

**ENSIGN COLLEGE OF PUBLIC HEALTH, KPONG,
EASTERN REGION, GHANA**

**AN ANALYSIS OF THE DISTRIBUTION OF HEALTHCARE
FACILITIES AND HEALTH PERSONNEL IN THE EASTERN
REGION OF GHANA**

Acheampong Gideon Kwarteng

**A thesis submitted to the department of community health in the faculty of
public health in partial fulfillment of the requirements for the degree**

MASTER OF PUBLIC HEALTH

MAY 2016

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DECLARATION

I hereby declare that except for reference to the work of others, which I have dully cited, this project submitted to the School of Graduate Studies, Kwame Nkrumah University of Science and Technology, Kumasi is the results of my own investigation, and has not been presented for any other degree elsewhere.

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Date

DR. CHRISTOPHER N. TETTEH

Dean

Signature

Date

DEDICATION

I dedicate this work to God Almighty for his immeasurable grace and favor throughout my studies.

This work is also dedicated to my entire family, friends and loved ones for their prayers and unflinching support.

ACKNOWLEDGEMENT

My profound gratitude goes to the Almighty God for his love, protection and steadfast peace throughout my endeavors as a student.

I am most grateful to my supervisor, Dr. Stephen Manortey for his guidance throughout the entire period of the project. I am also thankful to the leadership of the Ghana Health Service division of the Eastern Region as well as that of the Ensign College of Public Health

I would also like to acknowledge the class of 2016 of the Ensign College -Master of Public Health for their assistance during my field work.

Finally my sincere gratitude goes to my mother, Mrs. Joyce Acheampong, my supportive dad, Mr. El-dad Acheampong and all my siblings.

ABBREVIATION/ACRONYMS

IOM-	Institute of Medicine
CHAG-	Christian Health Association Ghana
GHS -	Ghana Health Service
GSS -	Ghana Statistical Service
MOH-	Ministry of Health
NGOs -	Non-Governmental Organizations
WHO -	World Health Organization
GIS -	Geographic Information Systems
ERHD -	Eastern Regional Health Directorate
CHPS-	Community Health Planning Services
GPS-	Global Positioning System
NPC-	National Population Council
HSS-	Health Systems Strengthening
HHS-	Health and Human Services
NAM-	National Academy of Medicine

ABSTRACT

Rapid population growth, lack of availability of resources, rising poverty levels and political interference have for a long time taken a toll on equitable provision of health services in the Eastern Region of Ghana. A major factor for health services provision in various communities is the concern for equity in the distribution of these facilities. The increase in the number of districts in the Eastern region in recent time has not been followed with a corresponding increase in the number of health facilities and health personnel, this has led to uneven distribution of health facilities and personnel in the region .The purpose of this study is to investigate the distribution of health facilities and health personnel in the Eastern region of Ghana. Data on the geographical location of each health facility as well as the total number of health workers were factored with the population in the administrative districts of the Eastern region as part of analysis to investigate the distribution of health facility/health personnel per population of each district and the region at large. The study established that health facilities and health personnel were unevenly distributed, some districts especially the recently added Kwahu Afram Plains South, Ayensuano, Upper West Akim along with existing ones such as Birim South, Kwahu West, Akyem Mansa, and Kwahu East all lacked in terms of health facilities and health personnel. The study recommended that areas that have been identified as disadvantaged districts should be considered for various intervention strategies.

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CHAPTER I

INTRODUCTION

1.1 Background Information

The Institute of Medicine (IOM), a division of the American National Academies of Sciences, Engineering and Medicine (NAM) defined primary health care as the provision of integrated and accessible health care services by clinicians responsible for addressing health care needs as well as developing a partnership with patients and practicing within the context of the family and community (IOM, 1978). The ultimate goal of a primary health care is better health for all, which includes accessibility, equity and affordability of healthcare as adopted in the declaration of the international conference on primary health care in Alma Ata, Russia in 1978 (Gauld *et al.*, 2012) and after became a principle of the World Health Organization's goal of Health for the WHO.

In a more recent time, there has been an increased concern for the healthcare of the poor and for reducing variations in both the health status and access to health care (Cissé *et al.*, 2007). A 2008 WHO report argued that substantial progress in health has been largely differential worldwide with convergence towards improved health in large parts of the world. A considerable number of countries are increasingly lagging behind coupled with growing health inequalities within countries (Gauld *et al.*, 2012). Health care accessibility includes the ability of a population in a defined area to bridge the gap between home and the location of a health delivery facility. Accessibility is determined partly by geographic barriers, including distance, duration of travel and transportation costs (McLafferty, 2003) as well as social,

behavioral, and economic factors (Buor, 2004). One of the dimensions shaping health services use in rural areas is geographic accessibility (Noor *et al.*, 2009).

Access to health care is an important predictor of the overall success of a healthcare delivery system and has a direct impact on disease burden especially in the developing world. This has been also shown to positively influence health systems in various populations (Macinko, 2005). Measuring accessibility to health care thus contributes to a wider understanding of health system performance (Abdelhafiz and Abdel-samea, 2013; Kibon and Ahmed, 2013). Unfortunately health care services is not equally accessible to all people and continues to be a major barrier to achieving the goal of health care for all and sundry (Perry and Gesler, 2000). The maintenance of good health as well as access to healthcare has been challenging to mankind. This challenge has led to attempts by various governmental and non- governmental outfits to set up health facilities in various parts of the world. Public health care is therefore regarded as the basic form of healthcare as it provides the least expensive source of medical care to the greater population of people residing in any defined region (Asangansi, 2013).

Geographic information systems (GIS) and global positioning system (GPS) technologies have greatly rejuvenated studies of distribution, accessibility and utilization of health facilities, especially in the developing world. Studies have developed methods for comparing the distribution of health service provision with respect to the Latin American populations being served. These studies used GIS to analyze physical distribution and accessibility to health care. There are three main dimensions of accessibility to primary healthcare, namely the supply of healthcare providers, demand for health care service and the distance-time impedance between the locations of the population and the health care providers (McLafferty, 2003).

The supply of health service providers and demand for health care services are variables used to define the provider-to-population ratio which serves as an essential indicator to gauge the healthcare delivery system. Travelling distance and time between the locations of the population and health care providers is one of the most important impedance to healthcare delivery. (McLafferty, 2003).The impact of distance to the health facilities on utilization of health care services has been broadly studied by Hadley and Cunningham (Hadley and Cunningham, 2003).

Financial constraints in Ghana contribute very significantly to the observed disparity in the distribution and accessibility of health care services over the years. Government's effort to increase resource allocations to the health sector have not accordingly been translated into improved service delivery and quality in Ghana (MOH, 2011). The health sector in recent time has exhibited variations in distribution of health facilities between rural and urban areas as well as among the geographic regions in Ghana. There is better distribution of health facilities in the urban regions than in the periphery and the slums (Buor, 2004). The reason being private motive influencing the establishment of private facilities and therefore areas with advantages of higher economic scale and effective demands are likely to be zones of attraction, hence Ashanti and Greater Accra regions had differential share of private health facilities. The Northern and Upper East regions however are mostly served by mission clinics and hospitals (MOH, 2014) .These differences are to a great extent attributable to the fact that, since the country's independence in March, 1957 its fertile and much populated southern section had been provided with better road infrastructure, health and educational facilities, compared to the dry and barren northern section (Anderson and Pomfret, 2002). The distribution of health facilities

in the country does not just reflect rural-urban disparities but also exhibits inter-regional disparities.

1.2 Statement of the problem

The inequitable distribution of health facilities and personnel in the country has resulted in a situation where more than three-quarters of urban households have good access to health facilities compared to a low 42% of rural households. A further 78% of the urban poor live within 30 minutes of a health facility compared to 27% of rural households (MOH, 2011). This is worrying because the time required to reach a health facility could be critical in the survival of a sick person, especially in emergency situations. Variations in the distribution of health facilities have also resulted in differences in health outcomes between the administrative regions of the country (Ofosu, 2012). For instance, the Northern Region recorded one of the highest neonatal mortality of 37 per 1000 live births compared to 20 per 1000 live births for that of Greater Accra (MOH, 2014). Doctor–population ratio was one of the highest in the Northern Region (1:31,231) compared to Greater Accra’s (1:3,028) (MOH, 2014)

The benefits of the addition of more administrative districts in a particular region cannot be overemphasized, however increasing the number of districts without adding more health facilities in this context is not a positive development and generates a certain level of social imbalance. In recent time, the Eastern region has been subject to frequent increases in the number of administrative districts over time (Ministry of Local Government and Rural Development, 2010) A report of the committee on district boundaries sighted issues such as divergence between traditional and administrative boundaries, lack of updated and authentic maps, lack

of collaboration between implementing agencies, growth and disappearance of settlements, interventions from politicians and opinion leaders as reasons behind continuous district disputes and subsequently further creation of district boundaries.(Ministry of Local Government and Rural Development, 2010). The initial 17 districts were increased to 21 in 2007 and from 21 to 26 in 2012. (Ghana District Repository, 2016).

However there has not been a corresponding increase in the number of health facilities and health personnel within districts in the region. A 2011 annual health report of the Eastern region indicated that, community based health planning services (CHPS) had been in a terrible state. A number of districts such as the then Kwahu North (now Kwahu Afram Plains North and South) and Akwapim South (Now Nsawam Adoagyiri, Ayensuano and Suhum Kraboa), New Juabeng, Upper Manya, Birim South and Asuogyaman recorded huge deficits in the number of CHPS compounds which in turn had a huge effect on access to health care facilities by residents in rural settings.

Residents who found themselves in these geographical areas had to travel over 8km to access health care, (ERHD, 2011) a phenomenon in clear violation of the WHO recommended standards (5km away from a residential area) for the proximity of health facility to residents (Gauld *et al.*, 2012). The interventions of the Ghana Health Sector aimed at reducing inequalities in distribution of health facilities between rural and urban areas has not brought about substantial improvements in this situation (ERHD, 2011) thus the purpose of this research to study the distribution of health facilities and health personnel in relation to the population of the region.

1.3 Rationale of the Study

Equity in the distribution of basic health needs has been considered a pressing issue in recent time. According to the WHO (1993), one of the main problems with healthcare in developing countries is not just the lack of quality health service delivery but the uneven distribution of facilities and healthcare workforce. In Ghana, most rural and deprived communities lag behind in the distribution of health facilities compared to urban areas. A study into the distribution will help inform policy decision on future citing of health facilities to help bridge the aforementioned accessibility gap.

Specifically, the Ministry of Health, which is directly responsible for provision of public health services delivery and Ghana Health Service which is in charge of implementation and service delivery, stand to benefit from the outcome of this research. Thus, the Ministry and its implementation agencies would be informed about the findings of this study especially with regards to the distribution of health facilities and health personnel and the need to put in place interventions to address the issues arising. Private health providers would benefit from the study in terms of having knowledge about communities where access to health facilities is low and the need to provide some interventions.

1.4 Research Questions

The issues discussed in the problem statement identified challenges associated with variations in the distribution of health facilities and corresponding health personnel in the Eastern region. This study seeks to investigate the following;

- The geographical distribution of health facilities in the region in relation to the population in the various districts and the region as a whole.
- The distribution of health personnel in the Eastern region with respect to the population.
- The accessibility constraints as a result of the distribution of these health facilities and health personnel

1.5 General Objectives

The main objective of this study is to investigate the distribution of health facilities and health personnel in the Eastern region of Ghana.

