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DETERMINANTS OF INFANT MORTALITY IN URBAN GHANA

BY

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ACCEPTANCE

Accepted by the School of Social Sciences, University of Ghana, Legon, in partial fulfilment of the requirement for the award of Master of Arts Degree in Population Studies.

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DECLARATION

I, ADWOA YEBOAH OWUSU, guarantee that this work is wholly my original work and has not been presented, in whole or in part, for another degree elsewhere, with the exception of citations and references found in published works, which have all been recognized and officially acknowledged in the reference section of the dissertation.

SIGNATURE……

DATE: 30th January 2023

DEDICATION

I dedicated this work to my mother, siblings, and especially my late father for all his support and assistance in helping me get this far.

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ABBREVIATIONS

MDG'S	Millennium Development Goals
SDG'S	Sustainable Development Goals
WHO	World Health Organisation
GDHS	Ghana Demographic Health Survey
GSS	Ghana Statistical Service
MICS	Multiple Indicator Cluster Survey
GMHS	Ghana Maternal Health Survey
DHS	Demographic and Health Survey
FP/PPAG	Family Planning/ Planned Parenthood Association of Ghana
ANC	Antenatal Care

ABSTRACT

Global statistics reveal a decline in the rate of infant mortality. Ghana like other countries has realised a decline in infant mortality rate over the years due to government policies and interventions. Previous studies allude to the fact that infant mortality is pronounced in rural than urban area, however, the recent demographic and health survey and multiple indicator cluster survey report higher infant deaths in urban areas. Accordingly, this study was carried out to examine the factors that contribute to infant mortality in urban areas in Ghana. The data used for this study was the 2014 GDHS. The study analysed data on 527 single births to urban women within the survey period. Infant mortality was the dependent variable while the independent variables included sex of the child, birth size, breastfeeding, antenatal care attendance, place of delivery, source of drinking water, type of toilet facility, maternal education, maternal age, maternal employment status, wealth status, religion, and ethnicity. Univariate, bivariate, and multivariate analysis were conducted using SPSS version 26. At the univariate level, socio-demographic characteristics of infants and their mothers as well as proximal causes of infant mortality were described using frequencies, bar graphs, and pie charts. To establish an association between the various independent variables and the dependent variable, the study specified cross tabulations. Pearson chi-square and p-values were calculated to establish statistical significance between the predictor variables and the outcome variable. At the multivariate level, a binary logistic regression was specified to evaluate the association between the independent variables and under-one death. The results from the analysis established that breastfeeding and antenatal care attendance were the only significant predictors of infant mortality among infants in the study. Breastfeeding and antenatal care attendance are therefore imperative in reducing infant deaths in urban Ghana. This study thus recommends that for the country to meet the SDG 3 target of lowering under five and new-born deaths to 25 and 12 deaths per 1000 live birth correspondingly, there should be continued sensitisation on the importance of breastfeeding and antenatal care attendance.

CHAPTER ONE

1.0 INTRODUCTION

1.1. BACKGROUND

Infant mortality rate is a relevant index for quantifying a population's well-being and development (Dwomoh et al., 2019; Kumar et al., 2021) and gives a glimpse of the technological advancements in the health sector of countries across the globe (Kumar et al., 2021). Infant mortality is when a child below age 1 dies. It comprises neonatal deaths and post-neonatal deaths (Ghana Statistical Service, 2015). The infant mortality rate quantifies the number of deaths to children less than one year per 1,000 live births. Neonatal mortality rate and post neonatal mortality rate are a subdivision of infant mortality rate, where the former is computed as the number of deaths before the first month per 1,000 live births and the latter is computed as the number of deaths from one month to one year per 1,000 live births.

It has been estimated globally that about 4.6 million infants die before their first birthday (Roser et al., 2013). In addition, the global infant mortality rate was estimated to be around 31 deaths per 1,000 live births in 2021(Population Referenece Bureau (PRB), 2021).Though infant mortality is a phenomenon that affects people everywhere, it is endemic in the developing world (Baraki et al., 2020). Neonatal deaths constitutes the highest among under five mortality (Dwomoh, 2021). These fatalities are primarily caused by issues with premature delivery, infections, problems during childbirth, and other factors (Fang et al., 2010). Other diseases that pose a threat to the lives of children under 5 years are malaria and diarrhoea in Africa, injuries in the Americas and Europe, and diarrhoea in South-eastern Asia (Fang et al., 2010).

Sub-Saharan Africa records the highest rate of infant deaths (Baraki et al., 2020). It is therefore not surprising that only 12 countries in the sub-region were able to meet the target of MDG4, 66.7% reduction in under-five mortality by 2015 (Dwomoh, 2021). While Europe reduced its infant mortality from 24.9 deaths per 1,000 live births to 8.7 deaths per 1,000 live births (WHO, 2016), that of sub-Saharan Africa still stands at 50 deaths per 1,000 live births (Population Referenece Bureau (PRB), 2021). This rate is higher than that of Africa's 47 deaths per 1,000 live births as countries in sub-Saharan Africa have higher infant mortality rates (Population Referenece Bureau (PRB), 2021) than countries in Northern Africa (Egypt, Tunisia, and Algeria) with lower infant mortality rates of 16, 14 and 17 correspondingly (Population Referenece Bureau (PRB), 2021). In the sub-region, Central Africa has the highest infant death rate, with Western Africa's rate coming in second.

Sub-Saharan Africa is bedevilled with socioeconomic disparities, especially in rural places as there exists an urban bias in development. However, with the rapid rate of urbanisation, similar disparities also exist in the urban space impacting the health and well-being of the region's human resources. All these factors impact health care provision and access leading to high mortality from preventable causes.

In Ghana, like most developing countries, infant mortality is a challenge that needs to be tackled particularly neonatal deaths which constitutes a greater share of the country's infant mortality. Of all deaths to children below 5 years, about 68% occur before the infant's first year, and 48% of these deaths occur in neonates. In Ghana, it is reported that out of 24 children, one dies before their first birthday (Ghana Statistical Service, 2015) Again, the country's recent DHS survey report indicates that more than 41,000 children died before their first birthday (Ghana Statistical Service, 2015). Ghana has made progress in reducing deaths to children below 1 year from about 149.60 to

33.02 deaths per 1,000 live births from the 1950's to 2022 (World Health Organisation (WHO), 2022b). Similarly, data from all the demographic and health surveys conducted in Ghana indicate that infant mortality rates have dropped from 57 deaths per 1000 live births in 1999 to 41 deaths per 1,000 live births in 2014 (GSS, 1999; GSS, 2015).

The progress in Ghana's infant mortality rate can be attributed to efforts from government and other organisations through policies such as, the free Maternal Health Care, the National Health Insurance Scheme, The Community-Based Health and Planning Services (CHPS) Initiative" and others. However, infant mortality is still endemic in the country compared to other regions of the world and there is a need for more to be done to reduce the rates to save the lives of the infants the country loses each year and ultimately achieve sustainable development for the country at large.

1.2. Statement of the Problem

Infant mortality persists as a serious public health concern that affects people around the world despite medical advances and investments made in the health sector (Kumar et al., 2021). As such, there is a need for current studies on the menace to uncover novel ideas to confront infant mortality. Infant mortality needs to be addressed as it impacts a country's life expectancy, an indicator of population health. Infants are pivotal to the economic development of all nations as they grow to make up the workforce needed for development. Higher level of infant deaths in a country has a propensity to affect its economic growth. Also, infant mortality is a significant predictor of a country's health system and gives an indication of the general health of the population. The issue of infant mortality affects the world, though there has been a tremendous reduction in its rate over the years from 63 deaths per 1,000 live births in 1990 to 31 deaths per 1,000 live births in 2020 (GHO Data, 2015; PRB,2021).

There exists an expansive scholarship on infant mortality, neonatal mortality, post neonatal mortality, and under five mortality since these became topical in the 1980's. Again, with the inception of the MDG'S and the SDG'S, there has been numerous studies on infant mortality as its reduction was captured in both the MDGs and SDGs. Additionally, the majority of research conducted globally has evaluated the factors that contribute to infant mortality utilizing data from the demographic and health survey (Aheto, 2019; Annan & Aseidu, 2018; Wakefield et al., 2019). Most of these studies found maternal education, electricity, immunisation, place of residence, birth interval, sex of the infant, number of children, age of the mother, ethnicity and breastfeeding as predictors of infant mortality (Ahinkorah et al., 2021; Annan & Aseidu, 2018; Baraki et al., 2020; Dwomoh, 2021; Dwomoh et al., 2019; Fang et al., 2010; Garcia Jenny, 2020; Kumar et al., 2021; Roser et al., 2013). Again studies have postulated that some maternal characteristics, child characteristics and environmental factors have a toll on infant mortality (Annan & Aseidu, 2018; Garcia Jenny, 2020; Roser et al., 2013; Sari et al., 2016). Similarly, a study by Mohammed and Akuoko (2022) also found that sub-national variations in electricity access impacts infant mortality.

