

REGIONAL INSTITUTE FOR POPULATION STUDIES

COLLEGE OF HUMANITIES

UNIVERSITY OF GHANA

**HOUSING CONDITIONS AND THE PREVALENCE OF DIARRHOEA AMONG  
CHILDREN UNDER FIVE YEARS IN GHANA**



BY

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MA  
POPULATION STUDIES DEGREE

JULY, 2019

## ACCEPTANCE

Accepted by the College of Humanities, University of Ghana, Legon in partial fulfillment of the requirements for the degree of MA in Population Studies.



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## DECLARATION

I, Andrews Akibateh Dabasea hereby declare that except for references made to other works which have been duly acknowledged, this is the result of my own research done under supervision, and that it has neither in part nor whole been presented for another degree elsewhere.

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DATE: 8<sup>TH</sup> APRIL 2021

## **DEDICATION**

This work is dedicated to God Almighty for the accomplishment of His good deeds with regards to this work. Also, to my late father, Mr. John Aduah Dabasea and to my mother Mrs. Veronica Dabasea for her love and support.

## ACKNOWLEDGEMENTS

I would like to extend my sincere and heartfelt gratitude to everyone who has helped me in this endeavor. Without their active guidance, help and encouragement, I would not have made it this far.

I am extremely thankful to the faculty especially my supervisor, Dr. Mumuni Abu. I can't thank him enough for his priceless guidance and encouragement to the completion of this work.

I also extend my gratitude to my colleagues for their support in diverse ways especially Ms. Ruth Sawyerr, Benjamin Memeh and Zahara N. Abubakar.

Furthermore, I thank my family and friends especially, my brothers and sisters, Mr. Nii Adjetei Sowah Lomo, Mr. Edward Adiibokah, Dr. Nii Tagoe, Mr. Appiah Patrick, Mr. Kofi Asare (YB), Isaac Yeboah, Ms. Lydia Nana Akua Manu and my adorable nieces and nephews.

Lastly, I am very grateful to my beautiful wife, Mrs. Francisca Dabasea and her family for their love and support to make this work a success.

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## **ABSTRACT**

Diarrhoea is a major disease of public health importance as it is the second leading cause of childhood mortality in the world and the second leading cause of death among children under 5 years. Each year, diarrhoea causes about 525,000 fatalities among children. Globally, there have been several studies that examined factors that affect diarrhoea disease among children under five years. However only a few studies have considered household water source, toilet facility, floor material and wall material as variables that make up housing conditions that have influence on diarrhoea infection among children under five years. There is therefore some limitation in the definition of housing conditions, because most studies do not consider these four variables. This study examined the relationship between housing conditions and diarrhoea disease among children under five years. Using data from the 2014 Ghana Demographic and Health Survey, the study employed binary logistic regression analysis to investigate the effect of housing conditions on diarrhoea disease among children under five years in Ghana. Diarrhoea prevalence among children varies by region and mother's age. The study found that children living under good housing conditions were significantly less likely to experience diarrhoea regardless of the household's wealth status and mother's level of education. The study recommends improvements in these key housing conditions in the country to help reduce the prevalence of diarrhoea among children below five years old in Ghana.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.0 BACKGROUND OF THE STUDY**

According to United Nations Development Programme (2015) a house is a structure that provides protection to an individual or groups of people from dangerous risk as a result of environmental and climatic conditions. It also provides protection from dangerous predators in the immediate environment. Housing condition refers to the physical state of the house or dwelling place of people (Collins English Dictionary). These conditions usually reflect the culture, social and economic status of an individual or a society. Ogundahunsi and Adejuwon (2014) described housing as the best physical and historical evidence of civilization in a country.

The United Nations office of the High Commissioner for Human Rights (UN-OHCHR) recognizes that everyone has the right to housing as a fundamental human right, which includes an affordable, safe, habitable and secure home with freedom and no fear of forced eviction. It is therefore important that individuals have access to good housing since it has implications. To ensure access to good housing, it is the responsibility of governments to guarantee that everyone can exercise their right to live in peace, security, and dignity (United Nations (UN), 2017). The growing trend of urbanization in Asia and sub-Saharan Africa, however, makes it impossible for governments to guarantee safe housing for the increasing urban population. The general housing conditions in these regions vary by the economic status of the household and this has implications for the health and wellbeing of the population. For the rural settlements, it is difficult for government to ensure decent housing for the population because poverty levels are high and they cannot afford rent rates even when it is subsidized.

Housing conditions play a key role in individual health status, as a wide variety of housing features have been reported to impact the physical, economic, social and the mental well-being of occupants (Turunen et al. 2010). Housing provides protection against communicable diseases, injury, poisoning, and chronic diseases, and reduce psychological and social stresses to a minimum (World Health Organization (WHO), 1990). A healthy housing environment is one that provides decent livable dwellings, clean surrounding of minimum acceptable standard of space and environmental health. Unhealthy or poor housing conditions are factors of housing that increase the risk of getting infected by disease causing microbes or conditions that pose a looming danger of an adverse condition to the health and well-being of the occupants (United Nations International Children's Emergency Fund (UNICEF), 2010).

Diarrhoea is one public health issue that is related to housing and living conditions such as the environmental conditions and water quality (Ozkan et al, 2007). Diarrhoea is the second leading cause of death among children under 5 years (WHO, 2017). About 1.7 billion cases of diarrhoea occur annually worldwide, resulting in about 525,000 deaths in children (WHO, 2017). Globally, diarrhoeal diseases are among the greatest causes of mortality in underdeveloped countries (Fewtrell et al, 2005), where they are more prevalent and can be fatal especially among young children (Rheingans M, 2006). The transmission of diarrhoea comes about by a complex process of many determinants but about 88% of diarrhoeal deaths are as a result of the use of unsafe water, poor hygiene and unsuitable sanitary conditions (UNICEF/WHO, 2009). That is the reason why the provision of safe or quality water in adequate quantity, the proper disposal of domestic waste and the promotion of good sanitation in localities are necessary actions that should be taken to prevent diarrhoea in children (UNICEF/WHO, 2009).

Worldwide, 780 million people lack access to improved drinking water and 2.5 billion individuals on the other hand lack improved sanitation. This has made diarrhea due to infection a very widespread phenomenon especially amongst developing countries (WHO, 2017). In the developed world, diarrhoeal deaths are rare and so the effect of these diarrhoea diseases outcomes are usually quantified by their financial implications. In the United States of America for example, children under five years encounter about 25 million episodes of diarrhoea illness and there are 200 000 hospital admissions every year. This contributes to 4% of all admissions (average cost US\$2307) and 2% of outpatient visits at about \$50 a time (The Lancet, 2016). Children in low-income countries experience an average of three episodes of diarrhea yearly and each episode deprives children of the adequate nutrition they need to develop, and malnourished children more likely have repeated episodes of diarrhoea (WHO, 2017).

In Ghana, Binka et al; (2011) reported that diarrhoea is responsible for 25% of mortality in children below five years of age, with more than 9 million occurrences annually. Notwithstanding the fact that diarrhoea is common, its prevalence in urban and rural areas are 10.5% and 12.8% respectively. Even though diarrhoea is quite common, it greatly affects under five children of specific risk groups with the highest prevalence observed among children from 12–23 months (16.8%). It is lower among female (10.2%) than male children (13.1%) (Ghana Demographic Health Survey (GDHS) 2014). It has been observed that diarrhoea is most prevalent in the wet season in Ghana (Addy et al, 2004). Activities such as drinking from contaminated sources of water, poor feeding practices and sanitation, poverty and illiteracy account for the freight of the disease. At the individual level, parents who reported diarrhoea among their children suffer helplessness, mental and physical exhaustion, loss of sleep and disruption of daily domestic and economic routine during the period their children were ill.

Diarrhoea disease is not only a burden on individuals but even a greater burden on national budgets. Ghana spends about US\$33 million directly or indirectly on diarrhoea alone per annum (Binka et al. 2011, Asenso-Okyere et al. 1998).

There is evidence showing that children are the most vulnerable and most importantly, more exposed than adults to unfavourable environmental conditions that result to adverse health outcomes such as diarrhoea. This study takes a closer look at housing conditions like source of drinking water, toilet facilities, walls and floor materials in households in Ghana. Furthermore, results from the study will inform recommendations that will aim at reducing diarrhoea prevalence among children under 5 years in Ghana.

Housing conditions as relevant as it is in the well-being of the human, it has however not been given the needed attention on a global scale. The need for this to be looked at is even more paramount in the African continent considering the rapid economic growth and for that matter growth in housing. Poor housing conditions (including water and sanitation) is directly linked to outcomes (including diarrhoea) that increased the risk of a child dying (Tusting et. al, 2020).

## **1.1 STATEMENT OF THE PROBLEM**

Deteriorating physical characteristics and limited access to social services are said to typify a substantial number of the housing types in Ghana (Brammah and Lawson, 2014). The impact of these on vulnerable groups such as children remains largely un-researched. The factors that impact on a child's life include family income, effective parenting, and a safe and secure environment. These factors are all directly or indirectly influenced by a family's housing conditions (Harker, 2006). At the United Nations World Summit on Children in 1990, governments were encouraged to develop interventions that help and protect children. For an

enhanced healthy life, characteristics such as clean water, decent toilets and good hygiene are very significant. Unfortunately, access to good drinking water and decent toilet are a major problem especially in developing countries.

One out of three people on the planet lack decent toilet of their own and, one in nine people do not have access to good drinking water near their home (WHO/UNICEF Joint Monitoring Programme (JMP) Report, 2017). Dirty water and poor toilets leading to diarrhoea kills a child under 5 every two (2) minutes. In sub-Saharan Africa about 23% of the population do not have access to toilets while 31% with toilets use facilities that are not connected to a formal sanitation system (Mooyoung and Shervin, 2018). This means that more than half (570 million people) of the sub-Saharan African population do not have access to proper sanitation.

Ghana, like many other sub-Saharan nations, has problems with poor sanitation and it can be linked to poverty. Poverty is coupled with the lack of adequate housing, overcrowding, inaccessibility to adequate and safe drinking water, lack of refrigerated storage for food, sanitary disposal of fecal waste and cohabitation with domestic animals that may carry human pathogens, all of which increase the occurrence of diarrhoea (Keusch et al., 2006). These challenges are further exacerbated by rapid urbanization.

According to (Water Sanitation and Hygiene (WASH), 2012) about 16 million Ghanaians use shared latrines, and 4.8 million practice open defecation because of lack of good toilet facilities. The poorest citizen is 22 times more likely to practice open defecation than the richest. UNICEF, in 2014, noted that diarrhoeal disease mortalities caused by open defecation, killed 247 people including children in Ghana. Access to household toilet facilities in the country remains limited to 18% in urban households and only 9% in rural households. This means that in Ghana, only 1 in 7 people have access to toilet facilities. Despite several attempts by successive governments in

Ghana to sanitize public and open spaces, there are frequent uses of the city's main beaches and open spaces in communities as defecation grounds. Children, who happen to play around these open spaces, may encounter diarrhoea causing bacteria either through direct contact, or through hand to hand transmission by their peers and through many other routes (Songsore and McGranahan, 1993). Among adults, diarrhoea disease may lead to a decrease in productivity and cost the nation millions of cedis each year. For instance, the incidence of diarrhoeal diseases among children affect their parent's productivity. This is because, they may frequently have to interrupt their work in order to attend to their sick child. Also, the capability of providing nutritional balanced diet or fortification of child's meal when he or she has diarrhoea in order to reduce and restore loss nutrients is also lacking in many households in developing countries including Ghana. Hence, these children barely provided with upright preventive care, they suffer from seemingly unending series of infections and usually visit the health facility after when illness is critical (World Bank, 2006).

Early childhood diarrhoeal disease may cause growth and physical impairment among children. Frequent occurrence of diarrhoea among children may lead to cognitive development defects, and this may also lead to lower human potential and productivity in the future. Above all, diarrhoea mortality and morbidity of children below the age of five years causes both emotional and psychological pain to the household and the community at large.

From Bradley (2006), to satisfy the good health of children, parents or guardians must provide an enabling environment that provides the safety, sustenance and other health-promoting supports needed. At the national level, the 1992 Constitution of Ghana, specifically Article 28, Section 1(d), stipulates that children and young persons must receive special protection against exposure and physical and moral hazards. Also, the Children's Act 560, 1998 provides for the best interest

of children and protects the survival, protection and development of the child (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2000; Government of Ghana, 1998). Despite the acknowledgement of the fact that children need to be given special protection from physical conditions that can be detrimental to their healthy development in the laws of Ghana, very little is done to implement and enforce the law. This study identifies the main housing conditions that lead to the persistently high prevalence of diarrhoea among children in Ghana. This will inform policy makers and development partners to know where interventions can be targeted in order to achieve the maximum desired outcome.

## **1.2 RESEARCH QUESTIONS**

The study answers the following questions:

- i. What is the relationship between housing conditions and the prevalence of diarrhoea in Ghana?
- ii. What are the sociodemographic factors that affect diarrhoea in Ghana?
- iii. What recommendations can be made to contribute to already existing national housing policies that aim to reduce the diarrhoea prevalence rate, especially among vulnerable populations such as children in Ghana?

## **1.3 OBJECTIVES**

The main objective of this study is to examine the relationship between housing conditions and the prevalence of diarrhoea among children in Ghana to contribute to the discussion on improving child development through the provision of quality houses, access to improved sanitation, and facilities for recreation. Specifically, this study seeks to:

- i. Investigate the relationship between housing conditions and diarrhoea in Ghana

- ii. Examine the relationship between some selected socio-economic and demographic factors and how they affect diarrhea incidence among children under five years in Ghana.
- iii. Make recommendations that can help improve the health outcomes of children in low income households.

#### **1.4 RESEARCH HYPOTHESIS**

- Children below five years from households with poor housing conditions are more likely to experience diarrhoea than those from households with good housing conditions.
- Children of mothers with higher education are less likely to experience diarrhoea compared to children whose mothers have no education.
- Male children below five years are less likely to experience diarrhoea compared to their female counterparts.