1.6 Specific Objectives

The specific objectives of the study are;

- To examine the distribution of health facilities versus the human population across districts/municipalities of the region.
- To examine the distribution of healthcare workforce among population
- To determine the relationship between the number of health facilities and the population as well as the relationship between number of healthcare workforce and population

1.7 Profile of the Study area -The Eastern Region of Ghana

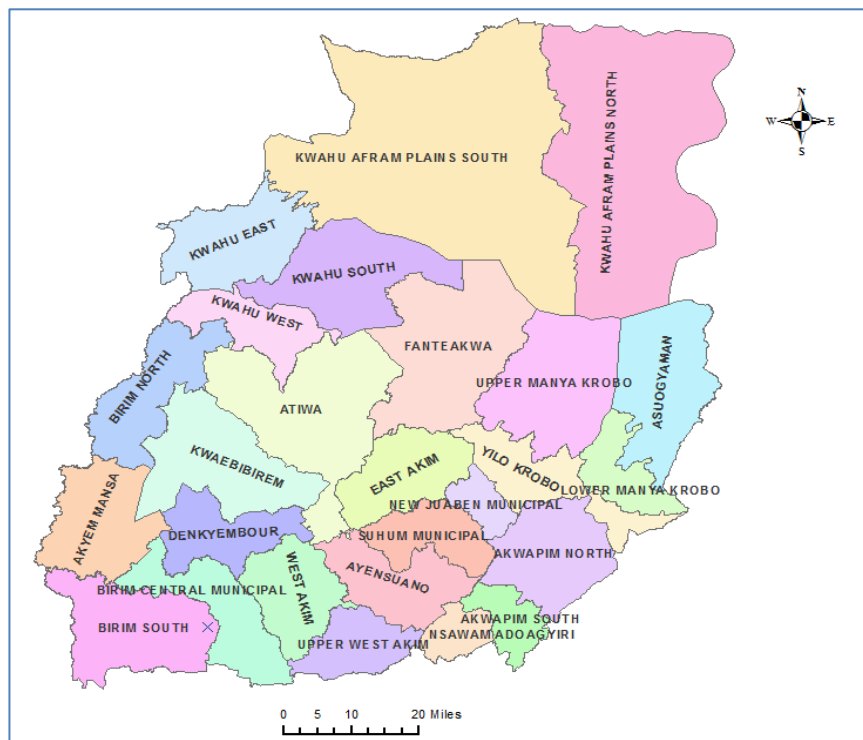


Figure 1.0: Map of the Eastern region showing the administrative districts.

The Eastern Region of Ghana shares boundaries with the Greater Accra, Central, Ashanti, Brong Ahafo and Volta Regions of the country. The region covers a total land area of 19,323 sq. km, which puts it in the top six large regions of the country in terms of land size. It has a population density of 136.3 people per sq. km.

1.7.1 Notable Physical features

Among a host of tourist attraction sites in the region are; the Aburi Botanical Gardens which offers rich tropical flora, the Lake Volta which is one of the largest man-made lakes in the world, the Boti falls, a water fall in the forest reserve at Huhunya. (Ghana District Repository, 2016)

1.7.2 Demography and Population density

The population of this region increased from 1,635,421 in 2000 to 2,633,154 in 2010. With a growth rate of 2.1%, the population is expected to increase approximately to 4.5 million by 2040. Forty-nine percent of the population are males. The age structure of the region shows that, the proportion of the population aged 0 – 14 years represents 38.4%, and those aged 15 – 64 years and 65 years and above are 55.9% and 5.7% respectively. The region has 43.4% of the communities being urban with an annual urban growth rate of 3.7%. It experiences more outflows of people to other parts of the country in comparison with people migrating into the region, this thus gave the region a negative net migration value of -332,086 in 2010. With respect to the economy, the labour force participation rate for population aged 15 - 64 is almost 74.2% (The Health Sector in Ghana: Facts and Figures, 2009).

1.7.3 Administrative districts/municipals and their capitals

In 2012, 5 new districts were created in the Eastern region to add up to the already existing 21 to make a total of 26 districts. The 5 newly created districts were born out of some of the old existing districts, the breakdown is as follows;

- Kwaebibirem was formed from Denkyembour
- Kwahu North is now split into Kwahu Afram Plains North and South
- Suhum-Krabo-Coaltar gave rise to the Ayensuano district
- Akwapim South gave rise to the Nsawam Adoagyiri district
- West Akim –gave rise to Upper West Akim
- (Ghana District Repository, 2016)

The following table is a list of the current 26 administrative districts/municipalities of the Eastern Region

Table 1.0: List of districts in the Eastern region and their capitals (Ghana District Repository)

No.	District/Municipal Name	Capital
1	Akwapim North	Akropong
2	Akwapim South	Aburi
3	Akyem Mansa	Ofoase
4	Asuogyaman	Atimpoku
5	Atiwa	Kwaben
6	Ayensuano	Coaltar
7	Birim Central Municipal	Akim Oda
8	Birim North	New Abirem
9	Birim South	Akim Swedru
10	Denkyembour	Akwatia
11	East Akim Municipal	Kibi
12	Fanteakwa	Begoro
13	Kwaebibirem	Kade
14	Kwahu Afram Plains North	Donkorkrom
15	Kwahu Afram Plains South	Tease
16	Kwahu East	Abetifi
17	Kwahu South	Mpraeso
18	Kwahu West Municipal	Nkawkaw
19	Lower Manya Krobo	Krobo Odumase
20	New Juabeng Municipal	Koforidua
21	Nsawam Adoagyiri Municipal	Nsawam
22	Suhum Kraboa	Suhum
23	Upper Manya Krobo	Asesewa
24	Upper West Akim	Adeiso
25	West Akim Municipal	Asamankese
26	Yilo Krobo Municipal	Somanya

1.8 Scope of report

This study was limited to the entire Eastern Region, with the 26 administrative districts all-inclusive in the study. Specific emphasis is placed on how health facilities as well as health personnel of all types are spread within the region and subsequently within the administrative districts of the region. Again emphasis is placed on the relationship between the population and the number of health facilities as well as health personnel. The issues of accessibility with respect to health facility to population ratio as well as health personnel to population ratio are all explored in a hotspot analysis of the various districts/municipalities.

1.9 Organization of report

This study is organized into six main chapters. The first chapter consists of the introduction, problem statement, rationale of the study, research questions, goals of the study, and organization of the study.

Chapter Two profiles work done on the subject matter by various scholars. It comprises a summary of the various findings of authors who carried out similar studies.

Chapter Three discusses the methodology used for the study. Items such as the research design, data collection methods, data management and analysis, and data presentation and reporting are discussed.

Chapter Four comprises the results obtained from the study and it provides a comprehensive understanding of data collected from the field.

Chapter Five comprises of the discussion.

Chapter Six contains the summary of findings, recommendations as well as conclusions.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

The subsequent review looks at the concept of GIS and public health (access to health facilities) as well as various reports and studies conducted in different countries and subsequently in Ghana. The focus of the review was on the distribution of health facilities versus human population, distribution of healthcare workforce among population and the relationship between number of healthcare workforce and populations in the Eastern Region of Ghana.

2.2 Geographic Information System (GIS)

Geographic Information System is a computerized system that records, stores, as well as analyzing information about the various features that make up the surface of the earth (Goodchild, 2008). GIS software can generate two to three-dimensional images of an area, showing topographical features such as rivers, mountains, hills and with artificial features such as roads, buildings and electric power lines. Scientists use GIS imaging as models and for gathering data (Goodchild, 2008, 2009, 2011).

This software accepts geographic data from a various sources, including satellite images, maps and printed text. The GIS software converts all geographical data into digital code, which it arranges in its database system (Goodchild, 2011). Operators program the GIS software to process information and produce the images or information they require (Goodchild, 2011). By using GIS, engineers can design

road systems, scientists can research into changes in the environment; electrical firms can manage their sophisticated network of power lines; governments can trace the uses of land; various fire and police departments can as well plan emergency routes. A number of private institutions have begun to use GIS to plan and improve service delivery(Goodchild, 2008, 2009, 2011)

2.3 GIS and Public Health

Health is an indispensable commodity for all and is an essential component of an individual's social needs. Equal access to primary health care services for low socioeconomic cohorts is an aim for various governments to meet as a social justice policy agenda. In response to this policy agenda, various governments' investments prioritize monitoring and evaluation of health care services. It is also essential to plan for more health facilities and transport for areas which need more attention when it comes to healthcare. To improve the access to public services either on the basis of the distribution of these services or on the availability of a number of transport services, studies pertaining to examining existing accessibility problems to healthcare facilities and transport provision must be conducted (Higgs, 2004).

The distribution of people and their differential needs for health services is an interest in the field of service planning, and provides a classic issue suited for Geographical Information Systems (GIS) to analyze (Goodchild, 2011). Access is an imperative aspect of healthcare service planning and delivery. GIS-based accessibility analysis is a method that can be applied to evaluate the degree to which access is obtained. Applications of GIS-based analysis have been useful in measuring the extent of accessibility of an existing or potential health service and

has provided a good basis for the planning of healthcare services as asserted by (Mokgalaka, 2014)

Analyzing the relationship between location and nearest health facility can help in controlling and minimizing diseases. It can be also used for better planning with more effective health facility utilization. A number of studies have shown that a regular decline in accessibility to health facilities corresponds to increasing distance on road transporting journeys to hospitals (Higgs, 2004). Other studies show variation distance which people travel to use health facilities. It is an accepted concept that the greater the distance between two points, the lower the chances of these points being functionally related(Higgs, 2004)

2.4 Health Delivery, Distribution and Access to Health facilities

According to the WHO (2008), health service delivery inequities can be ascribed to variables such as differences in availability, access, quality and burden of payment of health services (Gauld *et al.*, 2012). Rural areas are especially affected by facility and personnel shortages, with staff reluctant to work there as a result of poor infrastructure, lack of educational opportunities for their children and low standard of living (Gauld *et al.*, 2012).

Urban areas have higher numbers of facilities and personnel than rural areas predictably due to higher economic activities. In Cambodia the use of health facilities is three times higher in urban areas. This disparity subsequently led to lower infant and child mortality rates in the urban areas in comparison to rural areas (Annear *et al.*, 2008).To address the problem, the WHO recommends that political commitment and economic growth can positively impact investment in health sector

and by so doing establishing more health facilities in rural areas (Gauld *et al.*, 2012). For example; between 1900 and 2000, Thailand significantly reduced its level of child mortality and halved inequalities in child mortality between the different economic classes (Brueckner and Tetiwat, 2008). Among other measures adapted include improved insurance coverage and more equitable distribution of health care infrastructure and wider intervention coverage (Brueckner and Tetiwat, 2008). Increased production, financial incentives and educational strategies led to more equitable allocation of doctors in rural areas in the 1980s (Brueckner and Tetiwat, 2008).

2.5 Accessibility of health services

Accessibility can be explained in terms of mobility, which incorporates a number of spatial and associated non-spatial attributes and their temporal constraints on individuals or groups. (Ahmad, 2012). Spatial accessibility refers to the relationship between the locations of supply and the locations of demand for specific services, taking into perspective existing transportation infrastructure and travel barriers. Measures of accessibility can be opportunity based. Opportunities to access a health care service can be specified in terms of a fixed threshold of travel distance or time. Travel time in this respect includes notions of barriers, connectivity and critical distance (Linking People, Place and Policy, 1997). Euclidean distances (Apparicio *et al.*, 2008; Noor *et al.*, 2009; Pang and Lee, 2008; Sharkey and Horel, 2008) are often used to measure the distances between the health care service providers and users. Distance is related to access and utilization. The farther the travelling distance to a health service facility, the less probable an individual will use the service facility. (Noor *et al.*, 2009)

Other researchers argue that the effect of distance on the use of health services is affected by the time and cost of travel, compounded by topography and poor road conditions (Vissandjée *et al.*, 1997) and by a shortage of public transport (Krasovec, 2004). Poor road conditions have been associated with longer travel times to reach healthcare facilities, whereas better road conditions have been associated with regular visits to a physician (Ramsbottom-Lucier *et al.*, 1996). Thus, good road conditions can be one accessibility indicator because it helps human mobility within an area. Increased travel distance will heighten travel time which indirectly impacts on travel cost as the user takes the effort to organize their time to visit a health care service.