In addition, studies on urban and rural differentials in infant mortality first reported that mortality to infants in rural areas were higher than that of urban areas (Ely & Hoyert, 2018; Ezeh et al., 2015) However, current studies are reporting different patterns where infant mortality rates in urban areas are higher than infant mortality rates in rural areas. This pattern is similar in Ghana as the recent Ghana Demographic and Health survey reports a higher urban infant death rate compared to that of rural Ghana. Also, the estimates from the recent Multiple Indicator Cluster Survey puts infant mortality rates in urban Ghana ahead of rural Ghana at 47 and 36 deaths per 1,000 live births respectively. These trends indicate that the urban situation has worsened three

years down the line. This pattern is similar across the sub-region, for example, Kimani-Murage et al. (2014) concluded that the urban advantage had been lost in Kenya due to the developing world's high rate of urbanisation, which had resulted in the significant inequities in the urban space (Kimani-Murage et al., 2014). This disparity has resulted in worsening conditions for the urban poor who are mostly worst off than rural dwellers. With the increasing rate of urbanisation and the spatial and social problems that comes with it, it is imperative to understand the determinants of infant mortality in urban spaces of Ghana. It is also worth noting that there are disparities among urban residents in terms of wealth, residence, access to good health care and sanitation. There is therefore a need to also consider the urban differentials in infant mortality.

However, only a few studies have explored the determinants of child mortality as well as its differentials in urban areas of Ghana. Additionally, the few studies focused on under 5 child mortality within the Greater Accra Metropolitan Area (Bixby et al., 2022). With the rising urban infant mortality rate there is a need to understand the differentials of infant mortality in urban areas of Ghana and not just Greater Accra. Also, the rapid rate of urbanisation coupled with its accompanied spatial and social problems calls for an up-to-date study on the determinants of infant mortality in urban areas as infants are susceptible to their environment. It is against this backdrop that this study is being conducted and seeks to examine the determinants of infant mortality in urban Ghana.

1.3. Research Questions

The study seeks to find answers to the following research questions:

- What household characteristics influence infant mortality in urban Ghana?
- What maternal factors affect infant mortality in urban Ghana?
- What characteristics of infant living in urban areas predispose them to mortality Ghana?
- What proximate factors affect infant mortality in Urban Ghana?

1.4. Objective of the study

The main objective of this study is to examine the determinants of infant mortality in urban Ghana. Specifically, the study seeks to,

- Explore household characteristics that influence infant mortality in urban Ghana.
- Investigate some maternal factors associated with infant mortality in urban Ghana.
- Explore some infant characteristics that predispose them to mortality.
- Examine some proximate determinants that affect under one mortality in urban Ghana.

1.5. Rationale

Deaths of individuals at all age impact the development of the country as there are more years of life lost. Mortality is regarded as an important measure of population well-being and development. Empirically, more developed regions have lower infant mortality rates compared to less developed regions (Population Referenece Bureau (PRB), 2021). Ghana compared to other advanced countries has higher under one mortality. Though the country has seen improvement in infant health, there is more to be done. Infant mortality has dropped from 99.6 deaths per 1,000 live births

in 1975 to 41 infant deaths per 1,000 live births in 2014 (Ghana Statistical Service, 2014; GSS, 1999).

Currently, with the SDG goal 3 of reducing under 5 mortalities to 25 deaths per 1,000 live births by 2030, there is a need for more effort to be put into reducing deaths in infants especially neonates for the country to realise the above target. Hence there is a need for more research into infant mortality, especially in urban places as the rate of infant mortality in urban Ghana as per the last demographic and health survey was 49 deaths per 1,000 live births compared to 46 deaths per 1000 live births (Ghana Statistical Service, 2015). Research into the determinants of infant mortality can enhance the understanding of the determinants of infant mortality by identifying the underlying causes of the phenomenon. In addition to understanding the root causes of the phenomenon, it will help in developing strategies to reduce infant deaths in the developing world and the globe at large.

Moreover, reducing infant mortality can improve health outcomes for the entire population as addressing the root causes of infant mortality can improve the access to healthcare, improvement in living conditions and public health education resulting in the general health and well-being of mothers, children, and the entire population. The understanding of the determinants of infant mortality can inform public health planning and policy development particularly in the developing world where infant mortality rates are higher. This includes allocating resources to specific interventions and programs aimed at reducing infant mortality.

Urban areas have most amenities research has shown supports the wellbeing of infants but the rising infant mortality rates from the 2014 GDHS and the 2018 MICS coupled with the rapidity with which Ghana is urbanising call for an up-to-date study on the determinants of infant mortality in the urban space of Ghana. Also, increased knowledge of the urban differences in infant mortality within the country is essential for interventions and programmes to accelerate progress toward the

SDG as countrywide measures sometimes mask the variations that exist. Studying the determinants of infant mortality in an urban area can help identify disparities and inequities in health outcomes. This knowledge can inform efforts to improve health equity and reduce health disparities. Similarly, the risk factors for mortality that will be pointed out in this study will be dealt with to help the country achieve SDG 3's second target of eradicating all preventable under-five and new-borns mortality by 2030 (Osborn et al., 2015). This will consequently lead to Ghana's development as healthy infants will grow to replace the workforce and contribute immensely to nation building. Lastly, this study when completed will add to the discourse on infant mortality and serve as a reference for future studies.

1.6. Organisation of study

This study is grouped into six chapters. The first chapter of this study includes background information on infant mortality, the statement of the problem, research questions, study objectives, rationale, and organization of the study. The study's second chapter is devoted to a review of the relevant literature, the theoretical framework, the conceptual framework, and the hypotheses. A comprehensive methodology is presented in chapter three. The findings from univariate, bivariate, and multivariate analysis will all be covered in Chapter 4. While the study's findings will be discussed in chapter 5. The findings are summarized, a conclusion is drawn from the data, and some policy- relevant recommendations proffered in the final chapter.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Introduction

There are many contributory factors to infant mortality, and an analysis of the factors that influence infant deaths is vital. This chapter focuses on examining some empirical and anecdotal studies on trends and causes of infant mortality in Ghana. The review draws on existing theoretical frameworks as a guide for the study and examines some determinants of infant mortality. A conceptual framework and hypotheses are proposed to guide the analysis for this study.

2.2. Defining an Infant and infant mortality.

An infant is an individual below age 1, and deaths occurring to such people is termed as infant mortality. Infant mortality is the likelihood of dying between birth and exact age 1 (OECD, 2021; World Health Organisation (WHO), 2022a). Similarly, Mekuriaw and Mohamed, 2021 also defines infant mortality as the probability of a child aged 1 to 11 months dying (Mekuriaw & Mohamed, 2021). Also, Roser et al, define infant mortality as death to children under age 1(Roser et al., 2013). Infant mortality is subdivided into neonatal mortality and post-natal mortality where the former is deaths before one month and the latter is deaths occurring between 1 month and the first year of life. The yearly infant deaths over a thousand live birth gives an indication of infant mortality (Population Referenece Bureau (PRB), 2021). Infant mortality rate thus consists of neonatal mortality rate and postnatal mortality rate. Where the neonatal mortality rate is computed as the number of deaths before 1 month per 1,000 live birth, and the post neonatal mortality rate is computed as the number of deaths from I month to 1 year per 1,000 live birth (Mekuriaw & Mohamed, 2021). While the WHO, 2015 in (Mekuriaw & Mohamed, 2021) asserts that the

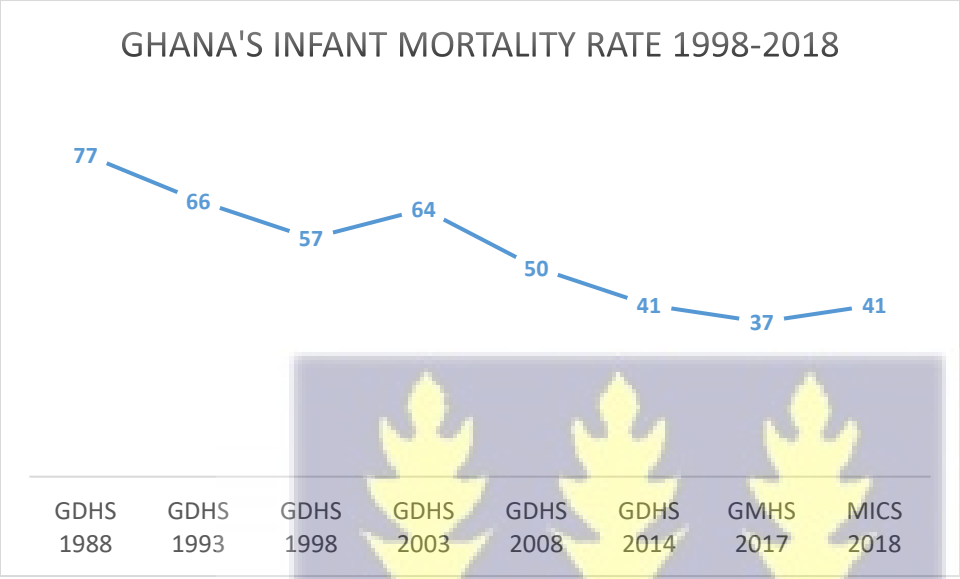
neonatal stage has the highest mortality risk due to infections and pre-term complication, deaths in the postnatal period are mostly due to environmental, socio-economic, demographic and other factors(World Health Organisation (WHO), 2015).