#### **1.5 RATIONALE**

In developing countries like Ghana, diarrhoeal disease has been identified as a crucial public health issue (Kosek et al., 2003). Studies have shown that prevention of diarrhoea is possible (see Mokomane M et al., 2017, Bhattacharya SK, et al., 2003, Martinez CA, et al., 1988). Lack of proper or adequate housing conditions contributes to the world's disease burden particularly diarrhoeal diseases (WHO, 2017). Governments invest in infrastructure like community boreholes, sewage systems, waste dumpsites etc., and employ sanitation experts to concentrate on helping people to enhance their own sanitation and to change their behaviors. This has come about, in efforts to impact not only on health and to reduce the occurrence of diarrhoea disease, but on economic and social developments especially in developing countries (Mara et al., 2010). In Ghana, housing conditions and living standards are greatly affected by population density. The urban population in the country grows at an annual rate of 3.4% (GSS, 2016), putting a lot

of pressure on the housing infrastructure in urban areas. While there have been several studies on diarrhoeal disease in Ghana (Tetteh, 2013, Anim-Larbi, 2017, Ameyaw et al., 2017), there has been little effort in most of the studies to critically examine the effects of housing conditions such as household source of drinking water, the availability of proper sanitation facilities, material used for the wall and floor of the house on diarrhoeal disease especially among vulnerable groups such as children under 5. Thus, a study to examine the relationship between housing conditions and diarrhoea prevalence will help to identify and possibly isolate the most important factors that influence the incidence of diarrhoea. This is especially important in the face of limited resources available to the Ghana government to address the issue of diarrhoea incidence among children.

This study identified children as the most vulnerable sub-population in order to help design effective programs and policies to tackle the diarrhoea menace. This study is of utmost importance because it identifies the kind of housing conditions that has the strongest influence on the incidence of diarrhoea in the household. This goes a long way to offer a more targeted approach to tackling the uncomfortably high morbidity and mortality rates especially among children. As a nation with limited resources, interventions need to be well targeted so that budgeting and judicious use of funding from donors and the national coffers is more assured.

Even though significant strides have been made in the achievements of the sustainable development goals, the world seems to be off-track in the achievement of the health related goals. There is a staggering 31 year gap between the countries with the highest and lowest life expectancies (UNDP-SDG 3). This is likely due to the uneven nature of progress among the developed and under-developed countries. This study will expose some key areas and suggest approaches that are essential to address inequalities and to build good health for all.

## **1.6 ORGANIZATION OF THE STUDY**

The study is organized into six chapters. The first chapter comprises the background of the study, the statement of the problem, research questions, the objectives and the rationale. The second chapter discusses the literature review of the study. It also discusses the theoretical framework, conceptual framework and the hypotheses. The chapter three talks about the methodology. In chapter three the data source, sampling method and the limitations of the data are discussed. This chapter also gives a brief description of how each variable was measured. The methods of analysis that were employed are also discussed in chapter three. In chapter four, univariate and bivariate analyses were conducted. At the univariate stage, each variable was discussed into detail with the aid of appropriate diagrams. At the bivariate stage, the main dependent variable was analyzed by pairing it with each independent variable using the SPSS software to demonstrate the relationship that exists between them. Tables and diagrams were used appropriately to help explain the relationships. Chapter five presents the multivariate analysis by running the main dependent variable against multiple independent variables to be able to establish the kind of relationships that exist between them. This enabled the study to identify the principal factors among housing conditions that produced the strongest relation with diarrhoea. Finally, chapter six provides a summary of the study findings, conclusions and some policy recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

This chapter entails information gathered by other researchers on areas that are related in one way or another. The information was basically taken from secondary sources such as research articles from online journals, internet websites, textbooks, as well as other equally relevant sources.

#### **2.1 Definition of Housing**

Protection is one of the basic needs of human beings, not only from fellow humans and animal dangers but from adverse weather conditions as well. This need has enabled human beings develop a "derived need" in the form of shelter or housing (Malinowski, 1960). Therefore, housing is a cultural response to the natural or biological need for protection. As civilization evolves from simple hunter-gatherers to agriculturalists, and then to advanced industrialization, there are unique dwellings or houses which vary by culture, by economic status, by topography and climate. Archaeologists provide evidence that primitive people lived in natural shelters such as caves and rock shelters. Early human beings accepted caves as housing, perhaps because they were already made and required minimal or no improvements. In areas with no caves, simple dwellings were built based on the availability of basic resources and the needs of that population (Centre for Disease Control (CDC), 2009). The earliest and, the simplest man-made physical housing structures were the crescent-shaped windbreaks. Otterbein (1977), based on the findings of Murdock (1934), reported that, the no longer existent crescent-shaped structures were characteristic of the native dwellers of Tasmania. In a report by Gluck (1973), it is believed that the Mbuti people of Zaire were the originators of the dome-shaped structures which are among the earliest built forms of houses in Africa.

UN-Habitat (2012) defines adequate housing as one that provides adequate space, assures physical safety as well as protection against the cold, heat, rain, damp, wind or other threats to health and structural hazards. The choice of a type of housing varies due to economic, geographic and socio-cultural factors. These factors affect the living conditions of people who dwell there. Research has shown that the immediate environmental conditions has a direct link to the health status of people. Wilkinson (1999) noted in her summary of a study on “poor housing and ill health” that there is a correlation between poor housing and ill health. Attempts to prove that poor housing actually causes ill health have often failed because perhaps the research field is characterized by weak, and sometimes contradictory empirical findings. Wilkinson (1999) pointed out that a range of diseases appear to be more prevalent. They include, aches and pains, nerves, diarrhoea, headaches and fever, wheeze and other respiratory problems

Throughout human civilization, patterns of urbanization have been strongest in proximity with large water bodies (Silver et al., 2019). It is understood that this was initially just to meet the water and food needs of the large population. However, due to the industrial revolution, the trend of urbanization along waterways has continued because large water sources are needed to sustain the industries. Not only do many businesses require large quantities of water to manufacture products, but they also depend on oceans and rivers for the transportation of goods. This is partially why 75% of the world’s largest urban areas are in coastal regions. Because industrialization leads to economic development, the demand for improvement in living standards such as education, housing and public workers shoots up urban areas. With the reason being that businesses begin to look for innovative ways to increase productivity just as the workforce also seeks greener pastures. Once an area is industrialized, the trend and process of urbanization continues for a long period as there is an improvement in communication and

transportation since the area continues to go through stages of social and economic rectification. The influx of migrants allows congestion, pollution, disease and crime to become prevalent issues in all urbanized areas while town planning authorities and dwellers similarly seek new solutions to the problems. This phenomenon often impacts badly on the living conditions of the working-class migrants due to rise in cost of accommodation and general living. With time migrants' resort to squatter settlements and set up slum communities which are usually built from flimsy materials like used cardboards, plastic bags, sticks etc. Living in crowded houses and cramped apartments with poor ventilation and no access to basic water and sanitation facilities results in rampant disease occurrence, with typhoid and diarrhoea being common.

In the developing world, a crucial agent of child's morbidity leading to mortality is diarrhoea (WHO, 2017). Diarrhoea disease is mainly caused by microbial agents usually transmitted through food and water contaminated with human faecal matter (Kung'u et al., 2002). Kosek et al. (2003) have estimated that diarrhoea accounts for 21% of all deaths of children under five years of age and causes 2.5 million deaths per year. Back in 1992, Bern and his colleagues documented that a child experiences an estimated 2.6 episodes of diarrhoea each year. Furthermore, WHO (2018) estimated one billion episodes of diarrhoea with approximately 500,000 deaths among children worldwide. Children in least and mean income countries like Ghana have an average of three episodes annually (WHO, 2018). In 2017, WHO noted that, despite improvements in efforts to stop diarrhoea, deaths due to diarrhoea disease has increased by 65% since 1990.

McCormick and Lang (2016) indicated that, diarrhoea morbidity outcomes are significantly associated with poverty and other sociodemographic factors. The burden of the disease is disproportionately concentrated in regions characterized by low resource and slow developmental

progress such as sub-Saharan Africa (UN, 2017). Prior studies (Teran, 1991; Diame et al., 1990; Timaeus and Lush, 1995) have indicated that factors such as level of maternal education, age of the child, quality and quantity of water, feeding practices, housing conditions, the general level of hygiene, place of residence, household economic status and availability of toilet facilities in homes affect the subjection to diarrhoea causing microorganisms. Diarrhoea diseases has a higher prevalence among poor households living under conditions of poor personal and domestic hygiene (McGranahan et al., 1999). Timaeus and Lush (1995) found lower diarrhoea morbidity and mortality among children from wealthy homes in the developing world.

In Ghana, despite numerous interventions, diarrhoea rates remain high with an estimated 113,786 cases reported among children below five years old (GHS, 2011). Tetteh and colleagues (2018) revealed that diarrhoea is among the top ten health conditions from out-patient records. Statistics from the Ministry of Health show that diarrhoea accounts for 84,000 deaths yearly with 25% being children under five years (Ghana News Agency, 2003). This study analyzes the various housing conditions that may or may not play a role in the incidence of diarrhoea morbidity especially among children under 5.

## **2.1 HOUSING CONDITIONS**

Human society has gone through a process of development from a primitive era to an industrial based system. This process has made social policies both necessary and possible. Pre-industrial social bonds (groups, family, church etc.) have been severed by industrialization, urbanization and individualization. This emergence of modern economic development also propelled a transition from subsistence to prosperity (Wilensky et al., 1987).

Throughout history, people have made houses that fit their surroundings (Richman-Abdou, 2017). Access to tools, type of climate and availability of building materials has put people in a

constant spiral to transition from one type of housing to a modern one (UN-Habitat, 2015). Economic (individual or national), geographic/environmental (vegetation, weather condition, land form, proximity to water bodies, etc.), socio-cultural (traditional village setting, amazon forest, extended family system, etc.) factors influence the choice of type of housing that can be found all over the world (UN-Habitat, 2015).

To many people, a house might be just a four-walled fixture on a permanent foundation but to others in various parts of the world, it could be a cave, a car, a floating boat, a tree house or even an icy sanctuary. A profile of housing types around the world by the national geographic team in 2012 provides an overview of how environmental conditions have influenced shelter. In south-east of Asia, communities of silt houses can be found even though there is prevailing heavy down pour (rain). These are homes that are raised high above the ground on planks so that the inhabitants are protected from flooding and invading vermin such as snakes and insects. These stilt houses are also present in the western hemisphere where homes are faced with high risks of hurricane damage. A south Australian town called Coober Pely is renowned for its habitats being built beneath the earth by way of constructing special dugout shelters. According to the Smithsonian magazine, these special underground houses are a safe haven from the high summer temperatures that could reach as high as 113 degrees Fahrenheit and occasional dust storms. Igloos are also special structures that are skillfully built from insulating and compressed snow such that these icy accommodations keep inhabitants warm by blocking out the harsh winds and also housing a small fire. Igloos are historic and cultural houses commonly found in Baffin Island, Canada and other snowy, North American places (Richman-Abdou K., 2017). While like the rest of the world, most people in London live in structures built on land, some others live on

boats floating on the regent's canal. This community of boat dwellers have opted for this less expensive alternative to London's pricey homes and flats.

Natural disasters have influenced the type of structures in places such as Bangladesh and Japan. Due to rampant disasters such as cyclones Sidr (2007) and Aila (2009), the governments of these countries have initiated an innovative type of housing where houses are designed to be built very quickly after experiencing a disaster. This is facilitated by using construction materials that are locally available from the surrounding environment. In Thailand, many houses are made of wood and bamboo with posts raising them from the ground. In Sub-Saharan Africa, houses that are most found in rural communities differ greatly from those found in urban areas. Huts made from clay, sticks, animal dung, and straw are common in rural communities. In Rwanda where most of the population lives in rural areas, houses are often made of mud, grass and banana leaves with clay tiles and thatch used for roof. Traditional Ethiopian houses are round and made of wooden strips covered with clay, sand, animal dung and straw. The Maasai tribe of Kenya live in small groups of houses made from mud, cow dung and sticks. This is probably because Kenya is mostly covered by savanna vegetation. Their homes are grouped together in a compound to protect them from wild animal attacks. This type of traditional housing is called "Manyatta". Similar types of houses are also common in rural communities in the northern part of Ghana. Nzulezu which means, "surface of water" is a popular place in Ghana where the community has adapted to life for centuries on a lagoon by building homes that sit stilts. Traces of colonial rule can be seen in places such as Elmina in the central region, Ga-mashie in Accra and Bantama in the Ashanti region as a lot of the houses are of colonial architecture.

The United Nations projects that, over the next two decades, 90% of urbanization will take place in developing countries, whose total populations are expected to grow by almost 70 million each

year. Unfortunately, growth due to urbanization has not been matched by adequate growth in the supply of decent housing. Recent studies have shown that, as populations double, urban land consumption triples and cities get caught up in a cycle of sprawl (Angel et al., 2005). Businesses and residents seek cheaper land and locate farther and farther away from the central core. Rich and poor urban residents alike must choose between long commutes or excessive income spent on housing. Meanwhile, lack of financing, outdated building regulations, unpredictable property tax burdens, and unaffordable land prices adds up to the urban life hustle. In fast growing urban areas such as most sub-Saharan African countries, housing has become very expensive and so the poorest in the society have little choice than to settle in slums regardless of the implications it might have on their health and wellbeing. The lack of access to housing and land is why many of the world's poorest residents are often found living on hillsides and in flood plains, along railroad tracks, in waste dumps and in densely packed slums (Green, 2009).

Housing tenure systems and policies are useful to ensure best practices under which housing in a country is owned, rented, financed, subsidized, serviced, regulated, planned and built. Decent and affordable housing provides access to education for children and access to jobs for adults. People who live free from the fear of sudden eviction are more capable of investing in improvements in their homes and livelihoods which leads to increase their economic prospects. The impacts of adequate and affordable housing are communitywide, contributing to the economic development of distressed neighborhoods and to economically vibrant and successful communities. Besides that, stable, secure housing is a platform for providing services to vulnerable populations, such as the elderly, children, people with disabilities and people living with HIV/AIDS. In more developed countries, access to credit allows middle- income households to buy or rent, and legally own, completed units fully serviced by water and

electricity and provided by private builders and developers. To the contrary, in many developing countries, formal housing markets and informal markets function side by side. Some credit may be available, but often it is for higher-income households. The poor often build incrementally, adding rooms or floors as resources permit. They do so with no access to formal financing, in violation of zoning or building codes, and often on land not legally owned.