2.6 Resource Inequalities in Ghana

International standards and guidelines to check healthcare services are based on two criteria which are; a primary health care unit which should serve a certain number of persons and, a health delivery facility which should also cover an area of a certain radius (Abdelhafiz and Abdel-samea, 2013). Access to health facilities and services is necessary to ensuring high living standards among the population hence, notwithstanding one's geographical and socio-economic circumstances, access to health must be a basic service. However, the situation has been poor in the Ghanaian context, particularly for the rural dwellers. (Sulemana and Dinye, 2014) Differences in development give rise to poverty, which are subsequently spatial in nature (Tsikata and Seini, 2004). In this respect, climatic conditions and physical resource availability are important. A classical case of inequality in Ghana manifests itself in the previously mentioned North-South dichotomy in development. Most important resources such as gold, diamonds and most recently crude oil are all found in the

southern part of the country. The climate in the south is also favorable for cultivating export crops (Tsikata and Seini, 2004).

2.7 Equity issues in the Eastern Region of Ghana

A 2010 population and housing census regional analytical report of the Eastern Region concluded that over 56% of the population of residents resided in rural areas (NPC, 2011). With the exception of the New Juaben (93.3%), Birim (67.7%) and East Akim (59.0%) which are predominantly urban and Kwahu West (51.2%), which also has a little more than half of the population of the district residing in urban centers, the rest of districts of the region have their populations concentrated in rural areas (ERHD, 2013). The Upper Manya Krobo district is the least urbanized, with only 13 percent of its residents in urban areas. The level of urbanization in New Juaben is explained by the location of the regional capital there. Vast disparities in district share and rural-urban distribution of the regional population suggests that employment opportunities and access to some amenities are not equitable in the region. The result of this development is most likely to be such that there will be inequalities in distribution of health facilities and as a result not in agreement with the principle of social justice and equity.

2.8 Distributive Equity in health care facilities and personnel

According to the concepts of the principles of equity and health, Equity in health care is based on the principle of making high quality health care accessible to all.(Whitehead, 2000). Underpinning most health care systems is the belief that there should be a fair and equitable deployment of available resources for the benefit of a

whole population. Health services could be based on equal expenditure per capita. By this definition an equitable allocation would be achieved if the available health service budget were divided equally amongst geographical areas based on the size of population in each area (Whitehead, 2000).

Health equity refers to the study and causes of disparities arising in the quality of health within different populations (HSS, 2007). On the other hand, health equality refers only to the absence of disparities in remediable aspects of health. Inequity implies some kind of social injustice. Therefore, if one population dies younger than the other due to genetic differences, which is a non-controllable factor, we tend to say that there is a health inequality (BlueCross and Blue Shield of Minnesota Foundation, 2010). Similarly, if a population has a lower life expectancy due to lack of access to medications, the situation would be classified as a health inequity (Kawachi *et al.*, 2002). These inequities may include differences in the presence of disease, health outcomes, or access to health care between populations with a different ethnicity, geographic location or socioeconomic status (HHS, 2010; Verutes *et al.*, 2012). Health equity is divided into two major streams: horizontal equity which refers to the equal treatment of groups in the same circumstances; and vertical equity, which implies that individuals who are unequal should be treated differently according to their level of need (Mills *et al.*, 2012; Vandemoortele, 2012; Vandemoortele, 2010). Variation in the quality of health across populations is properly documented globally in both developed and developing countries.

In recent time, a greater emphasis has been placed on issues regarding the pattern of distribution of health facilities and personnel. Atser and Akpan (2009) concluded that variation in distribution of facilities is crucial especially in rural areas where there are problems of limited facilities and low mobility of health personnel (Atser and Akpan, 2009). Results from a study in Ondo State show that healthcare facilities in the state were unevenly distributed, hence hampering health development at the grassroots. (Umar and Bolanle, 2015) Further studies by researchers (Adedayo and Yusuf, 2012) concluded that health deprivation is a disturbing phenomenon which hampers quality of life among rural settlements. Rural communities are exposed to different disadvantages in space and time. The implications of the mal-distribution manifest in overcrowding a consequent lack of proper attention to patients as well as poor access in some specific areas with vulnerable conditions of low number of health facilities especially among the rural dwellers. (Ujoh and Kwaghsende, 2014)

Equitable access to primary health care is a key objective to health policy makers. Healthcare workers should be accessible for all people in the farthest and poorest parts of a country, studies have been able to demonstrate the inequalities in distribution of health workers in urban and rural areas (Ezati *et al.*, 2015). As part of recommendations to solve the uneven health worker distribution crisis in various countries, a study in Turkey suggested that the number of health workers should be planned and considered according to the desire, need, population, target and workload criteria. (Alkan, *et al.*, 2011).

CHAPTER III

METHODOLOGY

3.1 Introduction

The following chapter discusses the approach and methodology used for the study. The chapter starts with the research design employed for the study and provides reasons for the choice of the research design. It also details the research processes, data collection techniques and tools, the study units and population, sources and methods of collection of data are also discussed. The chapter ends by presenting the techniques used to analyze the data. The rationalization and analysis as well as data presentation and reporting of the study has also been highlighted.

3.2 Research Design

A single case study has been adopted, by choosing the Eastern region of Ghana as the study area. According to (Bromley, 1990; Searle, 1999) a case study is a systematic inquiry into an event with an objective of describing and explaining a certain phenomenon of interest to the researcher. The case study method permits the collection of detailed descriptive data, which can be either quantitative or qualitative in nature.

Case studies can be advantageous such that, they can provide new insight to an existing occurrence, stimulate new research, and sometimes contradict already established theory as well as permitting investigations into otherwise inaccessible situations (Zucker, 2009). On the other hand a case study can sometimes be subject to a researcher's own subjective 'feelings' which may influence an outcome of an

investigation and make replication of such a study an arduous task as a result a case study lacks representativeness (Bromley, 1990).

3.3 Research Methods

1. Data on the number and types of healthcare facilities as well as the number and types of health personnel across the Eastern region was used for this study and obtained from the Eastern Regional office of the Ghana Health Service. The health facilities that were incorporated in this study were functional facilities in the region as at the year 2015.
2. The study utilized-partly existing records of the way points of health facilities and also generated way points from Google Map by entering the name and location of a particular health facility into the Google map search engine.
3. The 2010 population of the Eastern region was also obtained from the Ghana Statistical Service as part of items to be used for multivariate analysis.
4. Discussions were held with personnel of the Eastern regional division of the Ghana health service to deliberate on issues bothering on access to health care.

3.4 Study Population and Units

3.4.1 Study Units

The study units were all health facilities within each district or municipality in the Eastern region of Ghana. These facilities included hospitals, clinics, Community Based Health Planning services (CHPS) compounds, health centers and Maternity

centers. These facilities were classified as either being private owned, government-owned or property of the Christian Health Association of Ghana (CHAG).

3.4.2 Study Population

1. The total resident population of the Eastern region as at the 2010 National Population Census was used as part of information obtained for quantitative analysis and was sorted out by district/municipalities. The population of each district was categorized to investigate the relationship between the population and number of health facilities.
2. Again information on the total number of health personnel (both administrative and clinical and 'others') in the Eastern region was used and classified by district or municipality. The clinical health personnel included; medical officers, physician/medical assistants, pharmacists, pharmacy technicians, dispensary technicians, professional nurses, community health nurses, enrolled nurses, midwives, biomedical scientists and laboratory technicians. Administrative personnel included; health system administrators, administrative managers, executive officers, accountants, auditors, finance officers, audit officers and account officers. This information was useful for performing analysis on the relationship between the population and the health personnel (clinical health personnel). Others include; biostatistics assistants, field technicians, nutrition officers and health assistants.

3.5 Data handling and management

ArcGIS 10.3.1 (Environmental Systems Research Institute (ESRI) software was used to display the distribution of health facilities and health personnel. STATA statistical software package (StataCorp. 2007. Stata Statistical Software. Release 12. StataCorp LP, College Station, TX, USA) was used for all univariate and multivariate analysis.

Analysis was done based on set objectives. Geographic waypoints of health facilities originally in Keyhole Markup Language (KML) format was converted to a shape file format and launched into the ArcGIS software to display the position of health facilities within the map of the Eastern Region. Data on the number of health facilities and personnel per district was obtained in Microsoft excel format and converted into STATA format for analysis. The data sheets that were subsequently used for analysis included the following;

- *Data sheet 1* contained a list of health facilities of different types sorted by districts with their corresponding way points (GPS readings).The location by town and ownership type of these facilities was included on this data sheet.
- *Data sheet 2* as well contained a list of the districts in the Eastern region with their corresponding total number of health facilities in each of these districts and subsequently the total number of the various types of these health facilities (CHPS, health centers, government hospitals and clinics).
- *Data sheet 3* had the numbers of all various types of clinical staff in each corresponding district
- *Data sheet 4* as well contained a list of all districts in the Eastern region, with corresponding district capital, total district population by sex and age group.

3.6 Data Analysis

- To explore the influence of the geo-political zones on the number of health facilities provided, data on health facilities and district population were both categorized and subjected to a chi square analysis. The dependent variables was be the number of health facilities and independent variables was the resident population in every district
- Pearson Correlation analysis was applied to investigate the relationship between the population and number of health facilities as well as that between the population and the health personnel. Tables and graphs were used to display the data.

3.7 Ethical consideration

Ethical approval was obtained from Ethics Committee of the Ensign College of Public Health, Letters of notification were written to the Regional Health Directorate of the Eastern region, and the district health management teams of the health facilities in the Eastern Region.

3.8 Plans for data usage

Data on the GPS way points of health facilities, the population per district along with information on number of health facilities and number of health workers per district was double entered into both ArcGIS and STATA 12 softwares. Analysis was done based on set aims and specific objectives. ArcGIS was used to carry out all geospatial analysis while STATA 12 was used to carry out all quantitative analysis.

3.8.1 Dissemination of findings

During the weekly meetings of the regional health directorate team, presentation of findings was presented by the research team to the staff of the directorate.

3.8.2 Potential policy impact

This study is expected to provide a platform for policy direction towards meeting the national policy of social justice and equity.

CHAPTER IV

RESULTS

4.1 Study Region

Figure 4.0 displays the breakdown of the Eastern Region into its 26 administrative districts by population. The legend shown at the top left corner of the map shows the population in ranges arranged from the highest to the lowest, the strength of the color shade corresponds to how high or low the population is. Areas with the deep color shades represent high populations while low color shades depict low populations. As observed in the map, the New Juabeng Municipal, Birim Central Municipal and East Akim were the districts with high resident population compared to other districts, and hence had deeper color shades. Akwapim South had the lowest population followed by districts such as Ayensuano, Denkyembour, Birim North, Kwahu South and Upper Manya Krobo.