2.3. Trends in Infant mortality in Ghana

From 1988 to 2014, Ghana's under-one death rate dropped from 77 deaths per 1,000 live births to 41 deaths per 1,000 live births. (Adjei et al., 2021; Aheto, 2019; Annan & Aseidu, 2018; Bixby et al., 2022; Dwomoh, 2021; Dwomoh et al., 2019; Mohammed & Akuoko, 2022; Ghana Statistical Service, 2015). A trend similar with global and subnational reports as there has been improvements in technology, sanitation and healthcare (Kumar et al., 2021). Also, the implementation of the Free healthcare and maternal care can be attributed to Ghana's infant mortality trend. The trend of Ghana's infant mortality rate from 1988 to 2018 is represented in figure 2.1.

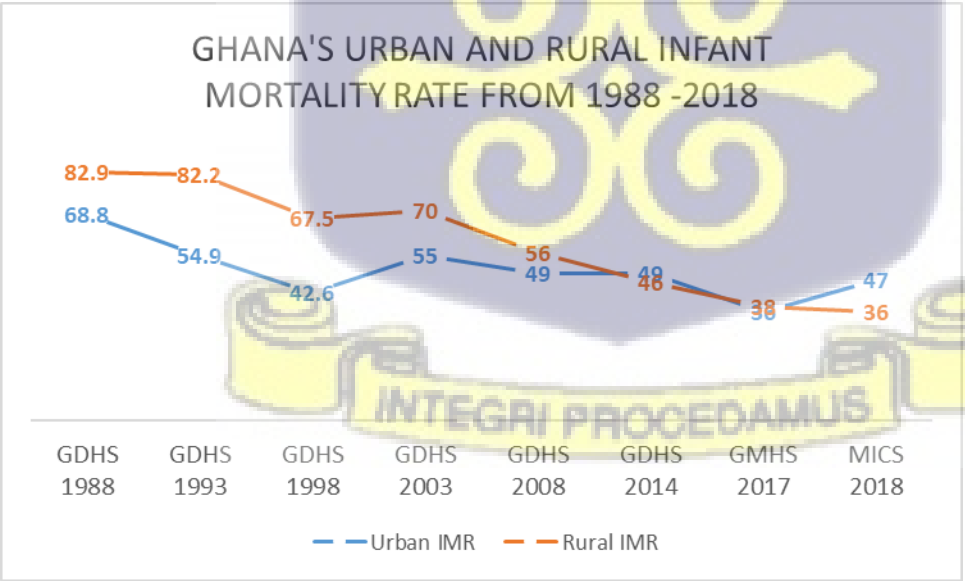
According to figure 2.2, it is evident that infant mortality in rural Ghana has significantly decreased, but it has plateaued at 49 deaths per 1000 live births in urban Ghana. This can be attributed to policies and programmes geared towards reducing infant mortality in deprived areas predominantly rural. The recent rate from the MICS illustrates a worsening situation for urban Ghana that requires prompt action. The graphs below portray the trends in infant mortality from 1988 to 2018 in Ghana and the urban rural trend in the same period.

Figure 2.1: Infant mortality rate from 1988 to 2018



Source (Ghana Statistical Service, 2015, 2017, 2018).

Figure 2.2: Urban and rural Infant mortality trend in Ghana from 1988 to 2018



Source: (Ghana Statistical Service (GSS) 2004; Ghana Statistical Service, 2015, 2017, 2018; Ghana Statistical Service 2009; Ghana Statistical Service & Institute for Resource Development/ Macro Systems, 1989; Ghana Statistical Service & Macro International Inc., 1994, 1999)

2.4. Determinants of infant mortality

Studies on infant mortality has brought to fore some maternal factors like education, wealth status, age, employment status, place of residence, region, ethnicity and religion that has an impact on infant mortality (Baraki et al., 2020; Dwomoh et al., 2019; Garcia Jenny, 2020; Mekuriaw & Mohamed, 2021; Roser et al., 2013). Also some household characteristics like source of drinking water, toilet facility and electricity are factors that has been proven by literature to affect infant mortality (Dwomoh, 2021; Kimani-Murage et al., 2014; Mohammed & Akuoko, 2022). In addition, infant characteristics that impacts infant mortality are the sex of the child, birth size and weight (Ezeh et al., 2015). Other contributing factors of infant mortality are breastfeeding, place of birth, antenatal care attendance, and birth attendant (Ezeh et al., 2015; Sari, et al., 2016) .

2.4.1 Maternal education and infant mortality

Globally, several studies on infant mortality have established a strong relationship between a mother's education and infant's health. Where infants born to mothers with no education are at a higher risk of dying before age one compared to infants born to educated mothers. For example, in a study by Ezeh et al.., 2015 in Nigeria, they found that compare to mothers with secondary education and higher children born to mothers with no education are more likely to die. In explaining this position they asserted that educated parents are knowledgeable in the health of the child, modern healthcare, more likely to immunise their children and also live in clean and neighbourhoods with good sanitation and sophisticated health facilities (Ezeh et al., 2015). Studies that reaffirms this position are (Kumar et al., 2021; Mekuriaw & Mohamed, 2021; Patel et al., 2018; Sarkodie, 2021; Yaya et al., 2019). Again in a study by Akuoko and Mohammad higher maternal education is mostly important in higher mortality regions (Mohammed & Akuoko, 2022). Also, a study conducted in Ghana reveals that children born to mothers with primary or Junior

High education are at a higher risk of dying before the first month compared to mothers with no education. While having secondary education or higher reduces the risk of neonatal mortality. This finding is justifies with the assertion that most of these mothers with primary or Junior high education were teenager (Adjei et al., 2021). Other studies also posit that paternal education is also important in reducing infant mortality as education enlightens individuals on preventive care (Ezeh et al., 2015; Yaya et al., 2019). Education has an impact on mortality in general and consequently infant mortality. Though most studies have found education as an important predictor of infant mortality, a study by Baraki et al did not find education as a significant predictor of infant mortality (Baraki et al., 2020).

2.4.2 Wealth status and infant mortality

Wealth status give a glimpse of the socio-economic status of a household which is sometimes measured using household income and assets. The wealth of a household indicates the type of neighbourhood they reside, education level and the general sanitation. A wealthy family as proven by research are on a higher socioeconomic status which indicates good nutrition, improved sanitation, proper health seeking behaviour, sophisticated health facilities and other good living conditions pivotal to health and wellbeing. Thus, children born to wealthier households are less likely to die before age 1. Studies that buttress these claims are (Adjei et al., 2021; Ezeh et al., 2015; Sarkodie, 2021; Yaya et al., 2019). However, Akuoko and Mohammed postulates that wealth is not a significant predictor of infant mortality in low mortality settings but in settings of high infant mortality richer households experience a rapid drop in infant mortality compared to their poor counterparts(Mohammed & Akuoko, 2022).

2.4.3 Maternal Age and infant mortality

Maternal age is a predictor of infant mortality that have been tested to be significant by several studies. Children born to younger (less than 20) and older mothers (30 years and above) are more likely to die before their first birthday compared to those born to mothers aged between 20 to 30 years. This assertion is supported by the assumption that teenage mothers sometimes have birth complications, are not physically matured to birth a child, poverty, and inadequate nourishment, and may not have adequate knowledge on childcare. While women aged 30 years and above may also have birth complications due to ageing. Thus, teenage pregnancy and being pregnant at an older age are risk factors of infant mortality. Studies that confirms this position are (Adjei et al., 2021; Dwomoh, 2021; Ezeh et al., 2015; Patel et al., 2018). Similar results was found by Sari et al in a study in India where there posit that children born to mothers aged 20-35 are less likely to die in the neonatal stage while mothers aged below 20 and above 35 stands a higher chance of experiencing the death of their infant (Sari et al., 2016).