Good housing policies in the most developed nations such as Japan enable densely populated cities like Tokyo to be characterized by high rising buildings to make maximum use of the decreasing space without compromising the health and safety living standards of the population. Such judicious use of space is also seen in the housing system in England where most homes are in small blocks of flats. In contrast, bad or ill-considered housing policies in most developing countries, result in a city composed of mostly low-rise buildings with densely packed “illegal” slums, and land and housing costs beyond the reach of much of the population. Likewise, it is common for cities to acquire overly ambitious plot sizes and road widths by taking away rural lands for urban purposes. Industrialization and real estate developments are good but they end up raising the cost of living and make accommodation too expensive for low-income residents. Meanwhile poor residents and households who typically earn irregular incomes from periodic employment or informal jobs are not viewed by bankers as good prospects for mortgages.

The housing sector in Ghana has noticed a remarkable modernization relating to housing types, design and architecture (Afram, 2009; Wellington, 2009). The growth impact of development in order to fit in internationally has to an extent led to the initiation of such imported architecture and designs as well as building materials and tools. As a result, the affordability of houses have been increased which in turn affects the accessibility of adequate housing on the part of some population sub-groups. It is most common in the urban areas to find these foreign building

architecture and designs accompanied by increased consumption of energy and other resources (Wellington, 2009). The diverse categories of housing in Ghana were noted in the 2000 and 2010 Population and Housing Censuses. The categories are, semi-detached houses, flats or apartments, compound houses, huts/buildings (same and different compounds), tent, improvised homes (kiosk/container), living quarters attached to office shop, uncompleted buildings and others (GSS). All other types of houses can be described as unofficial and unapproved as they are not captured in Ghana's building codes and regulations with the exclusion of semi-detached houses, flats/apartments, and compound houses. However, unapproved settlements such as huts, tents, kiosk/container, etc. are used as dwelling places, especially in informal sections of the urban areas. Despite the fact that these unapproved dwellings which are sometimes dangerous to be, they are equally counted and included officially in the country's housing stock just like the approved dwellings. A notable housing type is compound housing which is a dwelling unit which accommodates many households sharing facilities such as kitchen, bathroom, toilet, etc. It is the dominant housing type which is also common among the poor and low-income households as cost of accessibility is relatively low.

## **2.2 DIARRHOEA DISEASE**

The world health organization (WHO) defines diarrhoea as the passing of loose stools at a frequency of three or more times in a single day. On an individual basis, it could just be the passage of loose stools more than it is usual. Diarrhoea is usually a symptom of an intestinal tract infection by microbial organisms. The most common mode of infection is by ingestion of a contaminated food or drinking water. It is also not uncommon for people to get infected from other infected persons as a result of poor personal hygiene (WHO, 2017). The incidence of childhood diarrhoea is high for households who share their toilets with more than five other

households. High sharing of toilet creates unsanitary and unkempt conditions which provide enabling environments for vectors and pathogenic organisms associated with diarrhoea infection, and also increases the possibility of transmitting pathogens from one infected household to others. Songsore and McGranahan (1993) also found that sharing toilet with more than five households increased childhood diarrhoea by more than two-fold. Open defecation creates potential dangers of infections from faecal pathogens in contaminated grounds. Children who play on grounds contaminated with faecal matter risk contracting diarrhoea. Similar studies in the past found more than two-fold increase in childhood diarrhoea prevalence due to open defecation (Songsore and McGranahan, 1993). In addition, most pathogens that cause diarrhoea share a similar mode of transmission from the stool of one person to the mouth of another and it is known as fecal-oral transmission.

At any given time, close to half of the urban populations of Africa, Asia, and Latin America have a disease associated with poor sanitation, hygiene, and water, (WHO 1999). A policy report in a forum conducted by PLoS Medicine, in a series on water and sanitation, reveals that, of all human waste, faeces are the most dangerous to health. The report indicated that, one gram of fresh faeces from an infected person can contain around  $10^6$  viral pathogens,  $10^6$ – $10^8$  bacterial pathogens,  $10^4$  protozoan cysts or oocysts, and  $10$ – $10^4$  helminths eggs. The main fecal-oral disease transmission pathways are demonstrated, which illustrates the importance of particular interventions, notably the safe and proper disposal of faeces, in preventing diarrhoea disease transmission, (Mara et al. 2010). The same report also revealed that, the diseases associated with poor sanitation are particularly correlated with poverty and infancy, and this alone contributes to about 10% of the international burden of disease. It is important to mention that the provision of a decent toilet facility in houses has led to some significant reductions in the diarrhoea disease

incidence. Daniels et al. (1990) found a reduction of 24% diarrhoea incidence associated with latrines in Lesotho. Esrey et al. (1991) found some reductions in diarrhoea disease in 21 out of 30 studies. The greatest reductions were associated with flush toilets, although pit latrines also had positive impacts. Compared with flush toilets and pit latrines, public latrines, bucket latrines and the Kumasi ventilated improved pit latrine (KVIP) show high incidence of diarrhoea. Notably, public latrines are generally unhygienic and unhealthy for children due to the presence of flies and dirty floors. Children who are not accompanied by adults to public latrines may be tempted to pick up used tissues on the filthy floors for cleaning after defecating. Bucket latrines are associated with operational deficiencies, poor hygiene, repugnant smells and flies.

### **2.3. HOUSING CONDITIONS AND DIARRHOEA DISEASE**

Recently there is a growing interest in the subject matter and thus volumes of research literature on the influence of living conditions on the health of occupants (Braubach & Bonnefoy, 2001; Mackenbach & Howden-Chapman, 2002; Thomson et al., 2003). However, housing conditions and health outcomes have not been well comprehended in relation to the positive and negative effects on health and well-being (Lawrence, 2000). Over the years, there has been a call for a more focused research into housing conditions and health, integrating the mental and social components of housing as a fundamental setting for human habitation (Dunn, 2000; Williams, 2002).

Ideal housing conditions represent a safe physical harbor for the inhabitants, and as a “special place”, it mentally provides a retreat from the outside world and its pressures (Rapoport, 1995). Thus, a more holistic approach is needed to understand the wide range of interactions between place and health (Williams, 1998). Akinbamiro in 2012 recommended public health campaign, wider coverage of waste removal agency and public sector intervention in the form of improving

access to housing fund for rehabilitation, renovations and redevelopment. This was after he found significant relationship between the health status of residents and housing quality measured in terms of waste disposal method, frequency of collection, management of waste water, type of toilet, the current physical condition and the types of the building's materials, adequacy of electricity and type of kitchen. However, a housing and health symposium arranged by WHO in June 2001 showed that next to the awareness, the priority of problems differs strongly from country to country, as they are influenced by cultural, social, economic, building, climatic and geographic factors (WHO, 2001). Therefore, solutions to reduce or remove hazards will vary internationally depending on the cause and on building factors in different peculiar environments.

The World Health Organization millennium project which focused on improved water and sanitation for health revealed that, 88% of diarrhoeal diseases is as a result of consumption of unsafe drinking water, inadequate sanitary conditions, and poor hygiene. It also revealed that diarrhoea morbidity is reduced by around 21% through improved water supply and by about 37% through improved sanitation (Bartram et al., 2005). Another study looked at diarrhoea prevalence by comparing Demographic and Health Survey data from 14 Sub-Saharan African countries. The results show that shortage of rainfall in the dry season increases the prevalence of diarrhoea across Sub-Saharan Africa. The results also show that an increase in monthly average maximum temperature raises the prevalence of diarrhoea while an increase in monthly minimum temperature reduces diarrhoeal illness (Bandyopahdyay et al., 2011).

A longitudinal study in urban Brazil found that the major risk factors for diarrhoea in the first three years of life were low socioeconomic status, poor sanitation conditions, presence of intestinal parasites, and absence of prenatal examination. The study concluded that diarrhoea

disease rates could be substantially decreased by interventions designed to improve the sanitary and general living conditions of households. (Mara et al., 2010). Furthermore, investigations from various parts of the globe indicated that the presence of excreta in the yard of a household, lack of latrines, absence of refuse disposal pit and having no or inadequate excreta disposal facility were associated with higher diarrhoea morbidity.

In Ghana, shelter is one of the most critical challenges currently faced by the majority of both urban and rural dwellers. This, according to the Draft National Housing Policy (GoG, 2009), is attributed to rapid population growth and the increasing urbanization trend. Consequently, overcrowding, poor housing quality, and lack of access to adequate sanitary facilities and water to meet the daily physical needs are the main characteristics of most of the houses in the country (GoG, 2009; UN-Habitat, 2010).

Diarrhoea disease is a critical health condition of significant public health concern in developing countries due to rapid urbanization as it is associated with problems of decent housing and poor access to wholesome drinking water. A study on diarrhoea morbidity in the Accra Metropolitan Area by Boadi and Kuitinen (2005) revealed that, a household's access to a toilet facility showed a significant association with diarrhoea morbidity. Lack of access to a toilet facility is associated with high prevalence of diarrhoea. The study also concluded that, the greatest reductions in diarrhoea disease incidence are associated with improved toilet facilities such as flush toilets and pit latrines (Boadi and Kuitinen, 2005). Worldwide, 2.1 billion people have gained access to improved sanitation. Despite progress, over 2.4 billion are still using unimproved sanitation facilities, including 946 million people who are still practicing open defecation. Ghana, in 2017 was counted among the top ten countries without access to decent toilet facilities in the world

(WaterAid, 2017). This has consequently ensured Ghana to be named among the top ten nations that engage in open defecation.

The availability and accessibility to improved drinking water is an important aspect of the health of household members. The Millennium Development Goal 7 (MDG 7) of the UN aimed to reduce by half the proportion of people without sustainable access to safe drinking water by 2015 based on 1990 levels. The source of water supply, particularly for drinking has a tremendous effect on burden of diseases. For instance, one of the main health benefits of clean drinking water supply is a reduction in diarrhoea (GSS, 2010).

In Ghana, water sources are classified as 'improved' or 'unimproved'. Sources considered as improved are piped water into homes, public standpipe, borehole, protected (lined) dug-out well, protected spring, and rainwater collection whereas unimproved sources are unprotected wells and springs, vendors, and tanker-trucks (WHO and UNICEF, 2000). A major characteristic of Ghana potable water supply is the unequal distribution across metropolitans, municipalities, districts and between urban and rural areas. According to the Ghana statistical service, in 2000, more than half (51.2%) of households in metropolitan areas using pipe-borne water inside their dwelling as a main source of drinking water were in Accra metropolis and this has reduced to less than one-third (31.9%) within ten years (2010). Meanwhile, in 2000, households in metropolitan areas using pipe-borne water inside dwelling as a main source of drinking water were a little over one third (36.3%) in Kumasi metropolis and this increased to 43.4% in 2010. This implies that individual households in Accra metropolis have shifted to other means of drinking water including bottled water (59.6%) and sachet water (74.1%). The proportion of urban dwelling units that used pipe borne drinking water within the dwelling was 92.4% in 2010, representing a slight increase over the 2000 figure (91.6%). The proportion of households using

water supplied by a tanker/vendor in urban dwellings also increased from 71.1% in 2000 to 80.6% in 2010. On the other hand, the use of water from rivers/streams and dugout by rural households in 2000 (86.7% and 85.7% respectively) increased in 2010 (89.9% and 89.5% respectively). This shows the worsening situation in rural areas where high proportions of households still depend on rivers/streams and dugouts as their source of drinking water which could lead to increases in waterborne diseases such as diarrhoea (GSS, 2014).

Some studies have suggested that households whose main floor material is unimproved such as earth or soil are usually contaminated with faeces carried by foot wear, animal feet, flies and human feet (Ngure et al., 2013; Marquis et al., 1990). Such floors most often serve as a pathway to faeco-oral transmission of diarrhoea to children who are below five years especially those who play on the bare ground. When the floor of a house is made of improved materials like cement slabs, tiles, carpets etc., it is easier to clean and reduce or remove possible contaminants. A study by Danquah L. in 2013 to find out the implications of domestic water use on diarrhoea among children, showed that 48.5% of mothers reported that their children often played on the bare ground. Children below five years are the most vulnerable among members of the household because they have weaker immune systems (Mintz et al., 2001), are incapable of washing their own hands and therefore cannot adequately prevent diarrhoea-causing pathogen transfer from their hands to their mouth (Luby et al., 2004). In 2019, Tampah-Naah A. also stated in his journal that, the possibility of children experiencing diarrhoea was higher among those whose house floors were made of unimproved materials compared to their other children in households with improved floor materials. When children below five years crawl or walk about within houses, they are constantly in contact with contaminated floors, walls especially in environments built with flimsy building materials. Yaya S. et.al in 2018 revealed that having concrete walls

and floor influenced diarrheal outcomes for children below five years since there is a higher likelihood of oral contact with contaminated objects in houses with unimproved floor and wall materials. They suggested that making investments in improving living conditions of our immediate environment may by improving the wall and floor materials have some positive effect for child mortality preventions.

In 2018, Abu and Codjoe identified that there is a lack of knowledge due to insufficient research into housing or household conditions that may have a significant influence on the incidence and prevalence of diarrhoea in urban poor Accra. The study further noted that this gap may be due to the fact that available secondary data were mainly hospital recorded cases, and not individual cases at the household level. They recommended a massive educational campaign to encourage the practice of good sanitation among other things as a strategy to reduce the risk of future infections.

## **2.4 THEORETICAL BASIS OF THE STUDY**

### **THE HEALTH BELIEF MODEL**

The United States public health service came up with this model in order to explain and predict health-related attitude or behaviors especially in relation to accepting health interventions or services. The model is useful in developing effective interventions to change certain identified health-related behaviors by targeting key parts of the model's composition (Christopher, 2010). This allows for very effective use of funds as it targets the specific behavior that needs to be adjusted in order to achieve the desired public health outcome.

According to the rural health information hub (RHI, 2020), the health belief model can be used to design short and long term interventions by exploring some key action-related components

that determines the model's ability to identify and make critical changes in behaviors that affect the health of people. First of all, the model conducts a needs assessment so that the most vulnerable sub population is identified and properly targeted for interventions. Luby et al., (2004) noted that not all family members were at equal risk of death from diarrhoea. Anyorikeya and co, in a study in 2016, estimated that 113,786 cases of diarrhea and 2,318 deaths were recorded in Ghana for children under-five years in 2011. These show that children below five years are the most vulnerable population to focus on because they are at a higher risk of getting diarrhoea.