A summary of the study variables investigated from a regional perspective is provided in Table 4.0. The population of the Eastern region as at 2010 according to the Ghana Statistical Service was 2,633,154 at a growth rate of 2.1% and a population density of 136 individuals per square kilometer. As at March, 2016, a total of 587 health facilities were also counted in the region, indicating a 12.5% increase in the number of health facilities from 2010, where 522 health facilities were present. (The Health Sector in Ghana: Facts and Figures, 2009)

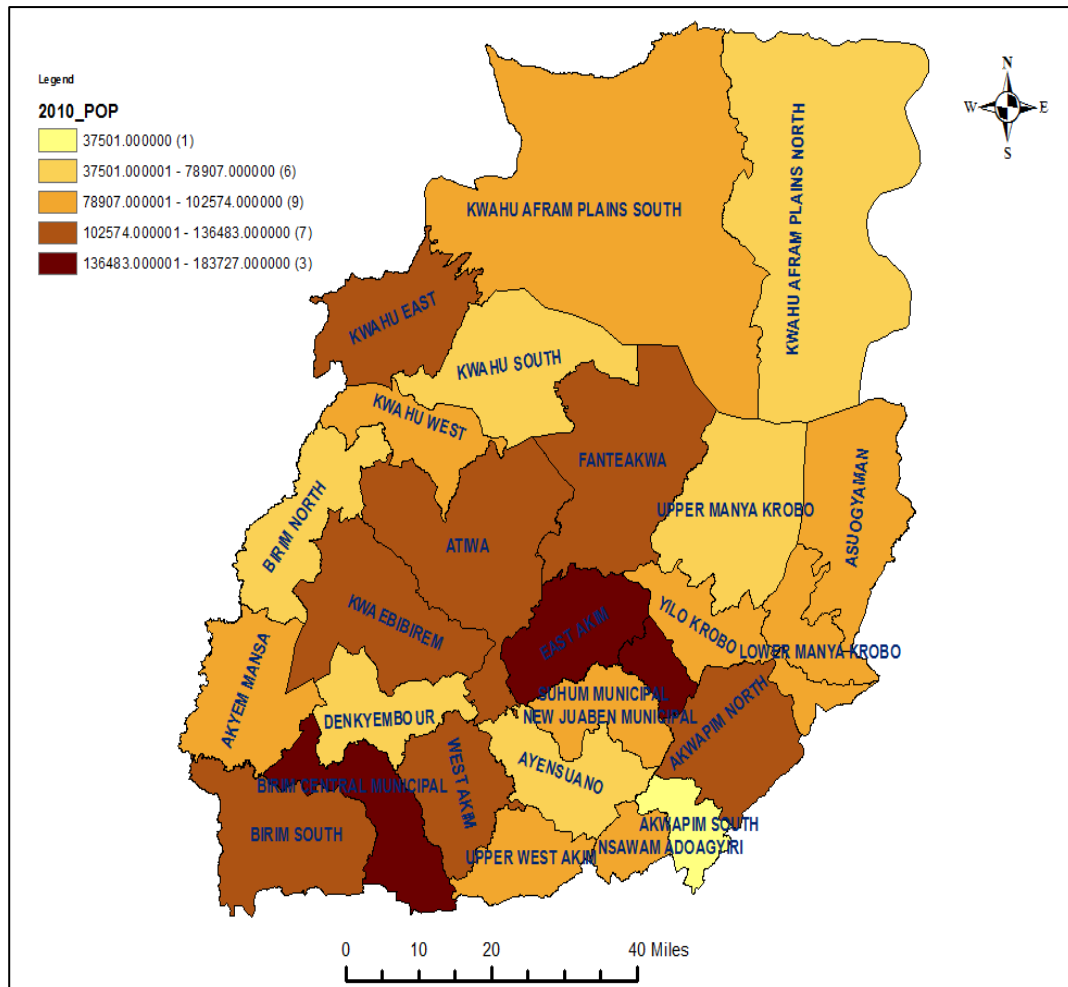


Figure 4.0; Choropleth map displaying population breakdown by district/municipalities in the Eastern Region of Ghana

Table 4.0: Summary of study variables

VARIABLE	FIGURE RECORDED
Population	2,633,154
Area(square kilometer)	19,323 km ²
Population density	136.3 individuals per km ²
GPS way point	6°14'14.65"N , 0°27'00.85"W
Total number of health facilities	587

Prior to field work, discussions with personnel of the Department of Health Information of the Eastern Regional Health Directorate were held and the results were summarized in the following bullets.

- It was asserted that health facilities were mostly randomly distributed in most districts however some of these facilities were placed upon request by community members.
- Most health facilities were not placed at vantage points with only a few well positioned for ease of access by community residents. Health facilities as well happened to be more clustered in urban areas and happened to be more scattered in the rural communities
- In relation to access and on the question of how close health facilities were to residents it was mentioned that some facilities were located at the heart of various communities while others were situated on the outskirts of communities. However it was mentioned that community members were best positioned to provide answers to how close facilities are to residents.
- With regard to proximity of health facilities to residents it was mentioned that community members living far from health facilities will experience difficulties reaching the facility.
- On the issue of the consequences of poor access to healthcare, it was highlighted that access problems would mean poor service coverage; more people may not be able to access health care as expected and that also means disease burden will increase due to incomplete containment of certain diseases. As part of a justification to improve healthcare, officials mentioned that when clients can easily get access to healthcare, they will seek care early

which will improve disease control and prevention as early detection of health conditions as well as early treatment is a key public health strategy.

4.2 Health Facilities

A total of 7 types of health facilities were observed in the Eastern region. Among these were, Hospitals, Clinics, Maternity Homes, CHPS, Health Centers, Reproductive and Child Health Centers (RCH) and ‘Others’ which consisted of health training institutions.

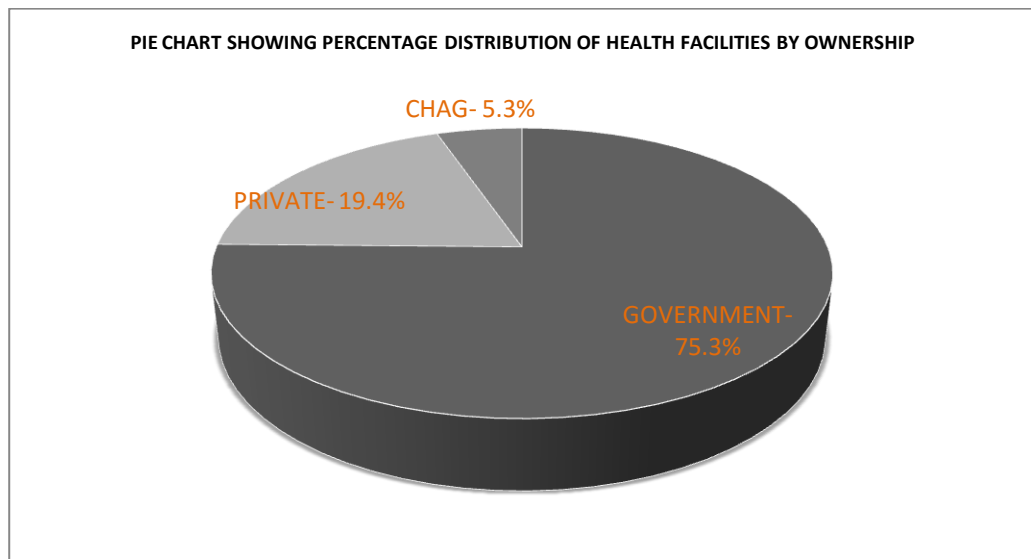


Figure 4.1: Pie chart showing percentage distribution of health facilities by ownership

4.2.1 Distribution of hospitals

Distribution of health facilities indicates variation in ownership status in the Eastern region as established by Figure 4.1 which displays the percentage distribution of health facilities by ownership status across the Eastern region. The ownership status

of these health facilities comprised 442 government facilities, 114 private and 31 CHAG facilities. The results were projected on a pie chart (Figure 4.1). A total of 587 health facilities were recorded among the 26 administrative districts/municipalities in the Eastern region, of which 36 were hospitals, 110 clinics and 215 were CHPS. Figure 4.2 below shows the spread of hospitals across the various districts. There appeared to be an overlap between these hospital facilities especially in districts with more than two or three hospitals. Districts such as Akyem Mansa, Kwahu Afram Plains South, Kwahu East, Ayensuano, Yilo Krobo and Upper West Akim did not have district hospitals neither did they have private nor mission hospitals (owned by the CHAG). The distribution of hospitals also seemed to be weighed more towards the southern and middle sections of the region compared to its northern section.

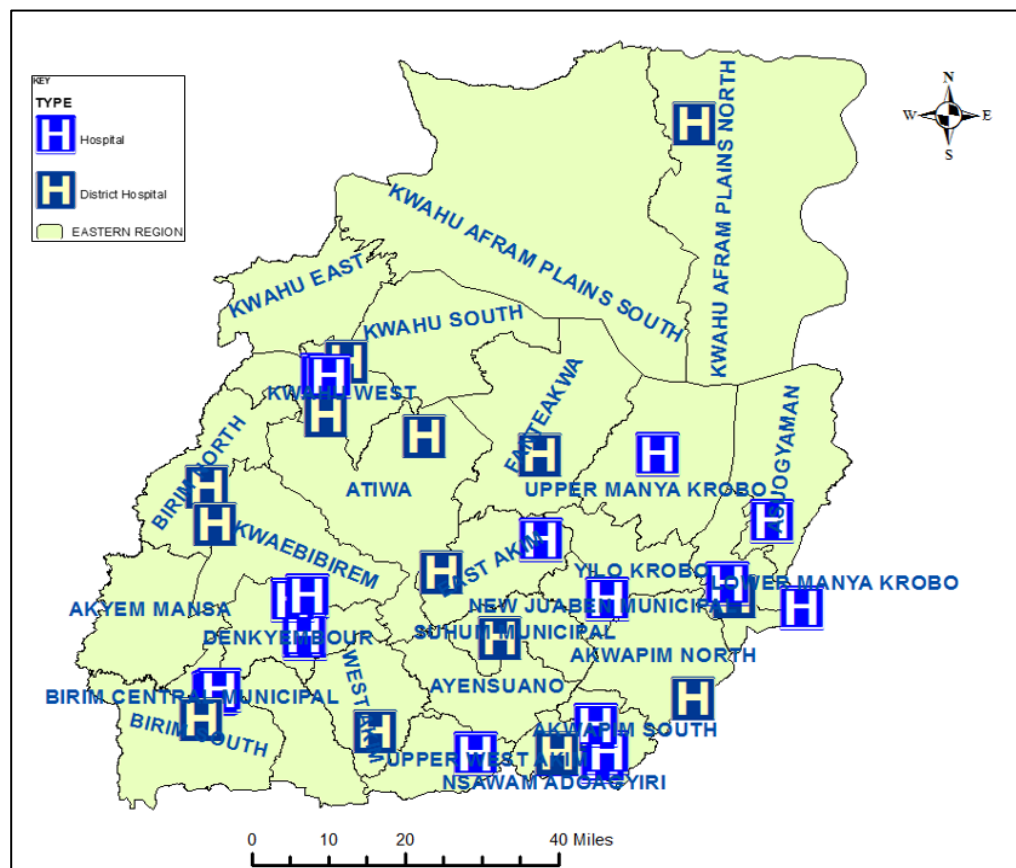


Figure 4.2: Map displaying distribution of hospitals in the Eastern Region of Ghana

4.2.2 Distribution of clinics

Contrary to the distribution of hospitals in the Eastern Region, the distribution of *clinics* took a different twist. Apart from the Ayensuano district which did not have any clinic all other districts had clinics with the district capitals of New Juabeng, West Akim and the Birim Central having the highest numbers of clinics. It was also observed that majority of the clinics were located to the more southern portions of the Region. Kwahu Afram Plains South and North had a combined total of only 2 health facilities (Figure 4.3). A similar situation is observed with the hospital distribution with Kwahu Afram Plains North and South recording low numbers in terms of hospitals.