2.4.4 Employment status and infant mortality

Employment status depicts working in exchange for remuneration. On employment status and infant mortality, the literature presents a mixed finding, where some studies found that infants born to working mothers a less likely to die before age 1. This position is linked to an increase in women empowerment which translates into them being able to cater for their wards and ability to make health care decisions that will improve the wellbeing of the infant as opposed to mothers who are not engaged in any employment activity (Dwomoh et al., 2019). Similar findings that support this position a. On the other hand, some studies posit that working mothers have limited time to care for their children and leave them in the care of nannies who may not be knowledgeable on childcare which impact on their health. In addition, breastfeeding in these children are sometimes not

exclusive thereby exposing them to vulnerabilities that may lead to mortality. (Igboanugo & Saibu, 2021; Mekuriaw & Mohamed, 2021; Titaley et al., 2008). Also, Titaley et al, argues that paternal employment also plays a crucial role in infant mortality. Paternal employment increases household income and improves living conditions (Titaley et al., 2008).

2.4.5 Place and region of residence and Infant mortality

Place of residence is a relevant predictor of infant mortality as infants are mostly susceptible to their environment. Environmental differences in terms of climate, vegetation and terrain have an impact on health and well-being. For example, children born in tropical regions may be at risk of malaria infection while children born in temperate regions may not. Again, the presence of amenities in a region may contribute to good health and wellbeing as opposed to another. On place of residence several studies have postulated that children born in rural areas are more prone to death before age 1 as compared to their urban counterparts. Rural areas are typified with lack of basic amenities, poor living conditions, limited or no education, high unemployment, condition established in the literature to affect infant health (Aheto, 2019; Ely & Hoyert, 2018; Ezeh et al., 2015; Jarde et al., 2021; Mekuriaw & Mohamed, 2021). In Ezeh et al, they established that children born to rural women in Nigeria were at risk of dying and that finding corroborated with studies on mortality in Rwanda, Bangladesh, and Burkina Faso. They related this finding to poor transportation network, poor WASH facilities and health facilities in rural Nigeria. In addition, in a study by Gyimah in Ghana he avows that there is a 38% decline in the risk of death for urban infants compared to their rural folks (Gyimah, 2002) an assertion that is supported by Sarkodie in 2021. Again in Sarkodie's paper he discovered that though sex of a child was not significant there was a higher odds of survival for male infants born in rural areas than girls a position underpinned by the tradition of caring more for male children because of inheritance, lineage perpetuation and

caring for the family in the future (Sarkodie, 2021). On region of residence too Aheto establishes that living in the Eastern, Ashanti, Brong Ahafo, Volta, Upper West, Northern and Central regions increases an infant's risk of dying (Aheto, 2019). Others studies that have showed region impact on infant mortality are (Baraki et al., 2020; Titaley et al., 2008).

2.4.6 Religion and Infant mortality

Religion is a factor that can influence mortality, as religious beliefs may affect behaviour and practices that impact on the health of individuals. Findings on infant mortality and religion is missed, some studies posit that it significantly predicts the menace while other studies deem it as not a significant factor of infant deaths. In a study by Naz and Patel in Sierra Leone, they found that religion was not a significant predictor of infant mortality (Naz & Kumar Patel, 2020). Similarly, Eke and Ewere affirmed that a mother's religion was not a statistically significant predictor of infant mortality(Eke & Ewere, 2022). But a study in rural Bangladesh by Pal and Jaamee postulated that religion is a significant predictor of infant mortality and infant of Muslim mothers are more likely to die before year one (Pal & Jaamee, 2021). The findings of Pal and Jaamee corroborates that of Shobiye et al however they posit that, the higher infant deaths amongst Muslim mothers may not be necessarily due to the Islamic religion but the susceptibility of Northern Nigeria to infant mortality (Shobiye et al., 2022).

2.4.7 Ethnicity and Infant mortality

Ethnic groups have some practices that may contribute to mortality or survival. Again, the environmental conditions of an ethnic group's boundaries can also influence mortality. Patel asserts that there exist a racial/ ethnic difference in infant mortality in the United states with infants born to Non- Hispanic Blacks having higher mortality rate (Patel et al., 2018). Similar studies by

Gyimah in Ghana reveals that mortality differentials exist amongst the various ethnic groups in Ghana mainly due to differences in socio-economic status (Gyimah, 2002).

2.4.8 Birth Characteristics and Infant mortality

Birth characteristics like birth interval and birthweight affect infant's health. Birth interval has an effect on the mother's health particularly when it is short which ultimately can result in infant mortality (Dube et al., 2013). Shorter birth intervals lead to physical and nutritional drain in mothers resulting in premature births and pregnancy difficulties (Dube et al., 2013). Ezeh et al, in their study found that birth interval predicts infant mortality significantly, children born with shorter intervals had a higher risk of mortality. They established that shorter birth intervals affect the mother's health and wellbeing and may lead to competition for attention and resources between the children in poorer households (Ezeh et al., 2015).Titaley et al, also found a strong link between birth spacing and mortality, thus shorter intervals in the second or third birth order increased the likelihood of infant deaths (Titaley et al., 2008). Dwomoh et al, again affirmed that children with less than 24 months interval were about three to six time at a higher risk of mortality (Dwomoh et al., 2019). Paradoxically, a study by Acheampong and Avorgbedor found that the risk of dying increases with increasing birth interval, a result different from other studies on the infant mortality discourse (Acheampong & Avorgbedor, 2017).

2.4.9 Household characteristics and Infant mortality

Two household characteristics that affect infant health are source drinking water and existence of sanitary facility. Sanitation is important to infant survival as they are most susceptible to their environment. Type of drinking water and existence of sanitary facility are proxy measure of household sanitation. Several studies posit that infants living in households with unimproved toilet facilities and water facilities are at a higher risk of mortality than their counterparts in households

with improved sanitary facilities. This is because using unimproved water and toilet facilities leads to infectious diseases like diarrhoea, cholera amongst others. Studies by Adekola et al, 2014 found that there were differences in infant mortality in Ibadan North due to the diversities in water and toilet facility. They also found that infant mortality is higher in low class residential areas with poor toilet facilities, waste management, drainage and quality water but in high class residential areas with improved water, proper waste management and improved toilet facilities there are limited diarrhoeal diseases (Adekola, 2016). Similarly, Mekuriaw and Mohamed asserted that infants with access to safe water had higher survival rates as they found a significant relationship between access to good water and lower risk of deaths in infants (Mekuriaw & Mohamed, 2021). In addition, a study by Acheampong and Avorgbedor found source of drinking water as a weak predictor of child mortality, however, water quality is an indicator of good sanitary conditions. They further concluded that there were higher under five mortalities in children whose mothers did not have an improved source of drinking water (Acheampong & Avorgbedor, 2017).

2.4.10 Infant characteristics and Infant mortality

An important infant factor that has been proven by literature to impact their mortality is the sex of the child. This is due to biological makeup and to an extent cultural beliefs and practices. Studies have asserted that male infants are at a higher risk of dying before age 1 because of their biological make up which make them more susceptible to infectious disease due to immunodeficiency. In addition, male infants are at a higher risk of respiratory diseases due to delayed development (Titaley et al., 2008). Similarly, Aheto, Baraki et al, Annan and Aseidu and Kayode et al, support this assertion as their study also revealed that male infants die in the early stages of life compared to female infants (Aheto, 2019; Annan & Aseidu, 2018; Baraki et al., 2020; Kayode et al., 2015). In addition, in a study in United States, sex was a relevant indicator of infant mortality (Patel et

al., 2018). At birth there are more males born than females, but the higher mortality amongst the males results in a slight increase in the number of females. However, Sarkodie did not find a significant association between infant survivorship and the sex of the child, but he found that in rural places males had a higher survival rate due to cultural practices that attributes importance to males due to inheritance. This result in male infants receiving more attention and care (Sarkodie, 2021).

2.4.11 Breastfeeding and Infant mortality

Nutrition is imperative to good health, and it is one of Mosley and Chen's proximate determinants of child mortality in the developing region. Research has established that breast milk contains essential nutrients that protect infants from infections and strengthen their immunity to diseases. It is therefore not surprising that most agencies in charge of health charge mothers to exclusively breastfeed infants from birth to about 6 months before introducing solid foods. Several studies on infant mortality and breastfeeding reports a strong association between them. Infants who are exclusively breastfed have a higher survivorship compared to those never breastfed. A study by Acheampong and Avorgbedor discovered that breastfeeding is a significant predictor of child mortality. They posited that compared to children who were breastfed from age 0- 6 months, children who were breastfed over 13 months had a higher odd of having a poor health (Acheampong & Avorgbedor, 2017). Also in their study they found that though breastfeeding is essential for infants, prolonged breastfeeding has a negative impact on infant health and consequently mortality (Acheampong & Avorgbedor, 2017). Other studies that corroborate this finding are Kayode et al, 2014 who also affirms that breastfeeding had a strong association with neonatal mortality. In their study 70% of infants who were never breastfed died compared to 2% deaths from infants breastfed in the similar era (Kayode et al., 2015). Jarde et al's study in Gambia

also revealed that no breastfeeding was a risk factor of infant mortality (Jarde et al., 2021). Other studies that affirms the importance of breastfeeding to an infant's health are (Aheto, 2019; Baraki et al., 2020; Sari et al., 2016; Titaley et al., 2008). However, a study by Sarkodie did not find breastfeeding as a significant predictor of infant health. He alluded this to the fact that infants whose mothers are unable to breastfeed them use other nutrient packed food that serve similar purpose (Sarkodie, 2021).