Secondly, the model helps to explain the health implications of the risky behavior or condition in a way that is clearly understood by all stakeholders. Going by this key action point, this study makes reference to other studies that were done in Ghana so that all the variables are discussed in practical terms and in the Ghanaian context, in order to convey the severity of the health problem to the target audience. The main data source for the study is the Ghana demographic and health survey 2014. The GDHS data was collected by fellow Ghanaians who communicated with the mothers or respondents in a language they understood clearly. This study draws attention to some housing conditions that are often overlooked when considering major determinants of the diarrhoea disease in Ghana.

The health belief model also helps in identifying and reducing barriers to interventions while communicating to the target, the steps involved in taking the recommended actions. The model suggests that when people recognize a health issue as severe or serious, there is a higher probability that they will put up measures that will avoid the health problem from re-occurring or at least reduce its severity.

Basically, the health belief model suggests that when people recognize a health issue as severe or serious, there is a higher probability that they will put up measures that will avoid the health problem from re-occurring or at least reduce its severity. This study draws attention to some housing conditions that are often overlooked when considering major determinants of the prevalence of diarrhoea disease among children below five years in Ghana.

## Conceptual Framework

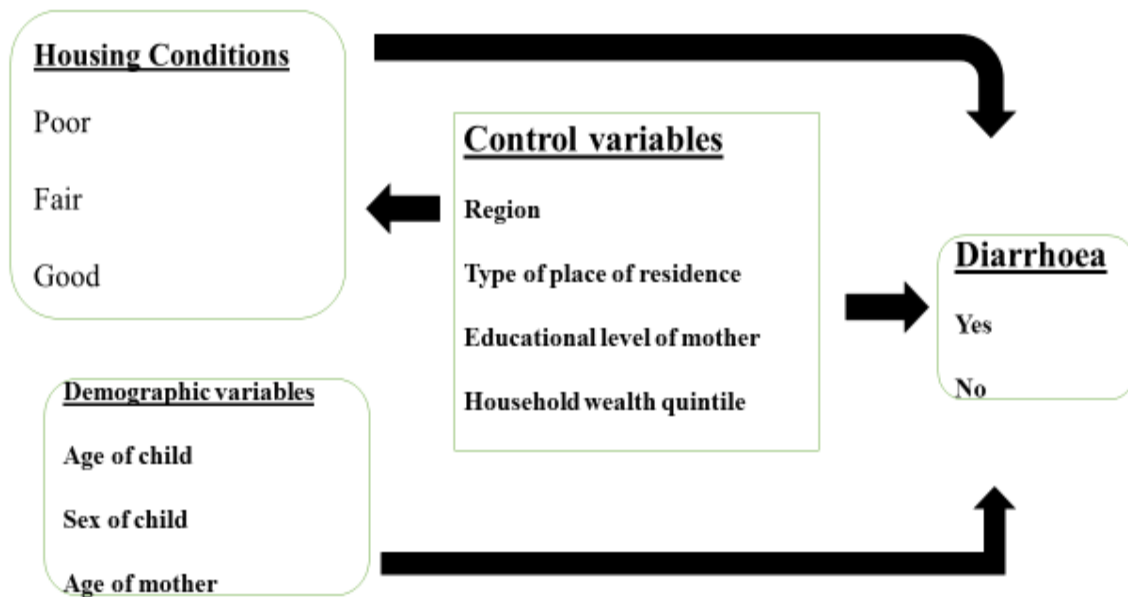


Figure 1: Conceptual framework showing the relationship between diarrhoea incidence, housing conditions, sociodemographic and economic variables

Source: Author’s construct, 2019

The conceptual framework categorizes the various variables of interest into appropriate groupings. The study considered Housing conditions as the main independent variable. The risk of a child experiencing diarrhoea due to housing conditions is dependent on whether the conditions are good, fair or poor. Water source, toilet facility, wall material and floor facility make up housing conditions in this study. Building materials used for house walls and floors

may contain or create the conducive environment for micro-organisms that cause diarrhoea. The reduced or lack of access to improved drinking water sources also tends to limit and affect personal hygiene practices, including hand washing, bathing, washing and cleaning.

Some variables like type of place of residence, region of residence, mother's level of education and the wealth status of the household were considered as controls. The control variables influence the housing conditions under which a household lives and thereby increase or reduce the risk of diarrhoea. Prior literature has established that higher level of education has a reducing effect on diarrhoea incidence and vice versa. Educational level of a mother enables her to engage in best practices that will minimize her child's exposure to diarrhoea. Higher educational level also improves her exposure to a better job and wage which affects assets acquisition and living conditions. Similar to the educational level, the wealth status of the household has a reducing effect on diarrhoea incidence when it is high and an increasing effect when low. It is attributed to the ability of a household own assets and to access proper sanitation facilities, good nutrition, purchasing power and education. Whether a household lives in a rural or urban area influences the likelihood of their children to experience diarrhoea. In rural areas, access to improved drinking water sources is low, and people endure long journeys in order to access an improved source as they walk long distances to fetch water; thereby reducing the amount collected. Even though coverage there is higher in urban areas, population growth due to rapid urbanization presents a growing challenge in further improving drinking water coverage.

The child's characteristics that were considered in the study include the age and sex. Diarrhoea incidence varies with the age of children. Lower risk of infection is observed in infants (below one year of age) and this could be as a result of either the protective effect of breast-feeding or by the fact that very young children spend more time indoors and therefore have reduced

exposure to contamination near the household. Breastmilk contains nutrients, protective antioxidants, hormones and antibodies that boost the immune system and needed by the child to stay resistant. Exclusive breastfeeding of children protects them from infections and other severe illnesses. In contrast, children above the age of one, begin weaning and are introduced to complementary and family foods. At this stage, children are more likely to consume unwholesome and contaminated foods that increases their risk of exposure to diarrhoea. Furthermore, children begin to crawl, stand and walk while holding and picking up objects that are usually ingested and cause infections. Male children are seen to be more prone to the possibility of wondering and venturing off into contaminated surroundings that leads to an increased likelihood of diarrhoea infection. The study also considered the age of mothers of the children. It is widely perceived that young mothers lack the knowledge and experience to adequately cater for and protect children from getting diarrhoea. Older mothers are more likely to possess the experience as they might have had some prior child caregiving experience.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

The philosophical framework within which the research is conducted or the foundation upon which the research is based is referred to as methodology (Brown, 2006). Methodology of a research is the specific procedures or techniques used to identify, select, process and analyze information about a topic. This chapter talks about how a representative sample was selected, how data was collected and how the data has been analyzed. The main source of data, scope of the study, study respondents, the measurement of variables and data limitations are outlined in this chapter.

#### **3.1 BACKGROUND OF THE STUDY AREA (GHANA).**

The Republic of Ghana is located on the coast of West Africa. Its land area sums up to 238,537 square kilometers, and it has three French-speaking countries on its borders. To the east, is Togo, Burkina Faso is to the north, and Côte d'Ivoire to its west. The Gulf of Guinea lies to the south and stretches across the 560-kilometre coastline. The highest elevation in Ghana is mountain Afadjato on the wet of the Volta River and it is 884 meters above the sea level.

Temperatures and rainfall patterns with varying distance from elevation and the coast are Ghana's has peculiar climate. In comparison, the northern section is dry and hot, the southwestern corner is hot and humid eastern coastal area is dry. Annually, the temperature on the average is about 26°C (79°F). There are two distinct rainy seasons in the southern and middle parts of the country, from April to June and September to November. The North is, however, characterized by one rainfall season that begins in May, peaks in August, and lasts until September. Annual rainfall ranges from about 1,015 millimeters (40 inches) in the North to

about 2,030 millimeters (80 inches) in the Southwest. The harmattan, a dry dusty desert wind, blows from the northeast and covers much of the country between December and March, lowering the humidity and visibility, and also creates very warm days and cool nights in the North. In the South, the effects of the harmattan are felt mainly in January.

Ghana, formerly Gold Coast, was the first in West Africa to gain independence from colonial rule under the British on 6<sup>th</sup> March 1957 and became a republic in the British Commonwealth of Nations on 1<sup>st</sup> July 1960 with Accra being the political administrative city of Ghana. The country is controlled by democratic multi-party system with a political leader who is being voted for through an election to be president to rule for four years as a term and can possibly be in ruling for two terms maximum. There is a parliament elected every four years, an independent judiciary.

Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West are the 10 administrative regions in Ghana. The population of Ghana is currently estimated at 27 million in 2014 (GSS, 2013). About 50% of the nation's population is made up by the Greater Accra, Ashanti, Eastern, and Ashanti regions where as Upper East is the least inhabited region, accounting for 2% of the total population of Ghana. The regions are subdivided into 216 districts to ensure equitable resource allocation and efficient, effective administration at the local level (GSS, 2013).

Census conducted in 2010 revealed Ghana's population to be about 24 million but as of 2016, the population was estimated to be about 28 million. About 29% of the population is under the age of 15, while 57.8% of person are aged 15-64. The major ethnic groups in Ghana include the Akans (48%), the Mole-dagbani (17%), Ewe (14%), Ga-Dangme (7%), and others which are not stated (GSS, 2013). From the 2010 census, the proportion of urban dwellers was 51%, whereas

49% being rural folks and about one third of the population was made up of internal migrants, with higher proportion of these being inter-regional migrants (GSS, 2013). The sex ratio was 95 and literacy rate was higher for males (80%) than females (69%).

English is the official language of Ghana but there eleven languages that have the status of government-sponsored languages. They are, Ga, four Akan ethnic languages, two Mole-Dagbani ethnic languages, Ewe, Dangme, Guan and Kassem. Of these languages, Akan is the most widely spoken. Since Ghana is surrounded by French speaking countries, French is widely taught in basic schools as well as in the universities.

Gold, cocoa and more recently oil, form the backbone of Ghana's economy. Ghana's growth target for 2019 is 7.4% mainly to be driven by the industry sector, especially oil, gas and mining (World Bank, 2019). Ghana has several tourist attractions sites such as the Cape Coast and Elmina castles, the Paga crocodile pond, Aburi botanical gardens, Kakum national park among others.

### **3.2 DATA SOURCE**

The main origin of data for this study is the 2014 Ghana demographic and health survey. It is the sixth in a series of national level population and health surveys conducted in Ghana as part of the global Demographic and Health Surveys (DHS) programme. The survey is designed to provide information to monitor the population and health situation in Ghana. The Ghana Statistical Service (GSS), the Ghana Health Service (GHS), and the National Public Health Reference Laboratory (NPHRL) of the GHS executed this survey. Financial support for the survey was provided by the Government of Ghana and many other international developmental partners.

### **3.3 SAMPLING METHOD**

The sampling frame used for the 2014 GDHS is an updated one from the 2010 Ghana Population and Housing Census provided by the Ghana Statistical Service (GSS 2013b). The sampling frame excluded nomadic and institutional populations such as persons in hotels, barracks, and prisons.

The 2014 GDHS followed a two-phased sample design and was intended to allow estimates of key indicators at the national level as well as for urban and rural areas and each of Ghana's 10 administrative regions. The first stage involved selecting sample points (clusters) consisting of enumeration areas (EAs) delineated for the 2010 Population and housing census. The survey selected a total of 427 clusters; 216 and 211 in urban and rural areas respectively.

A household listing operation was undertaken in all the selected EAs in the first three months of the year 2014, and households that participated in the survey were randomly selected from the household listing. About 30 households were selected from each cluster to constitute the total sample size of 12,831 households. All women age 15-49 years who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed. A total of 9,396 women were interviewed from the selected households.

The 2014 GDHS used specific questionnaires such as the woman questionnaire which was adapted from standardized DHS questionnaires to solicit relevant information from the eligible women. The definitive questionnaires were first prepared in English; they were then translated into the major local languages, namely Akan, Ga, and Ewe.

Mothers were asked whether any of their children under five years of age had diarrhoea during the two weeks preceding the survey. If a child had diarrhoea, the mother was asked about feeding practices during the diarrhoeal episode and about what actions were taken to treat the diarrhoea. The survey also provides information on the socio-economic background of respondents such as their educational attainment, place of residence, occupation, marital status, and religion, as well as demographic characteristics like age of mother and sex of child. These were used in analyzing the prevalence of diarrhoea disease among children under the age of five years.

In all, data from 2,761 women was used for this study. In the 2014 GDHS, 9,396 women between 15-49 years were interviewed but only 5,602 of them were mothers. From these mothers, 4,574 had children who were aged up to 27 years. Women were asked whether their children had diarrhoeal disease two weeks preceding the survey, and the last childbirth was of interest for this study. The respondents with non-available information were excluded from the sample. This further reduced the sampled mothers to 2,761 who had children below 5 years.

### **3.4. DATA ANALYSIS**

Analyzing data is defined as the systematic process of applying statistical and or logical techniques to report and illustrate, recap and condense, and evaluate data. Shamoo and Resnik (2003) demonstrated that there are various analytical procedures available that assist research analysts to better explain inferences that emanates from the data concerning the phenomenon of interest. This is a quantitative study and version 20 of the SPSS software was used to analyze the data. Three stages or types of analysis were done. An initial univariate analysis was done to show the descriptive analysis of each of the variables in tables and graphs. Secondly, a bivariate analysis was done to show the relationship between the dependent variable and each independent

variable. Finally, at the multivariate stage, a binary logistic regression model was used to analyze the data.

### **3.5 MEASUREMENT OF VARIABLES**

#### *3.5.1 Dependent Variable (Diarrhoea disease)*

The dependent variable (diarrhoea disease) is used in this study as a categorical variable. It is measured as those whose children suffered from diarrhoea (Yes) and those whose children did not suffer from diarrhoea (No), two weeks prior to the survey. In the 2014 GDHS, mothers were asked whether any of their children under five years of age had diarrhoea during the two weeks preceding the survey. Mothers who answered “yes” to the question are considered as those whose children suffered from diarrhoea and those who answered “no” are considered as those whose children did not suffer from diarrhoea.

#### *3.5.2 Independent Variable*

The main independent variable considered in this study is housing conditions. According to the World Health Organization’s guidelines on healthy housing, good healthy housing design and construction are relevant to enable cleaning and sanitary operations to be efficiently performed. Specifically, floors, walls and work surfaces should be constructed of smooth and impenetrable materials capable of being kept clean always. Also, parts of dwellings should be accessible for cleaning and suitable hygienic facilities should be provided for storing domestic goods, personal belongings, etc. Housing conditions are measured in this study by adopting the composite index method as a statistical tool to measure housing conditions. This study measured this concept by creating composite indexes out of the combination of housing factors made up of the building material for the main wall and floor of structures, household main source of drinking water and toilet facility. The 2014 GDHS asked questions that provide information on these housing

variables. In this study, main household drinking water source, toilet facility, main wall and floor materials were used as proxy to measure housing conditions. These variables were summed up using SPSS into a scale ranging from zero to four. A score of zero and one is categorized as poor housing conditions, a score of two and three is categorized as fair housing conditions while a household score of four is categorized as having good housing conditions. It must be noted before this index was constructed, each of the variables used was recoded to become dichotomous variables.