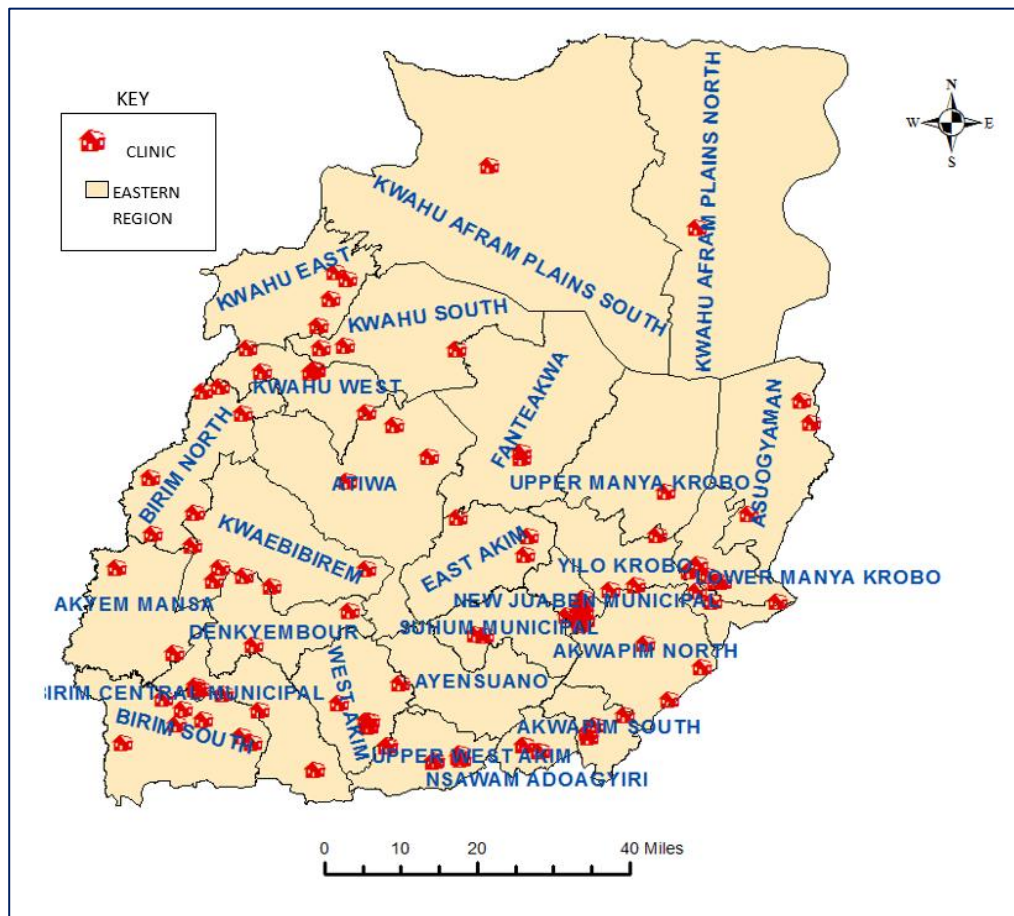


Figure 4.3: Map displaying distribution of clinics in the Eastern Region of Ghana

4.2.3 Distribution of CHPS compound

The distribution of CHPS compound in the region was relatively better than that of hospitals and of clinics. A look at Figure 4.4 shows the number of CHPS compound in each district. Apart from the Atiwa and Kwahu West districts which did not have any record of a CHP compound, all other districts had an average of about 8 CHPS compound. Districts in close proximity with especially Atiwa such as Kwahu South, Fanteakwa and East Akim all recorded numbers much lower than the regional average of 8. The phenomenon is well illustrated below (Figure 4.4).

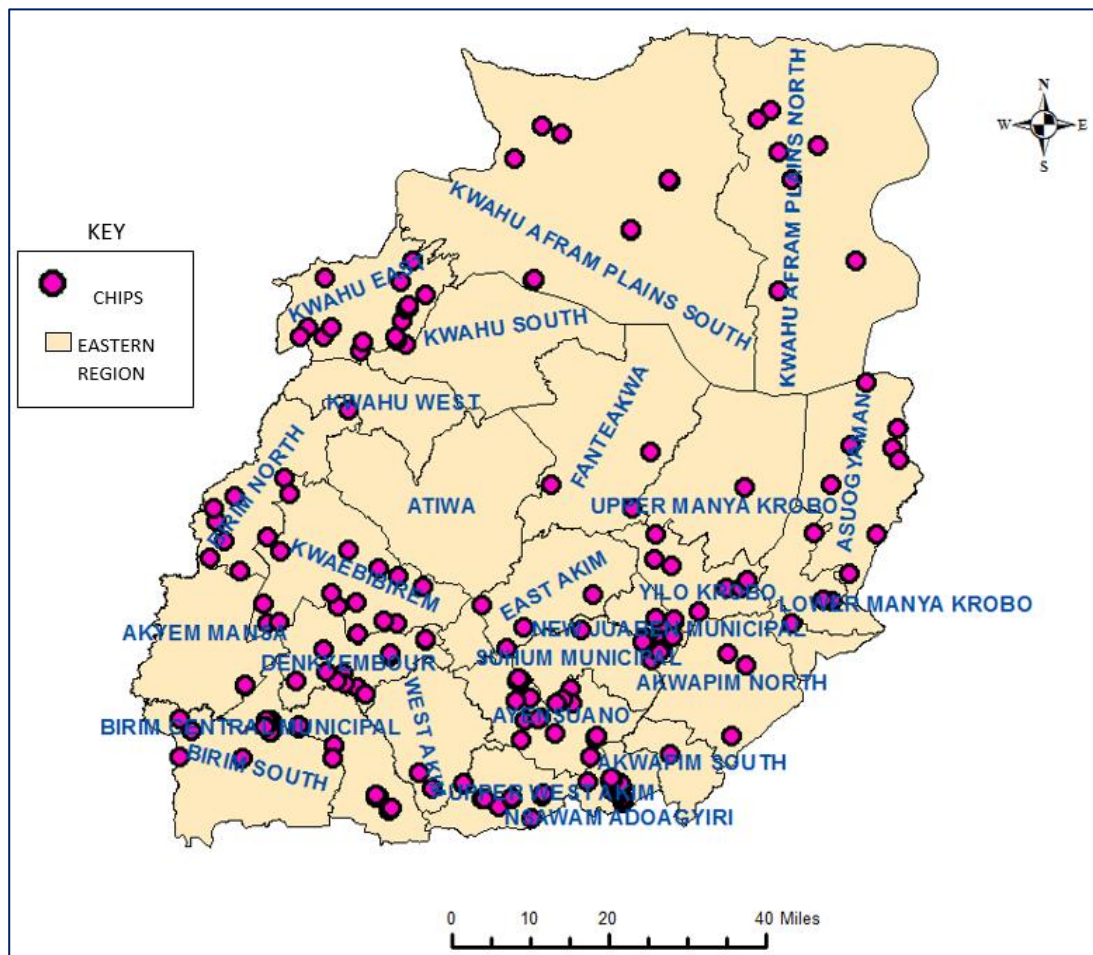


Figure 4.4: Map showing distribution of CHPS compound in the Eastern Region of Ghana

4.2.4 Test to determine variation of health facilities versus population

STATA was used to conduct a two-sample t test to determine whether the number of health facilities varied across the various populations in the different districts

Table 4.1: Test results for variation of health facilities versus population

Ha : diff < 0	Pr (T < t) = 0.5410
Ha: diff! = 0	Pr(T > t) = 0.9181
Ha: diff > 0	Pr(T > t) = 0.4590

It was observed that the distribution of health facilities among districts shows that no variations existed by numbers of health facilities across the districts/municipalities in the Eastern region. Populations were categorized into groups as part of processes to facilitate the t-test Group 1 represented populations between 0-100,000 and Group 2 between 100,001 -200,000. A p-value of 0.9181 indicates there is no significant difference in the number of health facilities and population across districts. The results imply that there was no difference in number of health facilities irrespective of an increase or decrease in population across districts/municipalities

Table 4.2: Summary of number health facilities across districts/municipals by types

DISTRICTS	HOSPITALS	CLINICS	CHPS	MATERNITY HOMES	HEALTH CENTRES	RCH	OTHERS	TOTAL
Akwapim North	1	3	3	3	6	6	1	23
Akwapim South	4	4	1	1	1	6	0	17
Akyem Mansa	0	2	2	0	1	0	0	5
Asuogyaman	1	3	9	1	3	7	0	24
Atiwa	1	3	0	1	2	5	0	12
Ayensuano	0	0	10	0	3	4	0	17
Birim Central	3	9	24	2	1	1	0	40
Birim North	1	7	8	3	3	6	0	28
Birim South	1	7	5	4	3	8	1	29
Denkyembour	2	2	12	0	1	0	0	17
East Akim	2	3	4	3	4	3	0	19
Fanteakwa	1	2	3	1	2	5	0	14
Kwaebibirem	3	5	15	1	3	6	0	33
Kwahu Afram Plains North	1	1	7	0	3	2	0	14
Kwahu Afram Plains South	0	1	16	0	5	0	0	22
Kwahu East	0	3	15	4	4	0	0	26
Kwahu South	2	6	3	6	7	5	1	30
Kwahu West	2	5	0	4	0	3	1	15
Lower Manya Krobo	3	6	2	1	0	2	0	14
New Juaben	2	13	11	3	2	9	3	43
Nsawam Adoagyiri	3	4	21	1	4	1	0	34
Suhum	1	2	12	1	2	9	0	27
Upper Manya Krobo	1	1	1	4	0	4	0	11
Upper West Akim	0	5	22	1	4	0	0	32
West Akim	1	8	2	1	3	2	0	17
Yilo Krobo	0	5	7	3	1	8	0	24
TOTAL	36	110	215	49	68	102	7	587

4.2.5 Association between Population and Number of Health facilities

The association between the population and number of health facilities in each district was investigated as part of procedures to examine whether there exists a subsequent relationship between a defined population of a district and its corresponding number of health facilities. Categories were defined for both the population and health facilities. Populations that occurred between 0-100,000 were

categorized as '1' and 100,001-200,000 denoted category '2'. Districts with total number of health facilities occurring between 0-25 were categorized as '1' and 26-30 labeled category '2'. The Fisher's exact test was used to conduct a chi-square test, the result of the analysis is shown in the Table 4.3 below. A p value of 1.000 implied no association between distribution of health facilities and the population in each district, meaning the numbers of health facilities are virtually independent of the population. To highlight this result, a district like Akyem Mansa with a population of 97,374 had only 5 health facilities as opposed to a less populated district like Akwapim South with only 37,501 residents with 17 health facilities. What this indicates is that the distribution of health facilities is entirely not based on the population, a situation that violates the principle of equity and social justice.

Table 4.3: Results for test for association between population and number of health facilities

Fisher's exact	1.000
1-sided Fisher's exact	0.588

4.2.6 Health facility-population ratio

The population per health facility ratio in the Eastern region was computed based upon data obtained from the Eastern Regional Directorate of the Ghana Health Service and the 2010 population census. The average population per health facility ratio for Eastern Region is 4,486:1 almost half the national average of 76,169:1 (Ofosu, 2012). Among the districts; Akyem Mansa (19,474:1) had the highest population-facility ratio while Akwapim South (2205:1) had the lowest.