2.4.12 Place of birth and Infant mortality

Place of birth has been pointed out as a significant of infant survivorship. This is because place of delivery may impact on birth complications and infections which can result in the death of the mother and infant. Kayode et al avows that delivery of a baby at a health facility increases the probability of the infant surviving during the neonatal period (Kayode et al., 2015). Studies conducted by Aseidu and Annan, 2018, corroborate this finding. In their study in Ashanti region, they found that place of delivery had an association with infant survival. They thus concluded that infants delivered at home had a lower chance of survival compared to infant delivered in a medical facility. Ironically a study conducted in Ghana by Adjei et al found that infants born to mothers who delivered at home, private maternity homes and clinics had a higher probability of surviving especially in the neonatal period compared to their counterparts delivered at a hospital. In their study in Kintampo they found that over 60% of the women in the community delivered at homes, private maternity homes with the Kintampo hospital serving as a referral unit (Adjei et al., 2021). Also in the Kintampo district about 47.4% of the births are at home while 34.3% occurs in a hospital and births at home are low risk from Adjei et al's study (Adjei et al., 2021). Again a study by Sari et al did not find a significant relationship between place of birth and infant mortality (Sari et al., 2016).

2.4.13 Birth attendance and Infant mortality

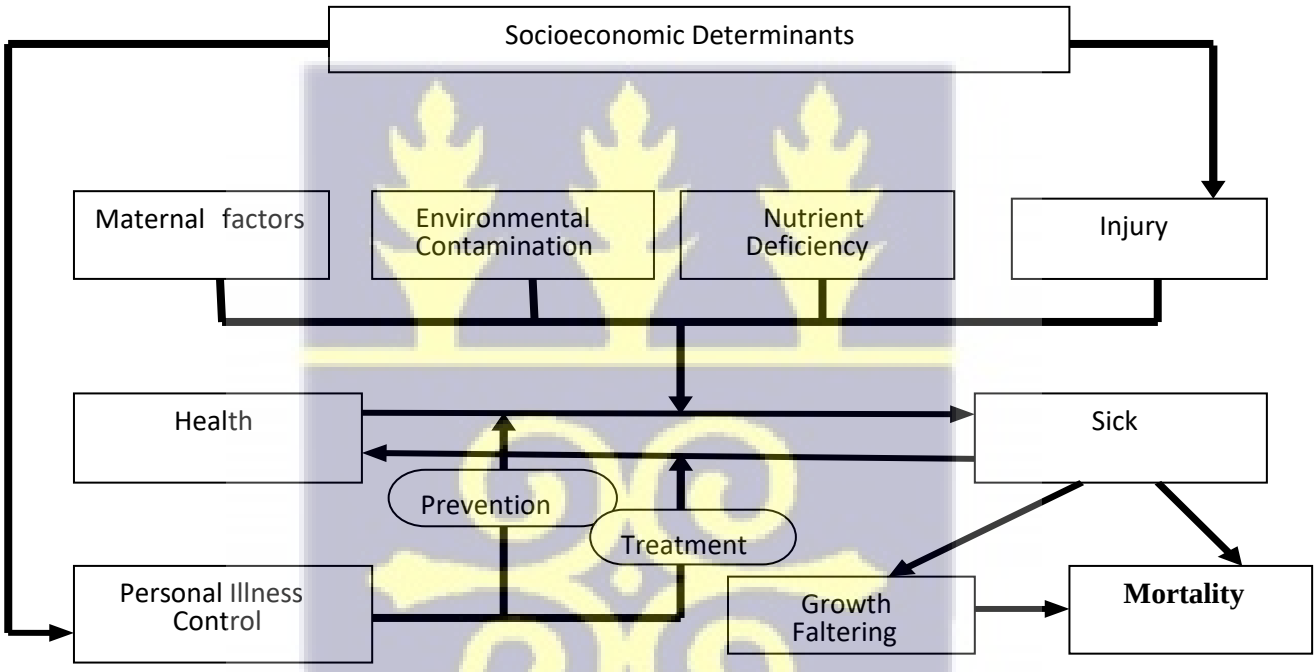
Childbearing is critical and the person attending to the birth is imperative. Births should be assisted by skilled personnel who would be able to manage the birth and be able to control complications. Titaley et al, affirm that birth attendance is a significant predictor of infant mortality as deliveries assisted by a trained birth attendant reduces the risk of deaths (Titaley et al., 2008). Also Annan and Aseidu, in their study in Ashanti region found that being attended to by a skilled professional during the pregnancy period, at delivery and postnatal care is important to both infant and maternal survival (Annan & Aseidu, 2018).Thus regions with high infant mortality especially at the neonate period have low access to skilled attendance on delivery (Annan & Aseidu, 2018) On the contrary, in a study by Sari et al, they did not find any significant association between birth attendant and neonatal mortality (Sari et al., 2016).

2.5. Theoretical framework

In many infant mortality studies, the Mosley and Chen proximate determinants model has been used to explain the relationship between background characteristics, proximate factors, and infant mortality. The Mosley and Chen framework is one of the best frameworks in infant mortality analysis as it expansively accounts for factors that impact on infant health namely, environmental, nutritional, maternal factors, injuries and socio-economic factors. It is thus a suitable model as all these factors impact on infant health in Ghana and sub-Saharan Africa. Nonetheless, the shortcoming of this theory is that it is challenging to find data on all these variables in surveys from sub-Saharan Africa. The Mosley and Chen model postulates that, mortality to infants occur either through biological factor, social factors, or a combination of both. Thus, socioeconomic factor may impact on an infant's health directly or work through proximate factors such as

breastfeeding, injuries and environmental factors to affect infants. The Mosley and Chen Proximate determinants of infant mortality framework is presented in Fig 2.3.

Figure 2.3: Mosley and Chen's Proximate determinants of infant mortality.



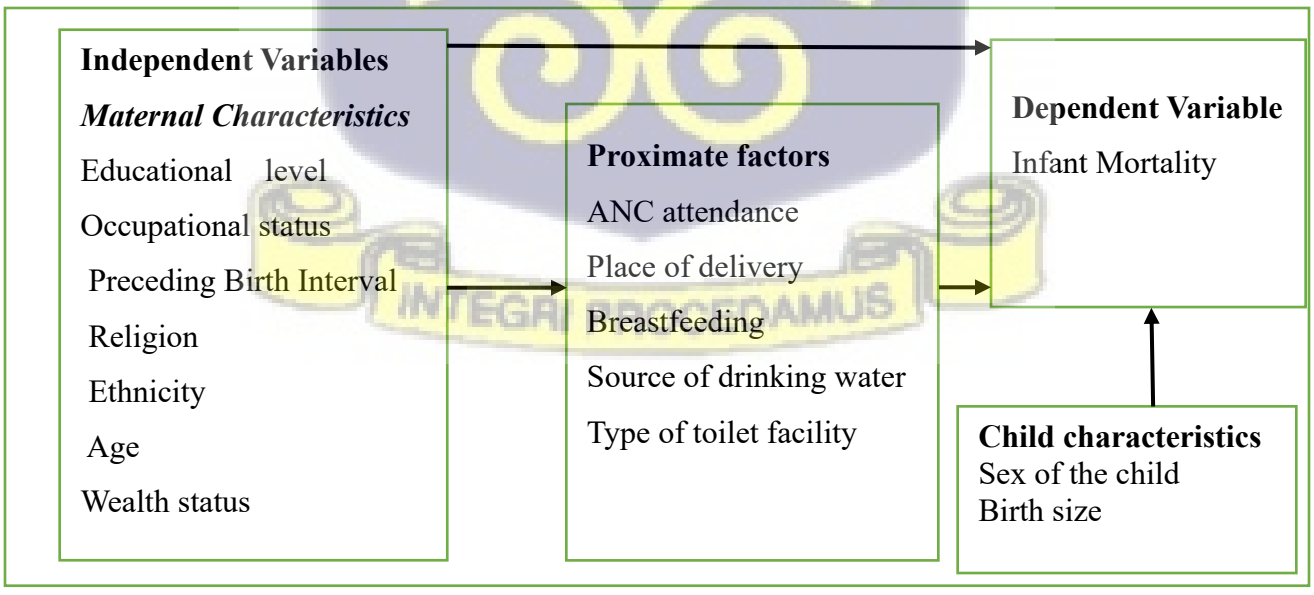
Source: (Mosley and Chen, 1984)