#### *Main wall material*

In the GDHS (2014), respondents were asked about the type of material used in constructing the main wall of their dwelling units. The responses were grouped into no wall, cane/palm/trunks, dirt, bamboo with mud, stone with mud, plywood, cardboard, re-used wood, cement, stone with lime/cement bricks, cement blocks, covered adobe, wood planks and other. Based on the healthy housing guideline by the WHO, this study categorized the variables as hygienic and un-hygienic. no wall, cane/palm/trunks, dirt, bamboo with mud, stone with mud, plywood, cardboard, re-used wood, covered adobe, wood planks and other were considered as un-hygienic and assigned a value of one (1) while cement, stone with lime/cement bricks, cement blocks were considered as hygienic and assigned a value of zero (0). The wall materials were classified as hygienic and un-hygienic based on their likelihood to be smooth and durable enough for children, impervious to liquids, does not allow for easy attachment of diarrhoea causing microbes, and easy to keep clean.

### *Main floor material*

The 2014 GDHS recorded information on the main floor material of the households as earth, dung, cement, wood planks, parquet, polished wood, vinyl, asphalt strips, ceramic/marble/porcelain tiles, woolen carpet/synthetic carpet, linoleum/rubber carpet, other and not a de-jure resident. For the purpose of this study the variables are re-grouped and measured as, hygienic and un-hygienic. Categories like, cement/concrete, vinyl tiles/linoleum, terrazzo, and ceramic/marble tiles were categorized as hygienic, and assigned the value of one (0), while earth, dung, woolen carpet and wood/wood planks were categorized as un-hygienic and assigned the value of (1). The floor materials were classified as hygienic and un-hygienic based on their likelihood to be smooth enough for children, impervious to liquids, does not allow for easy attachment of diarrhoea causing microbes, and easy to keep clean.

### *Main sources of household drinking water*

Clean drinking water is water used for domestic purposes, drinking, cooking and personal hygiene. Safe drinking water is water considered safe if it meets certain microbiological and chemical standards on drinking water quality. In the 2014 GDHS, respondents were asked the question; what is the main source of drinking water for members of your household? The following answers were provided for respondents: piped water, piped into dwelling/indoor, piped to yard/plot, public tap/standpipe, tube well or borehole, dug well (open/protected), protected well, unprotected well, protected spring, unprotected spring rainwater, tanker truck, cart with small tank, surface water, river/dam/lake/pond/stream/canal/irrigation channel, bottled water, sachet water, other and not a de-jure resident. These were re-grouped and measured as, improved sources of drinking water and un-improved sources of drinking water. According to WHO's Drinking-water Quality Guidelines (4th edition, 2011), improved drinking water source is a

source that, by the nature of its construction, adequately protects the water from outside contamination, from fecal matter. These include, piped household water connection, public standpipe, borehole, protected dug well, protected spring and rainwater collection. Unimproved drinking water sources include, unprotected dug well, unprotected spring, surface water (river, dam, lake, pond, stream, canal, irrigation channel), vendor-provided water (cart with small tank/drum, tanker truck), bottled water (bottled water is considered improved only when the household use another improved source for cooking and personal hygiene) and tanker truck water. Improved was coded as 0 and un-improved was coded as 1.

#### *Type of toilet facility*

In the 2014 GDHS, respondents were asked the question, “What kind of toilet facility do members of your household usually use?” The following responses were provided for the respondents to choose from: flush or pour flush toilet, flush to piped sewer system, flush to septic tank, flush to pit latrine, flush to somewhere else, flush don't know where, pit latrine, ventilated improved pit latrine, pit latrine with slab, pit latrine without slab/open pit, bucket/pan, composting toilet, no facility/bush/field and other. Improved toilet facilities will be measured as: connection to a public sewer, connection to a septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine. A household which uses any of this facility is considered as using an improved toilet facility. The WHO indicates that access to sanitation is measured by the percentage of the population using improved sanitation facilities. Improved sanitation includes sanitation facilities that hygienically separate human excreta from human contact. Access to basic sanitation is measured against the proxy indicator: the proportion of people using improved toilet facilities (such as those with sewer connections, septic system connections, pour-flush latrines, ventilated improved pit latrines and pit latrines with a slab or covered pit). Shared

sanitation facilities are otherwise-acceptable improved sanitation facilities that are shared between two or more households. Shared facilities include public toilets and are not considered improved but rather unimproved toilet facility. Un-improved toilet facilities include, pit latrines without slabs or platforms or open pit, hanging latrines, bucket latrines, open defecation in fields, forests, bushes, bodies of water or other open spaces, or disposal of human faeces with other forms of solid waste. Based on these groupings, improved was coded as 0 and un-improved was coded as 1.

#### *Highest level of education*

From the 2014 GDHS report, mothers were asked the question: What is the highest level of school you attended? The following responses were provided: primary, middle/JSS, secondary/SSS, or higher Education of mother is therefore measured as: No education, primary, middle/JSS, secondary and higher.

#### *Type of place of residence*

In the 2014 survey, the type of place of residence is measured as, rural and urban.

#### *The wealth quintile*

To measure the wealth status of the households that the respondents belongs to, the survey took details on household possessions such as items ranging from visual or audio media (television or radio) to vehicle either cycle or a car, as well as home features like source of drinking water, sanitation facilities, and type of flooring material. Wealth quintile was measured as Poorest, Poorer, Middle, Richer, and Richest.

### *Child's current age*

In the 2014 GDHS, women were asked the question, “how old was child at his or her last birthday?” These were therefore coded into the following for the purposes of this study. Age of child is measured as: Age in completed years as 0, 1, 2, 3, and 4. The ages of children was re-grouped as below one-year-old and those aged between one and four completed years. Children below one year were categorized as infants while children between the ages of one and four, as children. This was done to standardize and investigate the influence of child development stages on their susceptibility to diarrhoea.

### *Sex of child*

The sex of child is measured as male and female.

### *Region*

The 2014 GDHS measured the region of respondents as the 10 administrative regions of Ghana. They are, Ashanti region, Central region, Northern region, Eastern region, Greater-Accra region, Western region, Brong-Ahafo region, Upper east region, Volta region and Upper west region.

## **3.6 LIMITATIONS**

The use of the 2014 GDHS for the study was quite challenging due to some limitation issues. For instance, data on estimates of diarrhoea morbidity is of a cross-sectional nature. The information obtained from the survey only provides data on diarrhoea prevalence in the two weeks prior to the survey, which does not account for seasonality. A longitudinal study would give a more detailed account of variables that could explain some variations in the observations made in this study. A longitudinal study will also be appropriate to give a clearer picture of the pattern or trend of diarrhoea among children over a longer period. For instance the influence or role of the

weather changes on diarrhoea incidence among children. The reason being that the incidence of diarrhoea differs occasionally. Therefore, outcome from the 2014 GDHS should be interpreted with caution. Furthermore, the data does not provide information on other key housing variables, such as frequency of garbage collection, household liquid waste disposal, household place for hand washing and many other key variables which could have been explored or assessed to find their impact on childhood diarrhoea among children up to the age of five years. The data provides information on only toilet facility as the major sanitation variable (for international comparative studies) and this was a limitation to the study. Despite these limitations, the selected variables were enough to yield important findings concerning housing conditions and prevalence of diarrhoea among children under five years in Ghana,

## CHAPTER FOUR

# UNIVARIATE ANALYSIS AND BIVARIATE RELATIONSHIP BETWEEN DIARRHOEA AND HOUSEHOLD SOCIO-DEMOGRAPHIC AND ECONOMIC FACTORS

### 4.0 INTRODUCTION

This chapter is divided into two main sections. The first section, which is the univariate analysis stage, presents the distribution of diarrhoea, housing conditions of the sampled households and distribution of respondents by their sociodemographic and economic characteristics. The second section of this chapter presents the results of the bivariate analysis of the association between housing conditions and a mother's demographic and socio-economic characteristics. This chapter presents how each of the socio-economic characteristics of women, and their housing conditions influence the incidence of diarrhoea among under-five children. The bivariate analysis helped to gain insight into the socio-economic factors and housing conditions of women and the significance of their effect on the incidence of diarrhoea among children under five years.

### 4.1 UNIVARIATE ANALYSIS

This section describes the individual percentage distribution of all the variables considered in the study.

#### *4.1.1 Diarrhoea Morbidity*

##### *The Dependent variable*

Figure 4.1 indicates that 87.7 % of the respondents reported no incidence of diarrhoeal morbidity among their children who are below five years, while 12.31 % of the respondents reported

incidence of diarrhoeal disease among their children within the two weeks prior to the survey.

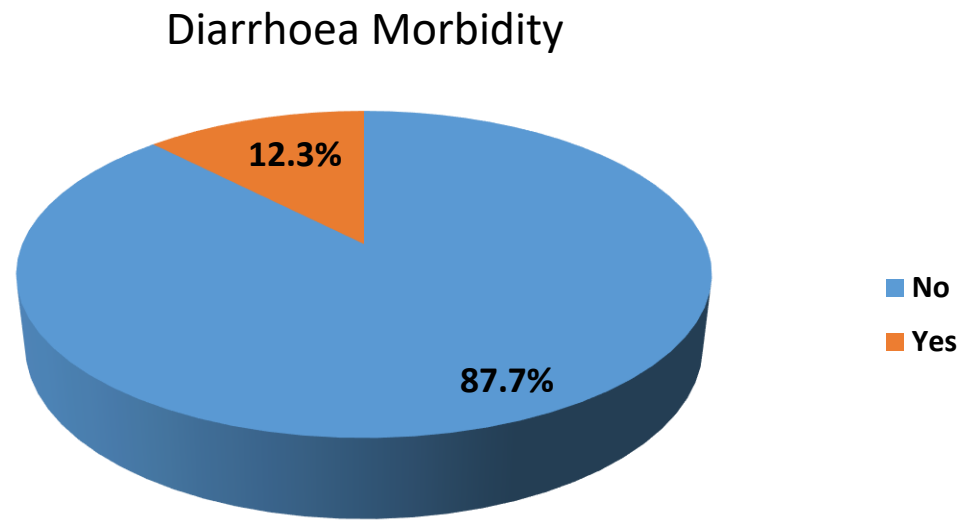


Figure 4.1: Pie chart showing the percentage distribution of mothers whose children suffered from diarrhoea disease in the two weeks preceding the survey.

Source computed from GDHS, 2014

#### *4.1.2 Housing Conditions.*

##### *Independent Variables*

From the housing conditions index that was created using the construction materials and the sanitation variables in the 2014 GDHS, Figure 4.2 reveals that only 7.2% of houses had good housing conditions while 33.8% were poor housing conditions. The figure also shows that majority of respondents live under fair housing conditions which represents 59% of the total sample.

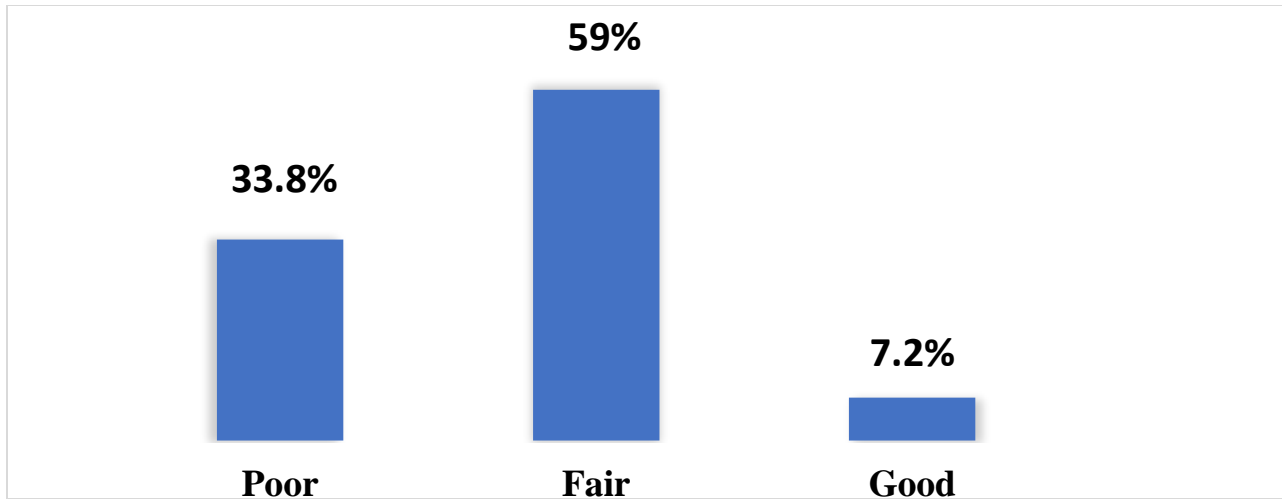


Figure 4.2: Percentage distribution of housing conditions.  
Source computed from 2014 GDHS

#### *4.1.3 Sociodemographic and economic variables*

##### *Highest level of education*

With reference to educational attainment, Figure 4.3 shows that more than half (52.6%) of the respondents in this study had secondary education (It must be noted that the definition of the secondary level of education of mothers includes junior secondary school education) whereas only 5.1% had tertiary or higher education. The figure also shows that 20.2% of the respondents had primary education while 22.1% of them had no education.