Table 4.4: Summary of Population per health facility ratio across districts/municipalities

DISTRICT	POPULATION	NO. OF HEALTH FACILITIES	HEALTH FACILITY-POPULATION RATIO
Akwapim North	136,483	23	1:5934
Akwapim South	37,501	17	1:2205
Akyem Mansa	97,374	5	1:19,474
Asuogyaman	98,046	24	1:4085
Atiwa	110,622	12	1:9218
Ayensuano	76,227	17	1:4484
Birim Central	144,869	40	1:3622
Birim North	78,907	28	1:4642
Birim South	119,767	29	1:2818
Denkyembour	78,487	17	1:4617
East Akim	167,896	19	1:8837
Fanteakwa	108,614	14	1:7758
Kwaebibirem	114,075	33	1:3457
Kwahu Afram Plains North	102,574	14	1:7327
Kwahu Afram Plains South	115,661	22	1:5257
Kwahu East	77,125	26	1:2966
Kwahu South	69,757	30	1:2325
Kwahu West	93,584	15	1:6239
Lower Manya Krobo	89,246	14	1:6374
New Juaben	183,727	43	1:4273
Nsawam Adoagyiri	86,000	34	1:2529
Suhum	91,324	27	1:3382
Upper Manya Krobo	72,092	11	1:6554
Upper West Akim	87,051	32	1:2720
West Akim	108,298	17	1:6370
Yilo Krobo	87,847	24	1:3660
TOTAL	2,633,154	587	1:4486

4.2.7 Relationship between total health facilities (THF) and population

To investigate the relationship between health facilities and the population, Pearson Product Moment Correlation was applied to the data in Table 4.4; a scatter plot was also displayed to graphically represent the relationship (Figure 4.5)

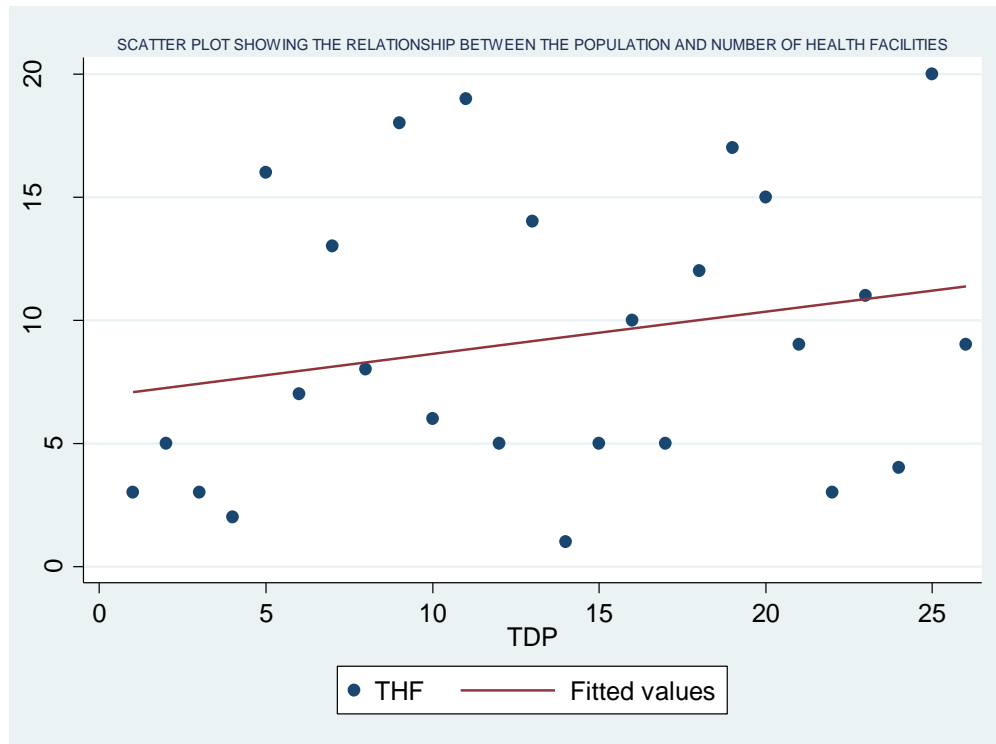


Figure 4.5: Scatter plot showing relationship between population and number of health facilities

A Pearson Correlation coefficient (r) of 0.2280 was obtained at significance level $\text{Prob} > |t| = 0.2216$. This implied from the graph and the r value there exist a weak positive correlation between the population and the health facilities, a result which is not significant according to the p value obtained. Thus there is a weak correlation between the number of health facilities and the population across the districts/municipalities across the Eastern Region. This result further establishes the result obtained from the test of association between the health facilities and the population in the Eastern region.

1.3 Health Personnel

Table 4.5 shows a summary of the numbers of various types of clinical personnel in the region, these include medical doctors (both specialists and physicians), physician assistants, midwives, nurses (enrolled, professional and community health nurses), pharmacists, laboratory personnel (biomedical assistants and technicians).

Table 4.5: Detailed Summary of various categories of health workers

HEALTH WORKER	FREQUENCY	MEAN	VARIANCE
Medical doctors	151	6	6.57
Physician assistants	157	6	15.26
Midwives	541	21	35.30
Nurses	3754	144	54.46

A total of 4,859 health workers were present in the Eastern region with nurses forming the category with the highest number of these workers representing 77% of workers, followed by midwives at 541. Doctors counted were 151, representing a meager 3% of the health labor force. Doctor to population ratio was at 17,438:1, a situation which far exceeds the national doctor population ratio of 10,452:1 (The Health Sector in Ghana: Facts and Figures, 2009) and the phenomenon is not different from that of physician assistants and midwives. The situation was better with regard to the nurse population ratio, which stood at 701:1, a figure in better

standing relative to the national nurse to population ratio of 1,251:1 (The Health Sector in Ghana: Facts and Figures, 2009)

4.3.1 *Distribution of doctors versus population*

A hotspot analysis of the number of doctors in each district on the corresponding population of districts was conducted and the results were pictorially displayed (Figure 4.6). The grades of color shades used represented the strength of the doctor population situation. Areas which showed darker color shades indicated districts with better doctor population ratios compared to lighter color shades. From the map, it is well observed that the New Juabeng Municipal had the best doctor-population ratio, followed by Kwahu South, Suhum, Lower Manya, Akwapim South and Nsawam Adoagyiri. Kwahu East, Kwahu West and Birim South districts were observed to have appalling doctor population ratios. The situation was much highlighted in Table 4.9 with Kwahu East, Kwahu West and Birim South recording doctor population ratios of zero. Akyem Mansa, Denkyembaour, Yilo Krobo and Kwahu Afram Plains South followed closely with poor doctor population ratios, a minimum of 78,000:1 (Figure 4.6).

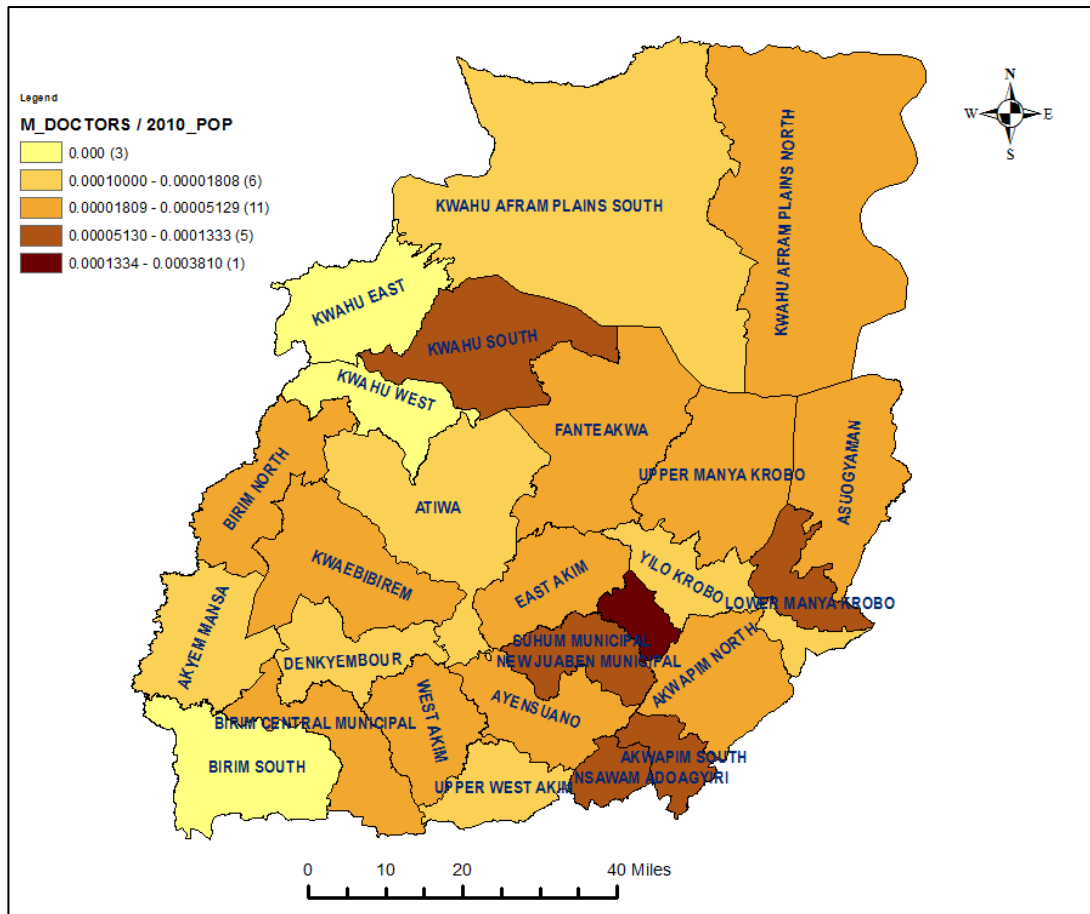


Figure 4.6: Choropleth map displaying distribution of doctors normalized by the population

4.3.2 Distribution of physician assistants versus population

Again, the software ArcGIS was used to conduct a hotspot analysis of the number of physician assistants in each district on the corresponding population of districts and the results were pictorially displayed on a choropleth map (Figure 4.7). The grades of color shades used represented the strength of the physician assistant- population situation. Areas which showed darker color shades indicated districts with better ratios compared to lighter color shades. From figure 4.6, majority of districts with good doctor population ratios were recorded in the Southern sector of the Eastern Region, physician assistant population ratios were better at the Northern Sector, with

both Kwahu Afram Plains North and South having the best ratio along with Akwapim South in Southern Eastern Region as shown in figure 4.7. East Akim, Lower Manya and the Birim Central Municipal recorded the lowest physician assistant-population ratios.

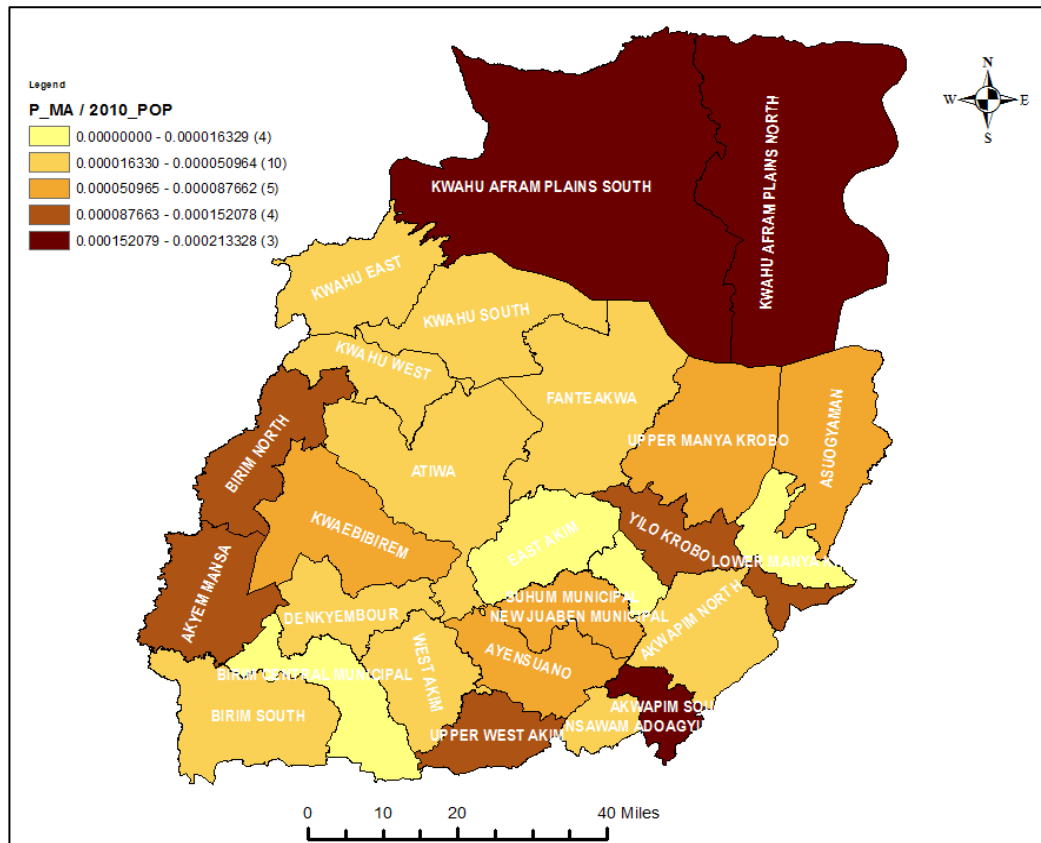


Figure 4.7: Choropleth map displaying distribution of physician assistants' normalized by population

4.3.3 Distribution of midwives, nurses versus population

Contrary to the distribution of doctors and physician assistants, midwives and nurses took a different turn partly owing to the fact that there were midwives and nurses present in every district in the Eastern Region. Nevertheless there still existed the uneven distribution per population within districts. The regional average nurse

population ratio recorded was 701:1 and that of midwives was 4867:1 (Table 11). Amongst other districts that fell above the average were Akyem Mansa, the Kwahu Afram Plains districts, Denkyembour and Upper West Akim. These districts lacked in terms of the numbers of midwives and nurses.