2.5 Conceptual framework

The conceptual framework for this study draws on the Mosley and Chen's model. For this study independent variables that can either affect infant mortality directly or work through other proximate factors to impact infant mortality are maternal factors and child factors such as the sex of the child, birth size, birth order and the age of the child. For example, an educated mother is more likely to use antenatal care services, deliver at a health facility and raise the infant under hygienic conditions and these factors have been proven to affect infant mortality. The proximate variables are the factors proven by the literature to directly affect infant mortality. In this study

they are ANC attendance, place of delivery, birth attendance, breastfeeding, source of drinking water, and type of toilet facility. These variables have a direct bearing on infant health and are significant predictors of infant mortality. For instance, a child delivered by a skilled birth attendant may have a higher chance at survival than one delivered by unskilled personnel. Similarly, infants are susceptible to environmental conditions such as sanitation, an important predictor of infant mortality mostly measured using source of drinking water and type of toilet facilities. Thus, infants in homes with improved sanitary conditions may be at a lower risk of being exposed to diseases that can result in mortality. Also, nutrition is important to the wellbeing of infants and provides them with nutrients required to fight against diseases and nourishes them to grow healthily. Infants who are not adequately breastfed may be exposed to diseases as a result of poor immunity and they stand a higher risk of dying before their first birthday.

Figure 2.4: The conceptual framework for the study



Source: Author's construct, 2022

2.6 Hypotheses

1. Infants born to mothers with higher levels of education have a lower risk of mortality compared to infants born to mothers with no education.
2. Infants born into poor households are more likely to die before turning one compared to children born into wealthy households.
3. Infants who have been breastfed have a lower chance of dying before age one compared to infants who have never been breastfed.
4. Infants born to mothers who never attended the hospital for antenatal care are more likely to die before the age of one compared to children delivered to women who had four or more prenatal visits.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter's main objective is to provide information on the methodology employed in conducting the study. Details about the study area, source of data, sample selection, methods of data analysis, variable measurement and the limitation of the study are discussed in the ensuing sub-sections.

3.2 Study Area

Ghana is a developing country in sub-Saharan Africa specifically West Africa. The country is sub-divided into sixteen administrative regions which is further divided into 216 district assemblies. Data from the 2021 population and housing census shows that the country's population is over 30.8 million (Ghana Statistical Service, 2021). Accra is the county's capital city and serves as the administrative and commercial capital of the country. The population of Accra as reported in the 2021 census is 5,455,692 (Ghana Statistical Service, 2021). As a developing country, Ghana's health system is not that robust compared to other developed nations of the world. However, compared to others in the sub region Ghana may be among the countries with a good health care system in West Africa. The county is urbanising at a fast rate with 56.7% of its population living in urban areas (Ghana Statistical Service, 2021). A well demarcated area with a population of 5000+ is the basic definition of an urban area in Ghana.

3.3 Data Source

The 2014 Ghana Demographic and Health Survey data were the primary source of data for this investigation (GDHS). Women and men's demographic and health information was gathered by

the Ghana Statistical Service in collaboration with the Ghana Health Service and with technical assistance from ICF International. The 2014 demographic and health survey was the sixth and most recent DHS conducted in the country. A two-stage sample method based on the 2010 Population and Housing Census frame was utilized as the sampling approach in this study. From a total of 11,835 homes from January to March 2014, a nationally representative sample of 9,396 women and 4,388 men between the ages of 15 and 49 and 15 and 59 were interviewed (Ghana Statistical Service, 2015). The 2014 Ghana Demographic and Health Survey gathered information on a variety of topics, including fertility rates, infant and child mortality, family planning, domestic violence, maternal health, prenatal care visits, STDs, abortions, and more (Ghana Statistical Service, 2015). The survey's objective was to provide insight into population and health indicator estimates at regional, rural, urban, and national levels for the benefit of the entire country. Basic demographic and health variables covered in earlier rounds of the 1988, 1993, 1998, 2003, and 2008 surveys are updated using data from the 2014 GDHS analysis.

3.4 Sample Selection

This study mainly focuses on infant mortality in urban areas as such cases from rural areas were not included in the study. Also, data on multiple births were excluded in this study because of the higher mortality risk associated with multiple births. To achieve the study's goal of studying the factors that contribute to infant mortality in urban Ghana, only single births in urban Ghana throughout the survey period were included in the analysis. Based on this, 527 single births in

urban Ghana were selected from the 2014 GDHS data for this study by filtering out the urban singleton birth throughout the survey period from the entire dataset.

3.5 Methods of Data Analysis

The data were analysed using the Statistical Package for Social Science (SPSS) version 26. Univariate, bivariate, and multivariate analyses were used to analyse the data. Additionally, Microsoft Excel was used to create tables and charts. Frequency and percentage distributions, and charts were used to describe the features of the study sample at the univariate analysis stage. Cross tabulations using chi-square testing were carried out at the bivariate level to examine the relationship between infant mortality and the predictor variables. The chi-square test of independence was used to assess the relationship between the outcome variable and the predictor variables because all independent variables are categorical. Given the dichotomous nature of the dependent variable, a binary logistic regression model with a 95% confidence level was established at the multivariate level of the investigation.

3.6 Variables in the study

There are three groups of variables in this study, independent variables, proximate factors and dependent variable, all of which are categorical. There are nine independent variables divided into maternal and child characteristics, five proximate and the dependent variable. The independent variables are factors that can impact infant mortality on its own or work through other an intervening variable to affect infant mortality. The proximate factors are the variables that directly affect infant mortality, these are mostly health factors, nutritional factors and household conditions. For this study the five proximate variables are breastfeeding, antenatal care attendance, place of delivery, source of drinking water and type of toilet facility.

3.6.1 Infant mortality

The original variable in the 2014 GDHS was recoded into infants who died and those who are alive. All under-one births at the time of the survey was selected to constitute the alive category and the deaths to babies below 12 months were recoded as infant deaths.

3.6.2 Sex of the child

The original variable in the 2014 GDHS dataset was maintained for sex of the child with two classifications (male and female).

3.6.3 Birth size

The variable in the 2014 GDHS dataset was recoded into a new birth size variable used for the data analysis. The original coding was large, very large, average, small and very small. The large and very large categories were coded as large, average maintained and small and very small combined into small for the purpose of this study.

3.6.4 Antenatal attendance

This variable was included in this study because of its significance to infant mortality. The original variable was recoded into three categories to aid in the data analysis, these categories are No visits, 1-3 visits and 4+ visits. The No visits category was an addition of the No visits and the don't know in the original dataset. Women who had one to three prenatal appointments was coded as "1-3 visits," and the category for women who had four or more prenatal visits was coded as "4+ visits."

3.6.5 Place of delivery

For the context of this research, the primary variable from the GDHS dataset was recoded into three categories. The new codes were 0 for not health facility and 1 for public health facility and 2 for private health facility. The original codes were respondents home, other home, government

hospital, government clinic, government health post/CHPS, mobile clinic, other public, private hospital, private clinic, FP/PPAG clinic, mobile clinic, maternity home and other private. Respondents home and other home were recoded as not health facility. Government hospital, government clinic, government health post/CHPS, mobile clinic, other public were recoded as public health facility and private hospital, private clinic, FP/PPAG clinic, mobile clinic, maternity home and other private were also recoded as private health facility.

3.6.6 Breastfeeding

The breastfeeding variable was also recoded into never breastfed and ever breastfed in the context of this study. The original codes were never breasted, ever breastfed but not currently breastfeeding and still breastfeeding. Never breastfed was maintained while ever breastfed but not currently breastfeeding and still breastfeeding were combined to form the new category ever breastfed. The categorisation of the variable is not the best in examining the impact of breastfeeding on infant mortality. However, given that secondary data was used in this research, the variable duration of breastfeeding had many missing cases which could have distorted the findings of the study hence the categorisation into never and ever breastfed.

3.6.7 Source of drinking water

Source of drinking water was reclassified into unimproved and improved water sources. That is, all sources of water protected from contaminants were coded as improved (piped into dwelling, public tap, piped into plot, borehole, protected well and spring, bottled and sachet water). On the other hand, unprotected wells, springs, river, dams, and tanker truck provided water were coded as unimproved sources. This categorisation was in line with the report on the 2014 GDHS.

3.6.8 Type of toilet facility

Type of toilet facility was also recoded into improved and unimproved sources. That is all facilities that safely separate human waste from human contact was coded as improved (flush to pipe sewer, flush to septic, flush to pit latrine, pit latrine with slabs, and ventilated improved pit latrine) while the vice-versa was coded as unimproved (Flush to somewhere else, flush to don't know where, pit latrine without slabs, no facility/bush/field, bucket toilet and hanging toilet/latrine).