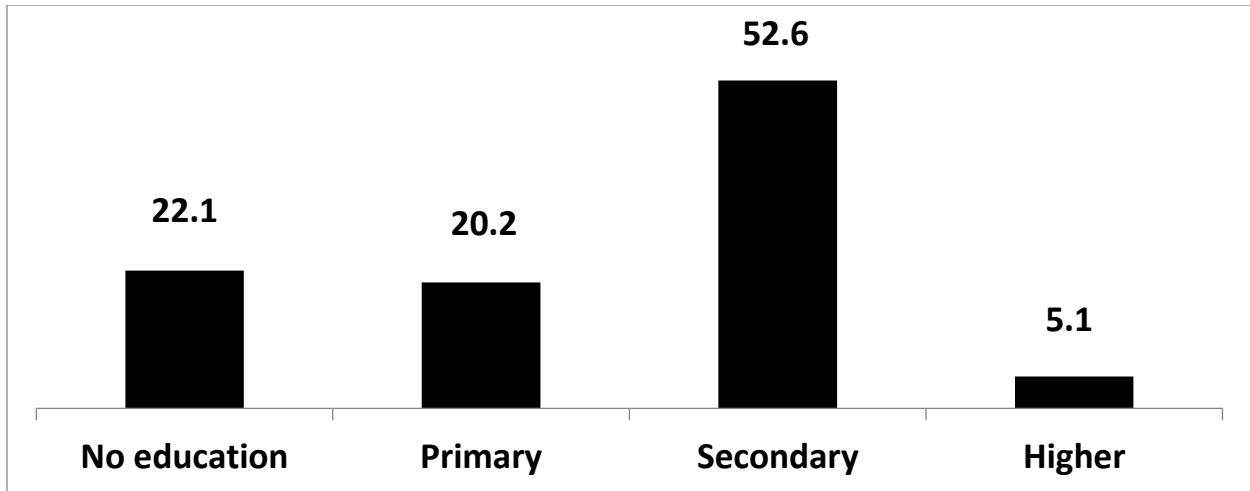


Figure 4.3. Percentage distribution by highest level of educational attainment of mothers

Source computed from GDHS, 2014

*Type of place of residence.*

The GDHS 2014, provided data on the rural and urban distribution of the respondents in the survey, and it is illustrated in Figure 4.4. The figure shows that 51% of the respondents live in urban areas, while 49% live in rural areas.

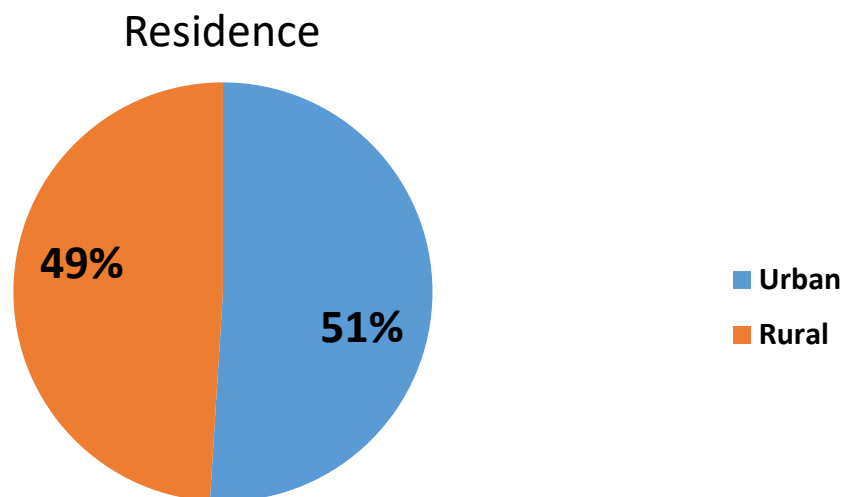


Figure 4.4. Pie chart showing the percentage distribution of mothers by place of residence.

Source computed from GDHS, 2014

## *Region*

Table 4.1 provides information on the distribution of the respondent by their region of residence. From the table, 13% of mothers with children under five years were from Central and Ashanti regions each, 13.1% from Brong Ahafo, 12.7 and 12.3% from Western and Eastern regions respectively. The table further shows that 11.2% of the respondents are from Greater Accra region, 8.5% from Volta region while 5.9% are from the Northern region of Ghana. The Upper West and Upper East regions also represent 6.7 and 3.6% of respondents respectively.

Table 4.1 Percentage distribution of mothers by their region of residence.

Region of residence	Frequency	Percentage (%)
Western	352	12.7
Central	359	13.0
Greater Accra	308	11.2
Volta	236	8.5
Eastern	339	12.3
Ashanti	358	13.0
Brong Ahafo	362	13.1
Northern	162	5.9
Upper East	100	3.6
Upper West	185	6.7
Total	2761	100.0

Source computed from GDHS, 2014

### *Age of mothers*

Table 4.2 shows the percentage distribution of age of mothers. The age of mothers has been put into age groups of five years from 15-49 years. The table illustrates that the age category with the smallest percentage (2.8%) are the oldest (45-49 years) in the sample. The group with the next smallest percentage (4.1%) is the youngest women. Women in the 20-24 age range represented 16.6% while those aged 35-39 constituted 18.8% of the sample. Women in the 25-29 age group and the 30-34 age group were noticeably highly represented by 23.8% and 24.6% respectively.

Table 4.2 Percentage distribution of the age groupings of mothers

Age of mother	Frequency	Percentage (%)
15-19	113	4.1
20-24	457	16.6
25-29	657	23.8
30-34	678	24.6
35-39	520	18.8
40-44	260	9.4
45-49	76	2.8
Total	2761	100.0

Source computed from GDHS, 2014

### *Sex of child*

The 2014 GDHS provides data on the sex or gender of the children under the age of 5 whose mothers reported them as being morbid or not due to diarrhoea two weeks prior to the survey. Their percentage distribution is well illustrated using figure 4.5. From the figure, 52.3% of the

total mothers sampled had male children under 5 years while 47.7% of the mothers had female children below 5 years.

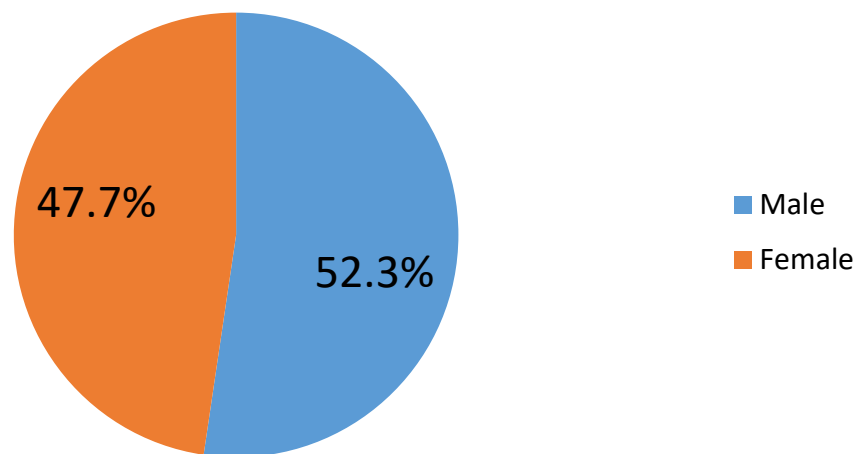


Figure 4.5: Pie chart showing the percentage distribution of the children whose mothers were sampled for the survey by the sex of the child.

Source computed from GDHS, 2014

#### *Wealth quintiles*

Figure 4.6 shows the percentage distribution of mothers by wealth quintiles. The figure illustrates that, 14.0% and 22.7% of women fall in the poorest and poorer category respectively while 23.2% falls in the middle wealth category. The figure further shows that 21.7% and 18.4% fall in the richer and richest category respectively.

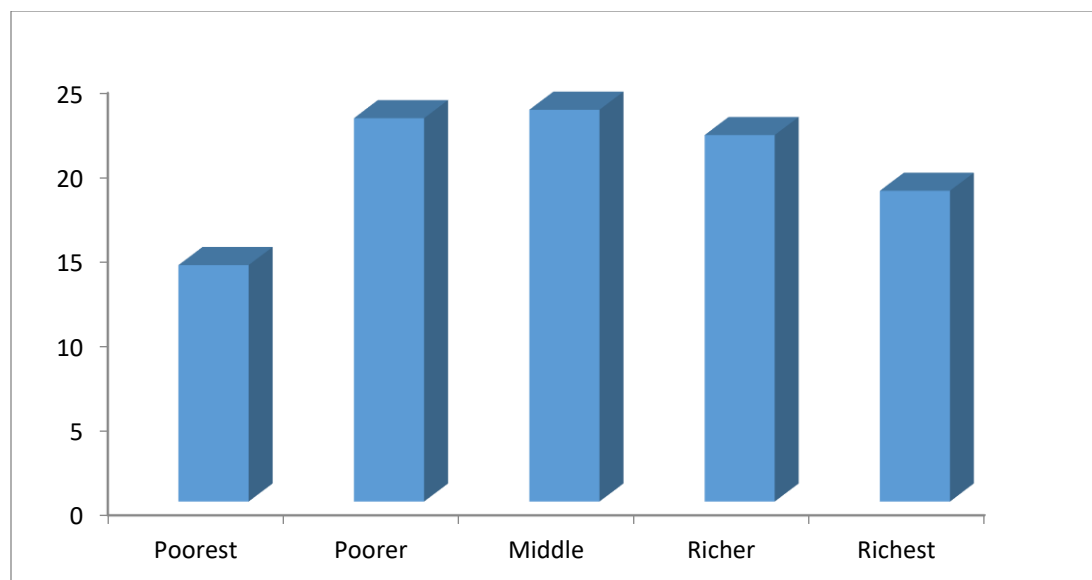


Figure 4.6: Bar chart showing the percentage distribution of wealth quintile of households mothers belong to.

Source computed from GDHS, 2014

### *Age of Child*

Table 4.3 shows the percentage distribution of children less than the age of five years. The Figure illustrates that 27.7% represent infants that are aged between 0 to 11 months old, while 72.3% represent children from 1 to 4 years old.

Table 4.3 Percentage distribution of the ages of children.

Age of child	Frequency	Percentage (%)
Infants	765	27.7
Children	1996	72.3
Total	2761	100.0

Source computed from GDHS, 2014

## **BIVARIATE ANALYSIS**

### *4.2.1. Housing Conditions and Diarrhoea Morbidity*

The main variables considered under housing conditions of the mother are, type of toilet facility used by caregivers (grouped into improved toilet facilities and unimproved toilet facilities based on the design of the facilities), main source of water of the household (Improved water source and un-improved water sources). Another housing condition that was considered is the type of floor material and the type of wall material of the household. These variables were also grouped into hygienic and un-hygienic materials. An index was developed from these four housing conditions variables and ranked on a scale from zero to four in descending order. This scale was then re-categorized into three groups; Good, Fair and Poor. A score of zero to 1 was categorized as poor while a score of 2 and 3 were categorized as fair and a score of 4 is categorized, good.

From the bivariate analysis illustrated in Table 4.4, 7.6% of reported diarrhoea morbidity cases that occurred two weeks prior to the study occurred in households living under good housing conditions while 12% of diarrhoea cases occurred under fair housing conditions. The table reveals that 13.8% which makes up the highest incidence of diarrhoea among children, occurred under poor housing conditions. It can also be seen from the table that, as housing conditions deteriorates, diarrhoea incidence increases. The table finally shows a statistically significant association existing between housing condition and diarrhoea morbidity among children below the age of five years in Ghana with a p-value of 0.045 and a chi-square value of 6.220.

Table 4.4 Percentage distribution of diarrhoea disease by their housing conditions.

Housing Conditions	Had Diarrhoea recently		
	Yes (%)	No (%)	Total
Good	7.6	92.4	198
Fair	12.0	88.0	1630
Poor	13.8	86.2	933
TOTAL	12.3	87.7	2761
$\chi^2 = 6.220$ degree of freedom = 2      p-value = 0.045			

Source computed from GDHS, 2014

#### 4.2.2. Type of Place of Residence and Incidence of Diarrhoea

Table 4.5 indicates that, women from rural areas reported 12.7% of diarrhoea morbidity, while women from the urban areas reported 11.9% incidence of diarrhoea among their children under age five. The percentage difference is about 0.8 percentage points and the p-value is not significant. Signifying that even at the bivariate level there is no difference in the incidence of diarrhoea for children of mothers who reside in rural or urban areas.

Table 4.5 Percentage distribution of diarrhoea disease by type of place of residence

Place of Residence	Had Diarrhoea recently		
	Yes (%)	No (%)	Total
Urban	11.9	88.1	1408
Rural	12.7	87.3	1353
Total	12.3	87.7	2761
$\chi^2 = 0.389$ degree of freedom = 1      p-value = 0.533			

Source computed from GDHS, 2014

### 4.2.3 Diarrhoea and Wealth quintile

Diarrhoea reported low percentages among the children of the rich households but higher percentages among children in the middle and poor households. Table 4.6 shows that, women of the middle wealth category, reported the highest diarrhoea incidence of 15.0% among their children, while the richest women reported the least diarrhoea incidence of 7.3%. Among poorer women, 14.6% reported incidence of diarrhoea among their under five children, while 15% of women in the middle category reported same. Among women from richer households, 10.9% of diarrhoea incidence is reported among their children who are less than five years old. The table shows that higher wealth quintile is related to less diarrhoea incidence. Table 4.6 predicts the assumption that, the richer the mother, the lesser her child who is below five years' experiences diarrhoea.

This finding is in line with other studies (Martinez et al. 1993; Alam, 1995; Ketema and Lulseged, 1997), which concluded that children living in poor households have higher incidence rates of diarrhoea than children from richer households. They further concluded that it may be due to bad housing conditions such as the lack of adequate access to basic toilet facilities, clean water, safe environments in the home, and poor child hygiene. The relationship between diarrhoea and wealth index, shows a highly statistically significant association.

Table 4.6 Percentage of diarrhoeal disease by wealth quintile of mothers.

Wealth quintile	Had diarrhoea recently		
	Yes (%)	No (%)	Total
Poorest	13.0	87.0	386
Poorer	14.7	85.3	626
Middle	15.0	85.0	641
Richer	10.9	89.1	599

Richest	7.3	92.7	509
$\chi^2 = 20.829$ degree of freedom = 4      p-value = 0.000			

Source computed from 2014 GDHS

#### 4.2.4 Education of Mothers and Diarrhoea Incidence.

From Table 4.7, it was shown that, 13.7% mothers who have had no education reported diarrhoea among children under five years. Among mothers with primary education, 13.8% reported diarrhoea disease among the children who are under five years of age. Also, mothers who attained secondary education reported 11.9% of diarrhoea disease among their children who are less than five years. This result indicated a decreased number of diarrhoea disease among the under five children by mothers who have completed secondary education compared to mothers with primary or no education. However, women who have gone further than secondary education reported the lowest occurrence of the diarrhoea disease among their under five children, represented by 4.2%. The table shows that, the incidence of diarrhoea disease among children under five tends to decrease as women attain higher levels of education.