4.3.4 *Test to determine variation of health personnel versus population*

Following a t-test analysis to determine variation of health personnel amongst the various districts/municipalities, it was observed that there was no variation in number of medical doctors, physician assistants, nurses or midwives across the populations of the districts. All p values obtained for each health worker categories were greater than 0.05 which indicates there is no significant difference in the number of health personnel and population across districts (Table 4.6).

Table 4.6; Summary t-test to determine variation of health personnel versus population

HEALTH WORKER CATEGORY	P-VALUE
Medical doctors	P value = 0.4190
Physician assistants	P value = 0.6430
Midwives	P value = 0.2234
Nurses	P value = 0.9744

4.3.5 *Association between population and number of health personnel*

The association between the population and number of health personnel in each district was investigated as part of procedures to examine whether there exist a subsequent relationship between a defined population of a district and its corresponding number of health personnel.

Populations that occurred between 0-100,000 were categorized as '1' and 100,001-200,000 denoted category '2'. Categories were again generated for all the health worker categories. Districts with total number of medical doctors between 0-5 were assigned category '1' and districts with 6 and above assigned category '2'. Physician assistants numbering 1-12 were denoted as category '1' and 13-24 category '2'. Midwives numbering between 0-45 were assigned category 1 and 46-90 category 2. Nurses numbering between 0-180 were labeled as category '1' and 181-360 category '2'.

The Fisher's exact test was used to conduct a chi-square test (Table 4.7). A p-value obtained for various categories of health workers (medical doctors, physician assistants, midwives, nurses) were all less than 0.05 which implied no association between distribution of health personnel and the population in each district, meaning the distribution of health personnel is irrespective of the population, a situation that violates the principle of equity and social justice.

Table 4.7; Results for test for association between population and number of health workers

TYPE OF HEALTH WORKER	ONE-SIDED EXACT TEST P-VALUE	FISHER'S FISHER EXACT TEST P-VALUE
Medical doctors	0.598	1.000
Physician Assistants	0.677	1.000
Midwives	0.677	1.000
Nurses	0.281	0.419

A look at Table 4.8 shows a summary of the distribution of health personnel across districts/municipalities. Fisher exact test above indicated no association between population and health personnel distribution. This result is further established by the following example. The Kwahu South district with a population of 69,757 had a doctor population of 6 while Akyem Mansa with a population 97,374 greater than that of Kwahu South has only one doctor. On the other hand West Akim with a population of over 108,298 has 4 doctors while Birim North with a population of 78,907 has 2 doctors. These classical examples reveal the anomaly in the distribution of medical officers across the region and further confirm that the population size is irrespective of the number of health personnel. The relationship between medical officers is neither directly nor inversely proportional to the population. A similar phenomenon is observed amongst physician assistants, midwives and nurses.

Table 4.8; Summary of the distribution of health personnel across the Eastern Region

DISTRICT	TDP	MD	PA	MW	NRS	TPHM	LAB	TOTAL
Akwapim North	136,483	7	11	30	238	9	8	303
Akwapim South	37,501	5	2	9	72	3	9	100
Akyem Mansa	97,374	1	1	3	107	1	0	113
Asuogyaman	98,046	4	5	11	124	1	1	146
Atiwa	110,622	2	4	20	164	6	4	200
Ayensuano	76,227	3	3	8	72	1	1	88
Birim Central	144,869	4	10	32	208	9	6	269
Birim North	78,907	2	5	15	135	4	4	165
Birim South	119,767	0	3	5	101	2	0	111
Denkyembour	78,487	1	3	4	67	0	0	75
East Akim	167,896	7	12	39	218	14	6	296
Fanteakwa	108,614	3	6	18	142	5	4	178
Kwaebibirem	114,075	5	4	30	187	5	4	235
Kwahu Afram Plains North	102,574	2	2	7	95	1	0	107
Kwahu Afram Plains South	115,661	1	1	4	62	2	0	70
Kwahu East	77,125	0	3	11	97	0	2	113
Kwahu South	69,757	6	8	31	186	9	6	246
Kwahu West	93,584	0	4	11	85	0	0	100
Lower Manya Krobo	89,246	7	10	46	207	15	8	293
New Juaben	183,727	70	21	87	360	20	25	583
Nsawam Adoagyiri	86,000	7	13	37	194	9	5	265
Suhum	91,324	6	7	24	158	10	5	210
Upper Manya Krobo	72,092	2	6	18	136	5	3	170
Upper West Akim	87,051	1	0	3	84	2	1	91
West Akim	108,298	4	9	21	147	9	5	195
Yilo Krobo	87,847	1	4	17	108	2	5	137
TOTAL	2,633,154	151	157	541	3754	144	112	4859

Key; TDP-Total District Population MD-Medical Doctors, PA-Physician Assistants, MW-Midwives, NRS-Nurses, TPHM-Pharmacists, LAB-Laboratory technicians

Table 4.9: Summary of Population per health personnel ratio across districts/municipalities

DISTRICT	TDP	DPR	PAPR	MWPR	NPR
Akwapim North	136,483	19498:1	12408:1	4549:1	573:1
Akwapim South	37,501	7500:1	18751:1	4167:1	521:1
Akyemansa	97,374	97374:1	97374:1	32458:1	910:1
Asuogyaman	98,046	24512:1	19609:1	8913:1	791:1
Atiwa	110,622	55311:1	27656:1	5531:1	675:1
Ayensuano	76,227	25409:1	25409:1	9528:1	1059:1
Birim Central	144,869	36217:1	14487:1	4527:1	696:1
Birim North	78,907	39454:1	15781:1	5260:1	584:1
Birim South	119,767	0	39922:1	23953:1	1186:1
Denkyembour	78,487	78487:1	26162:1	19622:1	1171:1
East Akim	167,896	23985:1	13991:1	4305:1	770:1
Fanteakwa	108,614	36205:1	18102:1	6034:1	765:1
Kwaebibirem	114,075	22815:1	28519:1	3803:1	610:1
Kwahu Afram Plains North	102,574	51287:1	51287:1	14653:1	1080:1
Kwahu Afram Plains South	115,661	115661:1	115661:1	28915:1	1866:1
Kwahu East	77,125	0	25708:1	7011:1	795:1
Kwahu South	69,757	11626:1	8720:1	2250:1	375:1
Kwahu West	93,584	0	23396:1	8508:1	1101:1
Lower Manya Krobo	89,246	12749:1	8925:1	1940:1	431:1
New Juaben	183,727	2625:1	8749:1	2112:1	510:1
Nsawam Adoagyiri	86,000	12286:1	6615:1	2324:1	443:1
Suhum	91,324	15221:1	13046:1	3805:1	578:1
Upper Manya Krobo	72,092	36046:1	12015:1	4005:1	530:1
Upper West Akim	87,051	87051:1	0	29017:1	1036:1
West Akim	108,298	27075:1	12033:1	5157:1	737:1
Yilo Krobo	87,847	87847:1	21962:1	5167:1	813:1
TOTAL/DISTRICT POPULATION-HEALTH WORKER RATIO	2,633,154	17,438:1	16,772 :1	4,867:1	701:1

KEY TDP-Total District Population, DPR-Population Doctor Ratio, Population-Physician Assistant Population Ratio, MWPR-Population-midwife ratio, NPR-Population nurse ratio

From Table 4.9 above and with reference to Section 4.3.1, the situation of doctor population ratio is however different from the Midwifery category of health workers, the current ratio of population to midwives in the Region stands at 4867:1, which is below the national average of 7600:1. This is however not surprising since

midwives in the Eastern Region form 11% of the health labor force as opposed to doctors forming 3%.

4.3.6 Relationship between health personnel and population

Pearson Product Moment Correlation was again applied to the data in Table 4.11 to investigate the relationship between the health personnel and the population and the results of the correlation between the various health personnel (medical doctors, physician assistants, midwives ,nurses and the total number of health workers) displayed in the following table.

Table 4.11; Summary of relationship between various categories of health workers and the population across districts in the Eastern Region

TYPE OF HEALTH PERSONNEL	CORRELATION COEFFICIENT(r)	P-VALUE
Medical doctors	-0.0704	0.7324
Physician assistants	-0.1044	0.6116
Midwives	-0.3032	0.1321
Nurses	-0.1169	0.5695
Total number of health workers	-0.0725	0.7248

A Pearson Correlation coefficient (r) of -0.0725 was obtained for the relationship between the total number of health workers and the population with a reported p-value of 0.7248. This implied the existence of a weak negative correlation between the population and the health workers, a phenomenon that cut across all categories of the health workers (medical doctors, midwives, nurses and physician assistants) a

result which is not significant according to the p-value obtained in all cases. Thus a very weak correlation exists between the number of health workers and the population across the districts/municipalities across the Eastern Region. This result further establishes the result obtained from the test of association between the health workers and the population in Section 4.3.5

4.3.7 Observations made in districts recently created from existing districts

As mentioned in chapter I, the issue of creation of new districts came with it some problems with regards to healthcare. Establishment of additional districts from the already existing districts should correspondingly be accompanied by establishment of various amenities including health facilities in order to create equity and social justice among districts/municipals. The creation of additional districts however did not come with it establishment of additional facilities especially hospitals and thus generated various inequalities in health facilities. The table below demonstrates this phenomenon as per the results obtained from the study using the number of hospitals as a reference point.

Table 4.12: Changes observed in number of hospitals after addition of districts

OLD DISTRICT NAME	NUMBER OF HOSPITALS SPLIT	OF NEW FORMED DISTRICT	DISTRICTS FROM OLD	NUMBER OF HOSPITALS SPLIT	OF
Akwapim South	7	Akwapim South	4	Nsawam Adoagyiri	3
Kwahu Afram Plains	1	Kwahu Afram Plains North	1	Kwahu Afram Plains South	0
Suhum/Kraboah/Coaltar	1	Suhum	1	Ayensuano	0
West Akim	1	Upper West Akim	0	West Akim	1

The above table indicates some changes occurred as newly districts were created. Even though these changes may not necessarily affect structural access to health facilities, addition of new administrative district must also be followed by structural adjustments by way of establishment of social amenities to erase every form of health inequalities amongst districts.

CHAPTER V

DISCUSSION

This study sought to investigate spatial distribution of health facilities as well as health personnel in the Eastern region of Ghana. The primary objective being to investigate the spatial pattern in distribution of health facilities in each district and the region as a whole. To accomplish the mentioned research objectives described in chapter I, relevant spatial and tabular datasets were collected from appropriate sources (Ghana Health Service division of the Eastern Region). A GIS based method was developed to map distributions of population, health care facilities and health personnel and subsequently to identify disadvantaged locations / districts by means of both spatial and multivariate analysis.

This chapter provided an overview of the main research findings described in chapter IV, including the summarized characteristics of the population; health care facilities, health workforce, the GIS based investigation of spatial distribution of health care facilities and health personnel, and the identification of districts/municipalities that were disadvantaged with regards to health facility and health personnel availability.