3.6.9 Educational level of the mother

Educational level is one of the independent variables under maternal characteristics included in the study. Maternal education as measured in the GDHS 2014 dataset was used for this study. This variable was an ordinal variable with four categories namely, no education, primary, middle/JSS/JHS and secondary/SSS/SHS/higher.

3.6.10 Occupation of the mother

Another important variable mostly utilised in infant mortality discourse is occupation of the mother. This variable was recoded into not working, Professional/technical/managerial, Sales, clerical/services, agricultural sector, and manual labour. The original codes were sales, clerical, services, skilled manual labour, unskilled manual labour, not working, agricultural employee, and agricultural employer. The following categories were maintained; not working, Professional/technical/managerial and sales. Unskilled and skilled manual labour was combined to for the new category manual labour. Agricultural employee and agricultural employer were also combined to form the agricultural sector category and clerical and services combined into Clerical/services.

3.6.11 Preceding birth interval

In the 2014 GDHS dataset, the preceding birth interval was captured as a discrete variable. However, it was changed for this study into a categorical variable with three categories: "first births," which referred to first order births, and mothers of lone children. Births with intervals of less than 24 months were recoded as "Less than 24 months," while births with intervals of 24 months or more were recoded as "24 months and above. “This categorisation was employed because the literature posits that births with less the 24 months’ interval are at a higher risk of experiencing mortality before age one compared to births with 24 months’ interval or more.

3.6.12 Mother’s Religion

The religion variable was recoded into 6 categories in the context of this study. The original variable in the dataset had 9 categories which was collapsed into Catholics, Anglican/Methodist/ Presbyterians, Pentecostal/Charismatic, Other Christians, Islam and Other. The other comprises of no religion and traditionalist. The nine categories were Catholic, Anglican, Methodist, Presbyterian, Pentecostal/ Charismatic, Other Christian, Islam, Traditionalist and No religion.

3.6.13 Mother’s Ethnicity

On the ethnicity variable, the original variable which comprised of 9 categories were recoded into 6 variables for the purpose of data analysis. These categories are “Akan”, “Ga/Dangme”, “Ewe”, “Guan”, “Mole-Dagbani” and “Other” The first five categories were maintained while the other category consisted of all other groups with the exception of the five. The original categories were Akan, Ga/Dangme, Ewe, Guan, Mole-Dagbani, Grusi, Gurma, Mande and other.

3.6.14 Maternal Age

The maternal age variable in the original dataset was maintained (V013). The study employed the age in five-year interval from the dataset.

3.6.15 Wealth status

The wealth status variable in the GDHS, 2014 dataset was maintained for the data analysis of the study. It had 5 categories namely, poorest, poorer, middle, richer and richest.

Table 3.1: Variables and Their Measurement.

VARIABLES	MEASUREMENT
Child Characteristics	
Sex of the child	1- Male 2- Female
Birth size	1- Small 2- Average 3- Large
Maternal Characteristics	
Educational level	0- No education 1- Primary 2- Middle/JHS/JSS 3- Secondary/SHS/SSS/Higher
Occupational status	0- Not working 1- Professional/technical/managerial 2- Clerical/services 3- Sales 4- Agricultural sector 5- Manual labour
Preceding Birth Interval	1. First birth 2. Less than 24 months 3. More than 24 months
Religion	1- Catholics 2- Anglican/Presbyterian/Methodist 3- Pentecostals/Charismatic 4- Other Christians 5- Islam 6- Other
Ethnicity	1- Akan 2- Ga/Dangme 3- Ewe 4- Guan 5- Mole-Dagbani 6- Other

Maternal Age	1- 15-19 2- 20-24 3- 25-29 4- 30-34 5- 35-49 6- 40-44 7- 45-49
Wealth status	1- Poorest 2- Poorer 3- Middle 4- Richer 5- Richest
Proximate Variable	
ANC attendance	0- No visit 1- 1-3 visits 2- 4+ visits
Place of delivery	0- Not health facility 1- Public health facility 2- Private health facility
Breastfeeding	0- Never Breastfed 1- Ever Breastfed
Source of drinking water	0- Unimproved source 1- Improved sources
Type of toilet facility	0- Unimproved 1- Improved
Dependent variable	
Infant mortality	0- Alive 1- Death

CHAPTER FOUR

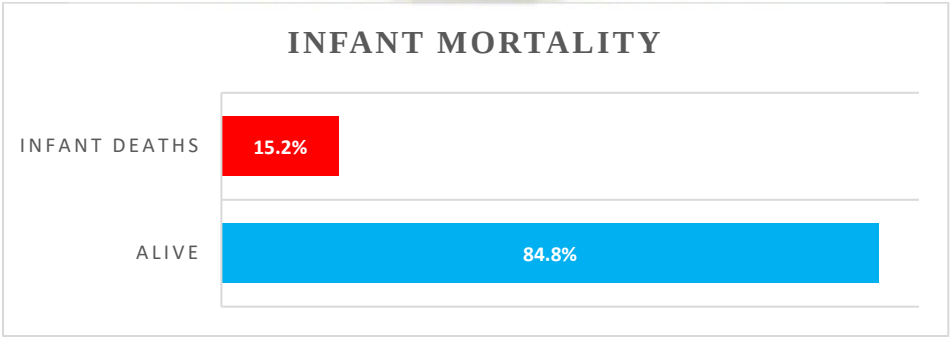
4.0 ANALYSIS OF RESULTS

4.1 Introduction

There are numerous factors that have been established in the literature to impact infant deaths. Some of these are maternal age, occupation, preceding birth intervals, place of delivery, antenatal care, maternal education, sex of the infant birth size, breastfeeding, type of toilet facility, source of drinking water, and wealth status to mention a few. In analysing the factors that affect infant mortality it is imperative to describe the characteristics of the participants in this study. This section is thus dedicated to first describe the characteristics of infants and their mothers and proximate factors associated with infant mortality. Frequencies, bar graphs and pie charts will be used in describing these characteristics. Secondly, in establishing the relationship between the various independent variables and the dependent variable, the study specified cross tabulation. Again, Pearson chi-square and P- values were calculated to establish statistical significance between the independent variable and the dependent. Lastly a binary logistic regression was specified at the multivariate level.

4.2 Under-one death

Figure 4.0: Bar graphs displaying frequency and percentage distribution of survivorship and deaths to infants in 2014 respectively.



Source: GDHS, 2014

From figure 4.0, 15.2% of children under the age of one who were born in the five years preceding the survey died before age one, while 84.2% of infants were alive at the time of the survey.

4.3 Child Characteristics

From table 4.1 there were more male infants than females in urban Ghana. Male infants constituted 56.7% while female infants were 43.4%. Given that there are more males born than females this trend is to be expected. Also, with research establishing more deaths in male infants than females, mortality may be higher amongst male infants. In addition, amongst infants born to women sampled for the study, those with large birth size were 48.2%, followed by 36.1% infants with average size and 15.7% infants whose size at birth was small.

Table 4.1: A table showing the frequency and percentage distribution of Sex of the child and birth size.

Child Characteristics	Frequency	Percentage
Sex of the Child		
Male	299	56.7
Female	228	43.3
Birth size		
Small	83	15.7
Average	190	36.1
Large	254	48.2
Total	**527**	**100.0**

Source: GDHS, 2014

4.4 Proximate Factors

Proximate factors are the factors that have a direct bearing on infant mortality. The results in Table 4.2 shows that most women utilised antenatal care services when they were pregnant with their infants. Children born to mothers who had four or more antenatal visits were 83.7%, while 2.4% of the children were born to mothers who had no antenatal visits. The results further show that 76.3 % of the infants were born in a public health facility while 11.0% were not born in a health facility. Also, about 13% of the births occurred in a private health facility. About 93.2% of infants were ever breastfed while 6.8% were never breastfed their children.

Table 4.2: A table showing the percentage distribution of antenatal visits, place of delivery and breastfeeding.