This result is in line with a study done by Timaeus and Lush (1995) who deduced that the incidence of diarrhoea in urban areas in Ghana is influenced by the educational level of mothers. Tagoe (1995) conducted a study which concluded that, educated mothers practice good hygiene which is closely related to good housing conditions such as the availability of improved toilet facilities, improved water sources and better child feeding. These practices contribute to a child's resistance against infectious diseases. The table indicates a statistically significant relationship between diarrhoea and education.

Table 4.7 Percentage of diarrhoea disease by educational level of mothers.

Educational level	Had Diarrhoea recently		
	Yes (%)	No (%)	Total
No Education	13.7	86.3	611
Primary	13.8	86.2	557
Secondary	11.9	88.1	1451
Higher	4.2	95.8	142
Total	12.3	87.7	2761
$\chi^2 = 11.149$ degree of freedom = 3 p-value = 0.011			

Source computed from 2014 GDHS

#### 4.2.5 Age of child and Diarrhoea

The results in Table 4.8 shows that older children (1 to 4 years) have higher incidence of diarrhoea disease and it is represented by 14.4% compared to 12.2% among the infants (0 to 1 year). Diarrhoea incidence is higher among older children because at that age, they begin to crawl, stand and walk and any contaminated thing that they pick up from their immediate surrounding ends up in their mouth. This act predisposes them to diarrhoea infection (Gebbru et al., 2014).

However, with a p-value of 0.886, the results from this study indicates that, there is no statistical association between diarrhoea morbidity and the age of a child in Ghana.

Table 4.8 Percentage distribution of diarrhoea disease by age of child

Age of child	Had Diarrhoea recently		
	Yes	No	Total
Infants	12.2	90.7	765
Children	14.4	84.6	1996
Total	12.3	87.7	2761
$\chi^2 = 0.21$ degree of freedom = 1 p-value = 0.886			

Source computed from GDHS, 2014

#### 4.2.6 Sex of Child and Diarrhoea

Table 4.9 illustrates that, even though diarrhoea occurs in both male and female children, it seems to be more common among the males. Contrary to studies by Dokeleadenu (2015) and Samani et al., (1989) which shows that the risk of diarrhoea was higher for females than in males, this study found that male children under the age of five had more diarrhoea cases reported than the females. This represents 13.8% of diarrhoea cases among male under five children and 10.7% of diarrhoea reported among the female children under five years. This means that there is some statistically significant association between the sex of child and diarrhoea disease as table 4.9 shows a p-value of 0.015 and a chi-square value of 5.962.

Table 4.9 Percentage distribution of diarrhoea disease by sex of child

Sex of Child	Had Diarrhoea recently		
	Yes (%)	No (%)	Total
Male	13.8	86.2	1445
Female	10.7	89.3	1316
Total	12.3	87.7	2761
$\chi^2 = 5.962$	degree of freedom = 1		p-value = 0.015

Source computed from GDHS, 2014

#### 4.2.7. Age of Mother and Diarrhoea Morbidity

The results in Table 4.10 illustrate that majority of mothers whose children under five years had a diarrhoea two weeks prior to the GDHS in 2014 were mothers among the youngest age group of 15 to 19. Diarrhoea morbidity reduces drastically to 13.1% among mothers within the age group of 20 to 24. From the table, diarrhoea morbidity is relatively equal among children whose mothers who were aged 25-29 through to mothers within the age group 40-44. The table further

illustrates that diarrhoea incidence is high at about 18% in children whose mothers were aged 45 to 49 years.

The result, from the bivariate test shows there is no statistically significant variation in diarrhoea incidence among children by age of mother with a p-value of 0.086. In essence, the incidence of diarrhoea among children does not seem to differ based on the age of the mother at the bivariate level.

Table 4.10. Percentage of diarrhoea disease by age of mother

Age of Mother	Had diarrhoea recently		
	Yes	No	Total
15-19	20.4	79.6	113
20-24	13.1	86.9	457
25-29	11.7	88.3	657
30-34	11.5	88.5	678
35-39	11.3	88.7	520
40-44	11.2	88.8	260
45-49	18.4	81.6	76
Total	12.3	87.7	2761
$\chi^2 = 11.072$ degree of freedom = 6      p-value = 0.086			

Source computed from GDHS, 2014

The cross tabulation of mothers' age and diarrhoea morbidity outcomes above shows no significant association ( $p=0.086$ ). This is contrary to literature as it is expected that mothers' age at birth influences childhood diarrhoea outcome. For instance, a study by Finlay et al in 2011 revealed that children of adolescent mothers (15-19 years) are the most vulnerable to infant mortality and poor child health outcomes like diarrhoea. It is further revealed by the analysis that

overall, the risk of a poor health outcome dissipates by age 21, but the general trend of improvement continues (Finlay et al, 2011).

#### 4.2.8. Region of Residence and Diarrhoea Morbidity

Diarrhoea episodes by region of residence shows higher incidence in the Northern with 19.1% and followed by Brong-Ahafo and Eastern regions with both having 17.4% incidence. The lowest incidence was reported in the Volta region (7.2%). The bi-variate analysis revealed a highly significant association between the region of residence of mothers and diarrhoea incidence with a chi-square value of 49.328 and a p-value=0.000.

Table 4.11 Percentage of diarrhoeal disease by region

Region	Had diarrhoea recently		
	Yes	No	Total
Western	8.0	92.0	352
Central	9.2	90.8	359
Greater-Accra	6.8	93.2	308
Volta	7.2	92.8	236
Eastern	17.4	82.6	339
Ashanti	13.4	86.6	358
Brong-Ahafo	17.4	82.6	362
Northern	19.1	80.9	162
Upper East	12.0	88.0	100
Upper West	15.4	84.9	185
Total	12.3	87.7	2761
$\chi^2 = 49.328$	degree of freedom = 9		p-value = 0.000

Source computed from GDHS, 2014.

**CHAPTER FIVE**  
**RELATIONSHIP BETWEEN HOUSING CONDITIONS, SOCIODEMOGRAPHIC**  
**VARIABLES AND DIARRHOEA INCIDENCE AMONG CHILDREN UNDER FIVE**  
**YEARS IN GHANA.**

**5.0 INTRODUCTION**

This chapter focuses on the analysis of the relationship between housing conditions, sociodemographic variables and diarrhoea prevalence among children under five years. Binary logistic regression analysis was used in this section to examine the effects of the independent variable (housing conditions) and the sociodemographic and economic factors on diarrhoea prevalence in children under five years in Ghana two weeks before the GDHS (2014) data collection. The use of the binary logistic regression model is justified by the fact that the dependent variable which is measured by diarrhoea morbidity of the child is dichotomous (whether a child suffered diarrhoea or not two weeks preceding the survey). Two different models were run to determine the possible effects of the variables on the incidence of diarrhoea.

The result of the first regression model was interpreted by looking at whether there is a statistically significant relationship between housing conditions which is the main independent variable and the dependent variable (at 95% confidence level). Variables with p-values equal to or less than 0.05 were considered to be statistically significant in influencing the incidence of diarrhoea disease among children below five years. Housing condition was found to be statistically significant at the bivariate level. The second model predicts the incidence of diarrhoea among children, considering their housing conditions and other sociodemographic and economic characteristics of mothers and the children.

## 5.1 FACTORS AFFECTING DIARRHOEA DISEASE

The first model examined the relationship between the dependent variable and the main independent variable (housing conditions). From the regression results in Table 5.1, the model is statistically significant with a p-value of 0.035. This shows that the model significantly fits the data. The model's Nagelkerke r-squared value of 0.005. This means that the model explains 0.5% of the overall variation in the diarrhoea disease outcome. So, building materials like the wall material, floor materials, main source of drinking water and type of toilet facilities reported as being used by the respondent or mother's household play a key role and affects diarrhoea incidence among children under five years in Ghana.

Table 5.1 further reveals that poor housing conditions and good housing conditions ( $p=0.018$ ) were significantly associated with diarrhoea incidence but fair housing conditions was not. From the table, it can be told that children whose mothers reported to be living under good housing conditions were 0.511 times less likely to experience diarrhoea compared to children who lived under poor housing conditions.

Table 5.1. A binary logistic regression model of Housing conditions and diarrhoea.

INDICATOR	ODDS RATIO	95% CONFIDENCE LEVEL	P-VALUE
<b>HOUSING CONDITIONS</b>			
POOR(RC)	1.00		
FAIR	0.852	[0.671, 1.081]	0.187
GOOD	0.511	[0.292, 0.893]	0.018
Nagelkerke R-square = 0.5% Model Chi square = 6.726 Degree of freedom = 2 p-value = 0.035*			

(RC) = Reference category

Source computed from GDHS, 2014.

The second model examines the impact of sociodemographic and economic variables on diarrhoea prevalence among children below five years. The table shows that this model is statistically significant with a p-value of 0.000 therefore the model adequately fits the data. The model further recorded a Nagelkerke r-square value of 0.070 which suggests that the explanatory variables explains 7.0% of the variance in the outcome variable.

This model also reveals a significant relationship between diarrhoea in children and housing conditions. From Table 5.2, good housing conditions has a p-value of 0.014 which indicates a significant association between children who live under good housing conditions and their chances of getting infected by diarrhoea disease. With an odds value of 0.478, children who live under good housing conditions are 0.478 times less likely to be infected by diarrhoea compared to children who live under poor housing conditions. Regardless of the sociodemographic variables, this finding confirms my hypothesis that children living under good housing conditions are significantly less likely to get diarrhoea compared to children living under poor housing conditions. This shows that households that lack for instance, an improved toilet facility, presents a higher risk of diarrhoea incidence as was found by Kumi-Kyereme and Amo-Adjei (2015) that children living in households that have improved toilet facility have a higher chance of avoiding diarrhoea morbidity.

The table shows that the model reveals some significant relation between some regions and diarrhoea morbidity in Ghanaian children. From the table, children who reside in Eastern (2.297), Ashanti (1.926), Brong Ahafo (2.141), Northern (2.539) and the Upper west (2.034) regions are more likely to get diarrhoea in comparison to the reference category (Western region).

From the table there is a clear indication of a significant relationship between a child's age and its susceptibility to diarrhoea. With a significant value of 0.001, children above 1 year are 1.591 times as likely to get diarrhoea compared to infants (below 1 year). At that age children are more likely to get diarrhoea because weaning begins as exclusive breastfeeding ends. Children begin to consume water and complimentary feeds and so if they are contaminated, they increase the likely of children to get infected. Furthermore, children around the age of 1 begin to crawl, stand and walk by holding unto walls and other objects which might be contaminated. As characteristics of children, anything they can hold or pick up usually ends up in their mouth; this increases the risk of diarrhoea infection. This finding is in line with a study by Woldemicael in 2001 which found out that children after infancy have a higher risk of diarrhoea infection because their immune system is weaker due to increased exposure of contaminated weaning foods.

The age of the mother proved to be statistically significant to prevalence of diarrhoea among children in Ghana. The risk of childhood diarrhoea declined steadily as maternal age increased. With mothers in the reference category (15-19years) having higher odds (1.00) of diarrhoea, children whose mothers were between ages of 40 to 44 years is predicted to have had the lowest (0.473) odds of suffering from diarrhoea. This could mean that mothers who are more advanced in age have more experience as they might have had children before, practice good hygiene and thereby reducing the risk their children being infected by diarrhoea. This finding is consistent with an earlier study done by Gyimah (2003).

The model concludes that there is some significant association between the sex of a child and diarrhoea morbidity. The table shows that female children were 0.738 times less likely to suffer from diarrhoea in comparison to male children. Therefore, this study discovered, male children

were more at risk of getting infected with diarrhoea. This contradicts the findings by El Samani et al. (1988), that risk of diarrhoea morbidity was higher among female children in rural Sudanese communities. This finding is however consistent with prior reports from Congo and Guinea Bissau that boys are more susceptible to infections than female children below 5 years. It is uncertain as to why it is so, but boys are likely to wander off into unclean environment due to their adventurous nature as compared to their female counterparts. Unhygienic floors and walls are breeding places for diarrhoea causing vectors that can easily be ingested by children. In a study of admissions in the pediatric units in Hong Kong, Hon and Nelson reported that male children consistently suffered more infections than females. A similar report is made by Siziya et al. (2013), who also confirmed that among children below 5 years in Iraq, males were more likely to suffer infection than females.

Results from this model shows that wealth quintile, type of place of residence and the educational level of mother were not statistically associated with diarrhoea incidence in Ghanaian children below five. Literature suggests that higher mother's education level mitigates the effect of inadequate or non-existent sanitation facilities (Ahiadeke, 2000), but this study does not uncover any such effect. The educational level of mother was among the sociodemographic variables included in the final regression model as a control variable.

Table 5.2. A binary logistic regression showing the relationship between housing conditions, sociodemographic variables, and diarrhoea disease.