5.1 Demographic characteristics

The population of the Eastern Region stood at 2,633,154, representing about 10.7% of Ghana's population according to the 2010 Population and Housing census. It happens to be the third most populous region after Ashanti and Greater Accra Regions. It has an area of 19,323 square kilometers, occupying 8.1 per cent of the total land area of Ghana,. The population is made up of 49.2 per cent males and 50.8

per cent females. The number of districts in the region increased from 17 to 21 then to 26 administrative districts. Majority of the population of the Eastern Region are in the rural areas. New Juaben Municipal (93.3%), Birim Central (67.7%) and East Akim (59.0%) are predominantly urban and Kwahu West (51.2%), which also has a little more than half of the population of the district residing in urban centers, the rest of districts of the region have their populations concentrated in rural areas (ERHD, 2013). With majority of the population being rural dwellers, there is a likelihood of a problem of access to health facilities since the situation of access to health facilities has been poor in the Ghanaian context, particularly for the rural dwellers (Adedayo and Yusuf, 2012; Sulemana and Dinye, 2014). Again according to discussions with personnel at the directorate, health facilities were more clustered in the urban areas and scattered in the rural areas and consequently had a bearing on the access of health facilities on community members in the urban and rural zones.

5.2 Distribution of Health facilities in the Eastern Region

Data on the distribution of health facilities obtained from the Ghana Health Service-Eastern Regional Directorate (2015) showed that there were a total of 587 health facilities, indicating a marked increase in these numbers since 2009 when 522 health facilities were recorded in the region (The Health Sector in Ghana: Facts and Figures, 2009). A two-sample t test confirmed that an increase or decrease in population did not correspond to a change in the number of health facilities. The number of hospitals and clinics especially further demonstrated the persistent imbalance in healthcare facility distribution in the region. The disparity in this distribution could also facilitate corresponding variation in access to healthcare on the part of the population (Ujoh and Kwaghsende, 2014).

Out of the total number of health facilities counted, hospitals represented a meager 6%. The dominant health facilities found were the CHPS compounds representing 36%. Considering the fact that hospitals are the premiere facilities offering a host of healthcare services; it is prudent for every district to at least have a district hospital. Districts such as Upper West Akim, Kwahu East, Kwahu Afram Plains South, Ayensuano and Akyem Mansa should be given priority with regard to establishment of hospitals in the Eastern region, especially with Akyem Mansa recording an alarming health facility to population ratio of 19,474:1. A thorough observation of Maps 4.1 and 4.2 indicated that there was a slight displacement of majority of hospitals and clinics to the southern sector of the Eastern Region. The Kwahu Afram Plains North and South districts were very deficient in terms of hospitals and clinics, particularly Kwahu South which was just created, recording just one clinic. This however is a disturbing situation and contravenes the principle of justice and equity of access to health facilities (Whitehead, 2000). Residents in any of the Afram Plains districts will have to travel to neighboring districts to seek healthcare.

Districts where the healthcare situation fails to reflect the population to health facility ratio should thus be given priority with respect to establishment of health facilities (Sulemana and Dinye, 2014). To add with, though majority of districts with poor health facility to population ratios, certain districts clearly had poor health facility to population ratio as a result of splitting of existing districts to create new ones, districts such as Kwahu Afram Plains South, Upper West Akim and Ayensuano districts fall within this group and hopefully the health authorities taking key interest in this occurrence will hope to address this issue of addition of new districts without establishing health infrastructure.

5.3 Relationship between health facilities and population

The results of the analysis performed on the health facilities vis-à-vis the population showed that there was no association neither was there a relationship between population and number of health facilities. This development further implies that the health facilities established in various parts of the Eastern region was not done evenly and did not take into account the population distribution of the region. Subsequently, it was observed that some districts were more disadvantaged than others. For example, the Akwapim South district with a population of 37,501 had 17 health facilities present while a district like the newly created Akyem Mansa with a population of about three times that of Akwapim South at 97,374 had only 5 health facilities. The consequence of this is that many individuals in such a vulnerable community cannot access the best of healthcare or at best will resort to healthcare facilities in neighboring districts, which in turn puts pressure with regards to numbers on the facilities of neighboring districts (Ahmad, 2012). This discernible imbalance/disparity is an affront to poverty alleviation within rural areas since access to healthcare has a bearing on the well-being of individuals.(Ujoh and Kwaghsende, 2014)

5.4 Distribution of Health personnel in the Eastern Region

A total of 4,859 health workers were counted in the Eastern region, with nurses forming the majority representing 77%. Doctors and Physician assistants on the other hand represented a mere 3% each of these workers. As indicated in the results section, there was no variation in the number of doctors and physician assistants across the districts/municipalities; this implied that an increase or decrease in

population did not correspond to a change in the number of health personnel, as similarly observed in the case of health facilities. The number of doctors and physician assistants especially demonstrated the persistent imbalance in healthcare facility distribution in the region. New Juabeng Municipal recorded the lowest doctor to population ratio of 2625:1, a situation which is primarily as a result of this district being the regional capital and hence expected to be more developed relative to the other districts (Verutes *et al.*, 2012).

Districts including Denkyembaour, Kwahu Afram Plains South, Akyem Mansa and Yilo Krobo recorded alarming doctor to population ratios of over 70,000:1. A phenomenon much higher than the regional doctor to population ratio of 17,438:1. The consequence of this occurrence is such that residents in these districts with a poor doctor to patient ratio are likely to have issues with access to appropriate health services and are either likely to seek alternative forms of health such as traditional medicine or access health services from other neighboring districts, (Umar and Bolanle, 2015) a situation that does not augur well for the principal of equity and social justice (Whitehead, 2000). The newly created districts such as Akyem Mansa and Kwahu Afram Plains South and North should be given priority with regards to provision of health workers.

5.5 Relationship between health personnel and population

As observed in Section 4.3.5 there was virtually no association between the number of health personnel in districts and the population. This implied that health personnel were recruited based on all other criteria except the population of the district or municipality in subject. This current situation has a direct impact on disadvantaged

districts/municipalities with alarming health facility to population ratios. A critical observation of Map 4.4 indicates that districts such as Kwahu South, Suhum, Akwapim South, Nsawam and Lower Manya Krobo came up second best with regard to the doctor population ratio, this can largely be attributed to the fact that these districts had lower populations to be addressed by doctors as compared other districts. For example both Akwapim South and the Kwaebibirem district have 5 doctors in total; however Akwapim South has a lower population than Kwaebibirem. Akwapim South thus has a lower and better doctor to population ratio than Kwaebibirem because there are more doctors to cater for a lower population like that of Akwapim South as opposed to Kwaebibirem.

This observed deficiency in distribution of health personnel in the Eastern region is counterproductive towards improved standard of living through improved healthy living and will most likely generate corresponding disparities in the levels of productivity among individuals in the various districts (Ujoh and Kwaghsende, 2014). The districts which have relatively higher populations should have more doctors compared with districts with relatively lower populations (HSS, 2007). Districts with virtually no doctors present should be prioritized ahead of any other district. Kwahu East, Kwahu West and Birim South which did not have any doctors at all were in very bad state and hence the need to address the problem of the absence of medical doctors. Priority must however be given to these districts with regard to provision of health personnel.

The situation with the doctors differs from midwives and nurses since they form the greater percentage of the health care workforce and are present in every district. A minimum of 3 midwives per district was observed and that of nurses was 67. Distribution of nurses and midwives though not even was by far better than that of

medical doctors. Physician assistants are however in the same situation as doctors with an observed uneven distribution across the Eastern region. Distribution of physician assistants is not directly proportional to the population and hence a need to address the situation. It was however noticed that districts that did not have doctors or even recorded low numbers of doctors had physician assistants present. For example Birim South, Kwahu East and Kwahu West were shown to record zero medical doctors but however had a minimum of 3 physician assistants present. In an attempt to mitigate the ailing doctor-population ratio situation in disadvantaged districts, it will be prudent to recruit more physician assistants and midwives provided the doctor population ratio situation cannot be immediately addressed.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

In conclusion, the distribution of health facilities within the Eastern region has been examined and subsequently the uneven distribution of health personnel has been brought to light. Secondly, disadvantaged districts/municipalities (districts with little or no health facilities and personnel) have been sighted. The zero association and the very weak relationship between health facilities and the population as well as the health personnel and population has been well established and as a result are not in correspondence with the principle of equity and social justice with regard to access to healthcare services.

The observed distribution of health facilities and health personnel was not even and this disparity was well noted in the Kwahu Afram Plains South, Ayensuano, Akyem Mansa, Upper West Akim and Kwahu East districts. The number of hospitals, clinics and CHPS compound in these afore-mentioned districts demonstrated the disparities in the Region and could generate inequalities in the access of population to healthcare. In a similar case, the inequalities in the distribution of health personnel especially the number of doctors was also established. Districts such as Birim South, Kwahu East and Kwahu West recorded zero number of doctors, the newly created districts such as Akyem Mansa and Kwahu Afram Plains South also lacked in terms of number of doctors. The importance of a healthy population with respect to achieving higher economic productivity and poverty reduction cannot be underestimated. Hence the concern of government to achieve equitable health care for all its citizens. However, there are inequalities in the distribution and access to health facilities in the country. This observed deficiency in distribution of health

facilities and health personnel has the potential to generate productivity inequalities among residents of the Eastern Region which in turn has a negative effect on the entire development of the region (Francis and Godskind, 2003). In summary some of the districts identified for their either lack of facilities or personnel were disadvantaged and need hence the need for health authorities to intervene.

6.2 RECOMMENDATIONS

Despite the concept of demarcating the nation into CHPS zones and the considerable effort to build such facilities close to the people of easy access to healthcare, it is still obvious disparities are there and much needs to be done to achieve such goals. On the basis of the findings of this study, it is recommended that more robust investigations should be carried out in the existing facilities with a view of establishing the actual levels of access individuals and communities have with regard to health facilities. Areas that have been identified as disadvantaged districts should be considered for various intervention strategies. It is also essential for government to be more considerate of remote areas that have not exceeded a population threshold for establishment of health facilities. The reason being these rural areas are farther away from the urban zones and hence there is another challenge of the travel time spent in accessing health facilities as well as the difficulty in transport availability. Future research interest could spatially explore the distances from the homes of residents in any of the district/municipality to chosen health facilities to assess the effect of distance on access to healthcare.

6.3 CHALLENGES & LIMITATIONS OF THE STUDY

One of the challenges encountered in the course of this research project had to do with cleaning of the data on health facilities and health personnel; there were some inconsistencies in the data on the number of health personnel as well as the data on the way points of health facilities. Again personnel at the directorate could not provide all the needed information on the distribution of health workers in the Eastern region.

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APPENDIX

ENSIGN COLLEGE OF PUBLIC HEALTH KPONG, AKOSOMBO-E/R

MASTER OF PUBLIC HEALTH PROGRAM

TOPIC: AN ANALYSIS OF THE DISTRIBUTION OF HEALTHCARE FACILITIES AND HEALTH PERSONNEL IN THE EASTERN REGION OF GHANAA

INTERVIEW GUIDE FOR DISCUSSIONS WITH HEALTH PERSONNEL OF THE EASTERN REGIONAL DIRECTORATE

This interview is strictly for academic purpose. No respondent or the organization he/she represents will be identified by name in the report without his/her consent. Your input to the discussion in the following areas regarding the distribution of health facilities would be highly appreciated.

1. How would you describe the general distribution of health facilities in your region?
 - Are these facilities placed at vantage points within the region?
 - How would you describe distribution of health facilities in both rural and urban zones in your region?
 - How close are health facilities to residents?
 - Are there any transportation difficulties pertaining to access to health facilities? Cost? Long Distance?
 - Is there a general public concern about the proximity of health facility to residents?

- Generally, what are some of the consequences of poor access to health facilities in your region? Disease burden? Overall performance of health system?
 - In your opinion, do you think better distribution of health facilities will help improve on the health care delivery system? Why? How?
2. How would you describe the distribution and availability of health personnel in your region?
- How will you describe the provider to population ratio in your district?
 - Is there disparity in the distribution of health care workforce in rural and urban zones? Why?
 - What are the challenges with regards to health personnel availability in your region?
 - What are some of the predictors of the lack of availability of health personnel in your region?
 - In your opinion, do you think better distribution of health workers will help improve on the health care delivery system? Why? How?
 - What in your opinion can be done to mitigate the situation?