the various classrooms at the selected schools

and no one else but myself will be present during the survey. The information provided will be kept on a computer that is password protected until all publications resulting from the data is a minimum of a year old. Your identifying information will be secured and separated from your research data. I will keep all soft copy information on a computer that is password protected and hard copies will be kept in a locker with only me having access to it. No one will be able to see it except myself. You will not be named in any reports. The records maybe reviewed to make sure the research is being done correctly.

Possible Risks and Discomforts

There is no health risk to you from your participation in this interview. We shall safeguard the confidentiality of information, but cannot guarantee any breach that could happen. However, the questionnaires and files contain no personal identification information and, therefore, your participation and information will remain confidential.

Possible Benefits

There would not be any direct benefit to the participants however, this information you provide us today will be useful for understanding the associated factors with childhood obesity in the Tema Metropolis.

Alternatives to Participation

You do not have to participate in the study if you don't want to.

Confidentiality

The information that you share with me will be kept confidential; it will be used strictly for research only. The report will use the collective responses and will not reveal names or any identifiers that may be linked back to the person

who gave the information. Nor will anyone who is not directly involved in this research be allowed to access the information that we obtain from you. Your response recorded on the questionnaire that does not have your name or any information that could be used to trace your identity. This consent form will be kept separate from the questionnaire and will be destroyed in one year. The questionnaire will be kept under lock and key and will not be accessed except by myself. I will have the key to the locked cabinet. The completed questionnaires will be destroyed one year after the study is completed. These will be destroyed using the paper shredder. Both the questionnaires and soft copy will have no personal identification information. We would like to reassure you that the information you provide will not be provided to anyone except the researcher (Yvette Dede-Terbi Akornor).

Additional Cost

It will not cost you anything to be in the study, except for your time.

Compensation

There is no compensation package either in cash or kind available for participation. However, principal investigator will express her heartfelt gratitude to respondents by thanking them and writing officially to the schools to thank them for the assistance they have provided.

Contacts for Additional Information

In case you have further questions regarding this study, please contact:

Yvette Dede-Terbi Akornor (Ms.): +233 (0)240860754

Professor Akwasi Kumi-Kyereme: +233 (0)244255234.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phones lines 0558093143/0508878309/0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title: Childhood obesity among primary school pupils in the Tema 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 volunteer.

Date

Name and signature or mark of volunteer

APPENDIX C

ASSENT FORM

Title: Childhood obesity among primary school pupils in the Tema Metropolis.

Principal Investigator: Yvette Dede-Terbi Akornor

Address: Department of Population and Health, University of Cape Coast, Cape Coast, Ghana.

General Information about Research

The purpose of this study is to investigate childhood obesity among basic school pupils within Tema metropolis. I hope that the findings of this study would be essential and useful for stakeholders (heads of schools, health workers and policy makers) in reshaping strategies and interventions that will be beneficial for controlling and preventing childhood obesity in schools and inform heads of schools as well as parents on their responsibilities in the prevention and management of obesity among school-aged pupils.

Procedures

For this purpose I invite you to be one among other primary school pupils for a self-administered questionnaire. I am trying to learn more about the factors that contribute to unhealthy weights among upper primary school pupils (class 4, 5 and 6). Unhealthful weights among children is a problem in most part of the world and I want to find ways to prevent this because it can lead to some health problems in the future, especially in adulthood. Some of the questions that will be asked may concern you and your household, your eating habits, your physical activity and your height as well as your weight will be measured. The body measurement and answering of questions will take place in your school. The survey will take about one and half hour (3040 minutes). The survey will take place in the various classrooms at the selected schools and no one else but myself will be present during the survey. The information provided will be kept on a computer that is password protected until all publications resulting from the data is a minimum of a year old. Your identifying information will be secured and separated from your research data. I will keep all soft copy information on a computer that is password protected and hard copies will be kept in a locker with only me having access to it. No

one will be able to see it except myself. You will not be named in any reports. The records maybe reviewed to make sure the research is being done correctly.

Possible Risks and Discomforts

There is no health risk to you from your participation in this interview. We shall safeguard the confidentiality of information, but cannot guarantee any breach that could happen. However, the questionnaires and files contain no personal identification information and, therefore, your participation and information will remain confidential.

Possible Benefits

There would not be any direct benefit to the participants however, this information you provide us today will be useful for understanding the associated factors with childhood obesity in the Tema Metropolis.

Alternatives to Participation

You do not have to participate in the study if you don't want to.

Confidentiality

The information that you share with me will be kept confidential; it will be used strictly for research only. The report will use the collective responses and will not reveal names or any identifiers that may be linked back to the person who gave the information. Nor will anyone who is not directly involved in this research be allowed to access the information that we obtain from you. Your response recorded on the questionnaire that does not have your name or any information that could be used to trace your identity. This consent form will be kept separate from the questionnaire and will be destroyed in one year. The questionnaire will be kept under lock and key and will not be accessed except by myself. I will have the key to the locked cabinet. The completed questionnaires will be destroyed one year after the study is completed. These will be destroyed using the paper shredder. Both the questionnaires and soft copy will have no personal identification information. We would like to reassure you that the information you provide will not be provided to anyone except the researcher (Yvette Dede-Terbi Akornor).

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There is no compensation package either in cash or kind available for participation. However, principal investigator will express her heartfelt gratitude to respondents by thanking them and writing officially to the schools to thank them for the assistance they have provided.

Contacts for Additional Information

In case you have further questions regarding this study, please contact:

Yvette Dede-Terbi Akornor (Ms.): +233 (0)240860754

Professor Akwasi Kumi-Kyereme: +233 (0)244255234.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phones lines 0558093143/0508878309/0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title: Childhood obesity among primary school pupils in the Tema 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 volunteer.

Sign this form only if you:

- have understood what you will be doing for this study,
- have had all your questions answered,
- have talked to your parent(s)/legal guardian about this project, and
- agree to take part in this research

Your Signature

Printed Name

Date

Name of Parent(s) or Legal Guardian(s)

Researcher explaining study

Signature

Printed Name

Date

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309 / 0244207814

C/O Directorate of Research, Innovation and Consultancy

E-MAIL: irb@ucc.edu.gh

OUR REF: UCC/IRB/A/2016/329

YOUR REF:

OMB NO: 0990-0279

IORG #: IORG0009096

28TH MARCH, 2019



Ms. Yvette Dede-Terbi Akornor
Department of Population and Health
University of Cape Coast

Dear Ms. Akornor,

ETHICAL CLEARANCE – ID: (UCCIRB/CHLS/2019/06)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research protocol titled **Childhood obesity among Primary School pupils in the Tema Metropolis**. This approval requires that you submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

Please note that any modification of the project must be submitted to the UCCIRB for review and approval before its implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'S. Asiedu Owusu'.

Samuel Asiedu Owusu, PhD

UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST
Date: 28.3.19