INDICATOR	ODDS RATIO	95% CONFIDENCE LEVEL	P-VALUE
<b>HOUSING CONDITIONS</b>			
Poor (RC)	1.00		
Fair	0.947	[0.734, 1.221]	0.673
Good	0.478	[0.265, 0.861]	*0.014
<b>REGION</b>			
Western (RC)	1.00		
Central	1.092	[0.641, 1.862]	0.745
Greater Accra	1.024	[0.553, 1.896]	0.939
Volta	0.774	[0.410, 1.463]	0.431
Eastern	2.297	[1.413, 3.733]	*0.001
Ashanti	1.926	[1.164, 3.189]	*0.011
Brong Ahafo	2.141	[1.314, 3.488]	*0.002
Northern	2.539	[1.396, 4.618]	*0.002
Upper East	1.515	[0.718, 3.194]	0.275
Upper West	2.034	[1.118, 3.704]	*0.020
<b>PLACE OF RESIDENCE</b>			
Urban (RC)	1.00		
Rural	0.838	[0.613, 1.145]	0.267
<b>CHILD'S AGE</b>			
Infant(RC)	1.00		
Child	1.591	[1.195, 2.115]	*0.001
<b>EDUCATIONAL LEVEL</b>			
No education (RC)	1.00		
Primary	1.104	[0.767, 1.591]	0.594
Secondary	1.013	[0.726, 1.413]	0.940
Higher	0.438	[0.177, 1.084]	0.074

WEALTH QUINTILE			
Poorest (RC)	1.00		
Poorer	1.187	[0.792, 1.781]	0.406
Middle	1.192	[0.765, 1.859]	0.438
Richer	0.814	[0.486, 1.363]	0.435
Richest	0.611	[0.329, 1.135]	0.119
AGE OF MOTHER			
15-19 (RC)	1.00		
20-24	0.590	[0.321, 0.969]	*0.038
25-29	0.578	[0.311, 0.922]	*0.024
30-34	0.566	[0.302, 0.893]	*0.018
35-39	0.536	[0.278, 0.855]	*0.012
40-44	0.473	[0.225, 0.792]	*0.007
45-49	0.804	[0.316, 1.493]	0.343
SEX OF CHILD			
Male (RC)	1.00		
Female	0.738	[0.583, 0.933]	*0.011
Nagelkerke R-square = 7.0%			
Model Chi square = 104.169			
Degree of freedom = 27			
p-value = 0.000*			

(RC) = Reference category

Source computed from 2014 GDHS

## 5.2. DISCUSSION

Childhood mortality has remained high in Ghana for many years partly as a result of severe diarrhoea (UNICEF and WHO, 2009). Diarrhoea in children is usually attributed to poor hygiene practices of mothers, especially when preparing food and getting water for children, poor

household sanitation, the lack of a reliably clean drinking water source and decent toilet facilities. The results from this study are in line with some of these findings. This study's findings provide evidence that, housing conditions such as household main water source, toilet facility, housing floor material and housing wall material are collectively significant predictors of childhood diarrhoea. Although other variables such as the age of child, sex of child, age of mother, and region of residence have effects on diarrhoea, this study correlates with several studies (Mukiira and Ibisomi, 2010; Magadi, 2000; Njeri and Muriithi, 2013) that indicate that ensuring decent housing conditions such as the access to safe source of drinking water and good toilet facility predicts reduction in childhood diarrhoea. The study identified houses that had good conditions of habitation for children by keeping a score of those that kept some basic sanitary environment. The results indicated that we can safely predict a lower likelihood of children residing in houses that have good water, hygienic wall and flooring material and also decent toilet facility to experience diarrhoea compared to children living in houses that lacked at least one of these conditions. Some studies (Esrey et al., 1985; UNICEF, 2017; WASH, 2017; Boot and Cairncross, 1993) have shown that availability of water in a house facilitates handwashing and other good hygiene behaviors that are associated with diarrhoea in children. Aung and Thein (1989) revealed a 30% reduction in diarrhoea when Burmese mothers and children were provided clean water in a bid to improve housing conditions and encourage good personal hygiene especially before preparing meals and after using the toilet. Songore and McGranahan (1993) also found that open defecation due to the lack of decent toilet facilities in houses creates potential risk for diarrhoea infections as it contaminates the grounds that children usually play on. Furthermore, Boadi and Kuitunen (2005) have associated the lack of access to a toilet facility in houses with high incidence of diarrhoea.

In investigating the association between housing conditions and diarrhoea disease outcomes in children under five, characteristics of the sample indicated that majority of households in Ghana are located in urban areas with a greater number of mothers having had secondary education but having poor wealth status. These households are likely to be residing in substandard housing conditions such as slums and squatter settlements mostly constructed with flimsy materials lacking basic sanitation infrastructure. Children below five years have a higher risk of morbidity and mortality as a result of infectious diseases like diarrhoea. Other studies have provided evidence demonstrating the influence of numerous interconnected sociodemographic and economic determinants of health, like mothers wealth status, mothers educational level and how the immediate surroundings contribute to the diarrhoea disease experienced by the vulnerable in the population such as children below five years (UN, 2017; Yilgwan and Okolo, 2012; Korie and Ikefuna, 2013).

From the results, there is proof of some statistically significant relation between housing conditions and diarrhoea incidence among children below five years old. Some literature has identified poor water quality and lack or inadequate access to toilet facilities as critical risk factors predisposing children below five years to diarrhoea. Therefore, it is necessary that toilet facilities are improved, especially at the district level within Ghana. This will go a long way to help prevent or reduce human contact with feces during use. In addition to this, there is more evidence from other studies (Oloruntoba et al., 2014; Ntaji et al., 2014) that show numerous ways through which the quality of drinking water deteriorates at the household level. Among these avenues are poor, unhygienic water handling and unhygienic storage of drinking water. It is necessary to know that the lack of proper housing conditions can amplify these factors in the home environment. A World Bank report in 2010, investigated children's health based on results

from 172 demographic and health surveys from 70 countries, including sub-Saharan African countries over the last two decades. They found that childhood diarrhoea morbidity and mortality is significantly low for households that have access to improved facilities like, flushed toilets with piped connection, in comparison to households that lack access to any such technology. This study revealed that access to good housing conditions reduces the odds or likelihood of children suffering from diarrhoea. The World Bank report in 2010 stated that improving overall housing conditions has a somewhat higher positive effect on reducing diarrhoea than improving toilet or water infrastructure alone. Therefore, there is strong evidence that more resources need to be invested in improving housing conditions from no access or access to just basic sanitation facilities in housing to advanced or improved facilities in Ghana. Other important indicators of good housing condition including main wall and floor construction material were used to measure the quality of the household environment of a child. However, if exposure to diarrhoea-causing pathogens is significantly limited by providing good housing conditions, then there will be a clear and positive impact of diarrhoea prevalence.

Just like Omariba (2001), this study found that, younger mother's recorded higher prevalence of diarrhoea among children compared to older women. This finding may rightly be argued that older mothers possess more experience in taking care of children. They may take extra care of the young and hence reducing childhood diarrhoea incidences. Younger mothers may not have the needed experience especially if they lack education. They may neglect some basic hygiene practices such as handwashing before handling baby foods and breast cleaning before breastfeeding.

With respect to the associations between childhood diarrhoea and other variables, the observed pattern in maternal education and wealth does not conform to the findings observed in previous

studies (Amy Quinn, 2009; Magadi, 2000) as they were not found to be significantly associated. Even though some previous studies (UNICEF and WHO, 2017) have shown that urban residence had higher odds of childhood diarrhoea, this study did not. This study found that the ages of children did not influence diarrhoea disease outcome. This is contrary to finding from a study by Bartlett in 2003 which showed that diarrhoea incidence is low among infants because most mothers practice exclusive breastfeeding which protects the infant from infections. Studies by Mihrete et al. (2014) and Woldemicael (2001) also indicated that risk of diarrhoea rises after infancy when immunity is weaker and exposure to contaminated weaning food is increased.

This study's findings further confirm a study by Ameyaw et al in 2017, who found that there is a difference in diarrhoea incidence with respect to the sex of a child. In their study, the prevalence of diarrhoea in male children was 13.1% and 10.2% in female children. Muenchhoff and Goulder, 2014 also said that the rate at which males get ill is higher than females throughout life because males from infancy and childhood are more susceptible to severe infectious diseases such as diarrhoea than females.

All of these have to be taken into consideration to enable us have an understanding of the effect of housing conditions on the prevalence of diarrhoea.

## CHAPTER SIX

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 6.0 SUMMARY

This study's objective was to explore housing conditions and its relationship with diarrhoea among children below five years in Ghana. Specifically, this study wanted to investigate the relationship between housing conditions and diarrhoea in Ghana, examine the relationship between some selected socio-economic and demographic factors and how they affect diarrhea incidence among children under five years in Ghana and make recommendations that can help improve the health outcomes of children in low income households.

The 2014 GDHS was the main data source in this study. In all, data from 2,761 who had children below 5 years was analyzed in this study. Earlier research suggested that childhood diarrhoea was a prominent note among cases reported at the out patients department as the mode of transmission of the disease vary greatly under different circumstances. Some are already known, some have been recently discovered and others presumably still remain to be found (Tetteh et. al, 2018). Health data from the District Health Directorate of the Ghana Health Service suggested that the Ghana is highly burdened by diarrhoea disease especially among children below five years old. The District Health Information Management System II (DHIMS II) in 2015, reported that the diarrhoea cases in the Jasikan District numbered up to 3107. Anyorikeya and her counterparts in 2016, also revealed that diarrhoea killed over two thousand children below five years in 2011 alone. This unfortunate reality gave reason to investigate the housing conditions that predisposes children who are below five years to the diarrhoea menace in Ghana in this particular study.

In summary, the study made some key findings with respect to housing conditions and diarrhoea disease occurrence among children below five years in Ghana.

The housing conditions that were considered in the study are the main water source of the household, toilet facility, main wall material and main floor material. Other variables that were employed in this study include the age of the mother, the age of child, the wealth quintile, the educational level of the mother, the region of residence and the type of place of residence.

The following hypotheses were proposed based on existing literature,

- Children below five years from households with poor housing conditions are more likely to experience diarrhoea than those from households with good housing conditions.
- Children of mothers with higher education are less likely to experience diarrhoea compared to children whose mothers have no education.
- Male children below five years are less likely to experience diarrhoea compared to their female counterparts.

Data used in this study was from the 2014 installment of the Ghana Demographic and Health Survey (GDHS).

In order to answer the main research question of this study, a composite index was developed using four main housing variables. They are the main drinking water source, toilet facility, the main wall material and the main floor material. On a scale of 0 to 4, where 4 is the highest score and also represents good housing condition whereas a score of 2 and 3 represents fair housing conditions and finally a score of 0 and 1 denotes poor housing conditions. Some sociodemographic and economic characteristics of mother were considered as well.

Based on the health belief model, the study tried to bring out the housing conditions that influence diarrhoea disease outcomes in children in Ghana. The theory explains that when the attention is drawn to a particular behavior of a population that has adverse effects on their health and its severity, they are more likely to accept interventions that will reduce or eliminate that health problem.

At the univariate level, results were presented in frequencies and percentages using charts, graphs and tables. The bivariate level analysis included the use of chi-square test to examine the relationship between housing conditions, other selected sociodemographic and economic characteristics and diarrhoea prevalence, testing at a 95% confidence level. At the multivariate stage, two binary logistic regression models were used to investigate the relationship between the dependent variable and the other variables. Both models were statistically significant. In the first regression analysis, where housing conditions was modeled against diarrhoea, results showed that good housing conditions has a reducing effect on diarrhoea among children in Ghana. It also showed that bad housing conditions leads to an increase in the incidence of diarrhoea among children below five years old. This confirmed the study's hypotheses that children who live under good housing conditions are less likely to get diarrhoea. When the sociodemographic and economic variables were introduced in the second model, housing conditions remained statistically significant.

At the bivariate and multivariate stages of the analysis, the place of residence was not found to be a good predictor of diarrhoea disease among children below five years in Ghana. Variables such as education and wealth quintile which were significant at the bivariate stage, but were not significant predictors at the multivariate level. On the other hand, variables such as the age of the mother and the age of the child which were found not to be significant at the bivariate stage

became significant predictors of diarrhoea in children at the multivariate analysis stage. Housing conditions, region and the sex of the child were the only predictors of diarrhoea in children in Ghana that remained significant at all stages of analysis.

## **6.1 CONCLUSION**

This study investigated the effect of housing conditions on diarrhoea disease prevalence among children under five years in Ghana. This is to fill the knowledge gap that exists in research concerning the direct health implications of housing conditions especially on childhood diarrhoea. In this study, housing conditions remained a statistically significant predictor of childhood diarrhoea at every stage of the data analysis. According to the GDHS, despite flagship interventions and improved sophisticated preventive and advocacy programs, Ghana continues to record high rates of childhood diarrhoea. Furthermore, the data suggests that only 7.2% of children below the age of five reside under good housing conditions while 33.8% of their counterparts live under poor housing conditions. Upon critical scientific analysis, a significant association was confirmed to exist between the housing conditions of children and diarrhoea frequency among them. Diarrhoea incidence was found to be highest among children living under poor housing conditions whereas diarrhoea incidence among children living in good housing conditions was significantly low. This key finding is in line with a study by Tetteh et al. (2018) that also associated decline in diarrhoea incidence among children to improvements in their immediate external environmental conditions. Based on results from the analysis of the 2014 GDHS, it was revealed that substandard or poor housing conditions can contribute to the high prevalence of diarrhoea disease among children who are below five years in Ghana.

It must be stated though that the study found other significant predictors of diarrhoea in children under five years in Ghana which include, the age of the child, the sex of the child, the age of the

mother and the region of residence. This study should serve as a reliable road map that charts the way for a more in-depth investigation into diarrhoea outcomes as a result of housing conditions. In such future studies, more emphasis should be placed on housing conditions especially among the disadvantaged communities in Ghana, with an emphasis on those that are residing in slums and squatter settlements and urban poor communities along the coasts. This will contribute to reduce childhood diarrhoea morbidity and mortality rates in the Ghana.

## **6.2 RECOMMENDATIONS**

The ability to identify and implement effective and sustainable solutions to prevent diarrhoea is very integral to achieving SDG three and six in order to improve child survival by 2030. The study revealed that in order to reduce diarrhoea prevalence, housing conditions must not be ignored. So, it is recommended that government and private institutions collaborate to come up with a comprehensive strategy to address the inadequate hygiene practices among households especially those with children below five. It is critical that they also improve and advance housing infrastructure by using more hygienic flooring and walling materials as they have shown some evidence of influencing diarrhoea in Ghanaian households. Improving water and toilet facilities in communities and houses may potentially be the cheapest preventive solution which can help decrease the burden of disease that is attributed to childhood diarrhoea mortality in the country.

Secondly, since the study found that older age mothers had children who recorded lower incidence of diarrhoea, it is recommended that such women be mobilized at the community level so that they can share some of their child care skills and experiences with younger age mothers. Town and community authorities could resource capacities building programs to teach mothers new child care methods and explain the impact of housing conditions to the health of their

children. A paper by Schore (2017) explains that male children mature more slowly and are more negatively affected by early environmental stress than girls. Mothers should therefore be educated appropriately to pay more attention to their male children in order to reduce the incidence of diarrhoea among them.

Furthermore, it is necessary for enough logistic, financial and human resources to be invested in campaigns aimed at educating individuals, especially mothers and households at the community level. Such educational campaigns should be focused in communities that practice open defecation. This can guide necessary behavioral changes, related to physical improvements in their housing conditions and with respect to hygiene practices. Proper Implementation of these strategies can improve overall housing conditions and may cause significant reduction or prevention of under-five childhood morbidity and mortality attributed to diarrhoea.

A major limitation of this study was the self-reported nature of the sociodemographic variables. This exposed the data to vulnerabilities such as the risks of recall and reporting biases. It is recommended that a longitudinal study be done to make available a robust dataset that shows the pattern of diarrhoea prevalence over time.

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