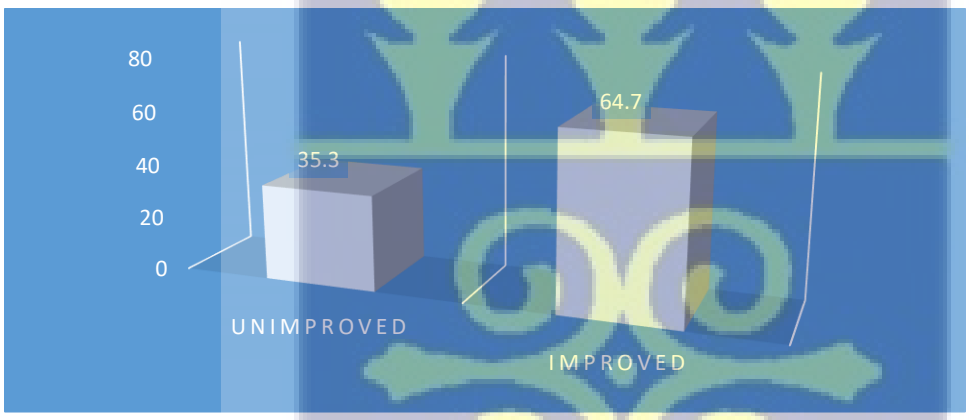
Proximate factors	Frequency	Percentage
Antenatal visits		
No visits	52	9.9
1-3	34	6.5
4+	441	83.7
Place of delivery		
Not health facility	58	11.0
Public health facility	402	76.3
Private health facility	67	12.7
Breastfeeding		
Never breast fed	36	6.8
Ever breastfed	491	93.2
Total	**527**	**100.0**

Source: GDHS, 2014

4.4.1. Source of drinking water and type of toilet facility

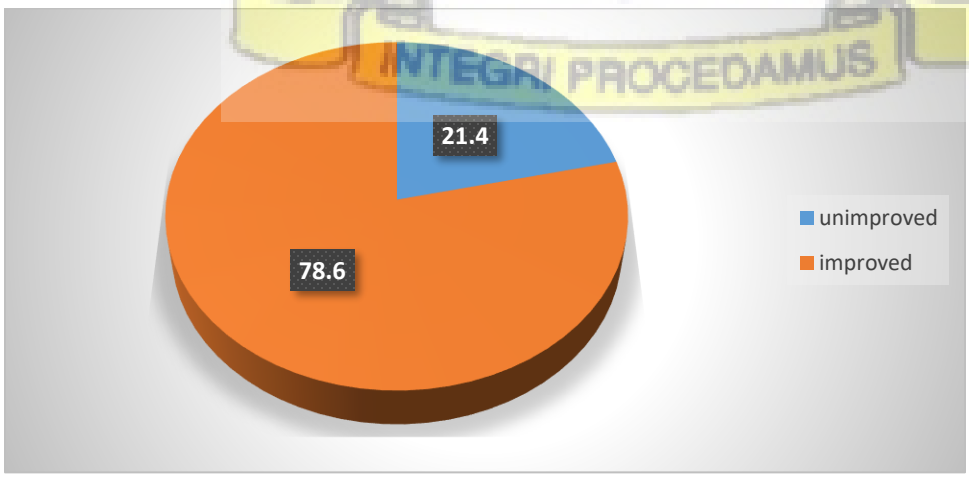
As portrayed in figure 4.1, 64.7 % of the infants lived in households with access to improved sources of drinking water compared to 35.3 % who lived in households with access to unimproved sources of drinking water. Also, from figure 4.2, 78.6% of the infants resided in households that utilised improved toilet facility while 21.4% of the infants resided in households with unimproved toilet facilities.

Figure 4.1: A bar graph showing the percentage distribution of source of drinking water used by mothers with infants in Urban Ghana in 2014.



Source: GDHS, 2014

Figure 4.2: A pie chart showing percentage distribution of type of toilet facility used by mothers with infants in Urban Ghana in 2014



Source: GDHS, 2014

4.5 Maternal Characteristics

From table 4.3, children born to mothers with middle education had the highest percentage (38.5%) while infants born to mothers with primary education had the least percentage of 16.5%. Also, mothers with no education makes up 21.1% of the sample. In addition, children born to mother's employed in sales constitute 43.6% of the sample and infants born to mothers who were not working at the time of the survey made up 26.8% of the sample. Mothers employed in clerical/services had the least percentage of the total sample (3.4%). Infants born to mothers who are engaged in some form of employment is higher than those unemployed in the study. Also, 30.0% of infants were born to mothers in the richer wealth index while 8.9% of infants were born to mothers in the poorest wealth category. 22.2% of mothers with infant are in the middle wealth category. The richer and richest categories constitute more than half of the sample (59.8%) while 18.0% of the sample are in the poorest and poorer wealth categories.

From the table 4.3, 71.2% of the respondents are Christians, out of which 35.7% are Pentecostal/Charismatics comprising the highest percentage of the sample, followed by Muslims (25.2%). Respondents who identified themselves as other constituted 3.6%. This breakdown is similar to that of Ghana as a majority of the country's population ascribe to the Christian faith. Again, infants born to mothers belonging to the Akan ethnic group made up 44.8% of the sample. On the other hand, the Guan group had the least respondents with a percentage of 2.7. Respondents consisting of the other ethnic groups in Ghana are 9.5. The higher percentage of Akans is to be expected as that is the major ethnic group in Ghana. From table 4.3 26.2% of infants were first order births with no intervals, infants born with less than 24 months' interval constituted 8.2% of the sample while infants born with 24 months or more birth interval constituted 65.7% of the total sample. On maternal age, infants born to mothers aged between 45-49 constituted the least

proportion of the sample (1.5%). While infants born to mother between the ages of 25-29 was 28.7%. Close to three-quarters of the sample were born to mothers in the age brackets of 20-24, 25-29, and 30-34. Infants born to mothers between the ages of 45 to 49 being the least in the sample is to be expected as women at this age scarcely put to bed.

Table 4.3: A table showing the frequency and percentage distribution of mothers with infants by educational level, occupation, age, religion, wealth index and ethnicity.

Independent Variables	Frequency	Percentage
Mothers educational level		
No education	111	21.1
Primary	87	16.5
Middle/JHS/JSS	203	38.5
Secondary/SSS/SHS/Higher	126	23.9
Mothers Religion		
Catholics	46	8.7
Protestants	62	11.8
Pentecostal/ Charismatic	188	35.7
other Christians	79	15.0
Islam	133	25.2
other	19	3.6
Wealth index		
Poorest	47	8.9
Poorer	48	9.1
Middle	117	22.2
Richer	158	30.0
Richest	157	29.8
Mother's age		
15-19	26	4.9
20-24	99	18.8
25-29	151	28.7

30-34	132	25.0
35-39	80	15.2
40-44	31	5.9
45-49	8	1.5
Preceding birth interval		
First births	138	26.2
less than 24 months	43	8.2
24 months and above	346	65.7
Ethnicity of the mother		
Akan	236	44.8
Ga/Dangbe	35	6.6
Ewe	56	10.6
Guan	14	2.7
Mole-Dagbani	137	26.0
Other	49	9.3
Mothers Occupation		
Not working	141	26.8
Professional/technical/managerial	44	8.3
Clerical/Services	18	3.4
Sales	230	43.6
Agricultural sector	34	6.5
Manual labour	60	11.4
Total	**527**	**100**

Source: GDHS, 2014

4.6 Association between child, maternal and proximate factors and infant mortality

The results from the bivariate analysis are presented under the ensuing headings.

4.7 Child characteristics

On the child characteristics at the bivariate level, the two-variable included in this study were not statistically significant at the 95% confidence level.

4.7.1 Sex of the child and Birth size

At the 95% confidence level, the sex of the child did not show a statistically significant association with infant mortality. Similarly, birth size was not a significant associated with infant deaths after running the Pearson's Chi-square test at the 95% confidence level. From table 4.6 it is evident that children born with an average birth size has the least percentage of infant deaths (14.2%), followed by children with large birth size (15.6) and lastly children with small birth size had the highest proportion of infant deaths (19.3%).

Table 4.4: Infant Mortality and Child Characteristics Distribution by Percentage of Births During the Survey Period

Infant Characteristics	Infant mortality		Total	Person $X^{2,}$ P-value
	Alive	Dead		
Sex of infant				2.451, 0.117
Male	87.0	13.0	299	
Female	82.0	18.0	228	
Birth size				1.295, 0.523
Small	80.7	19.3	83	
Average	85.8	14.2	190	
Large	85.4	15.6	254	

Source: GDHS, 2014

4.8. Proximate Variables

These are variables that have immediate effect on the dependent variable. After running the Pearson's chi-square test only two proximate variables were significantly predicting infant

mortality namely breastfeeding and antenatal care attendance while place of delivery, source of drinking water and type of toilet facility were not significant predictors of infant mortality in urban Ghana.

Table 4.5: Percentage Distribution of Births During the Survey Period by Proximate Variables and Infant mortality

Proximate Variable	**Infant mortality**		**Total**	**X^2, P-value**
	Alive	**Deaths**		
Antenatal Care				216.636, **0.000**
No visits	9.8	90.2	52	
1-3 visits	97.1	2.9	34	
4+ visits	92.1	7.9	441	
Breastfeeding				201.989, **0.000**
Never breastfed	2.7	97.3	36	
Ever breastfed	90.8	9.2	491	
Place of delivery				3.446, 0.179
Not health facility	77.6	22.4	58	
Public health facility	86.3	13.7	402	
Private health facility	82.1	17.9	67	
Source of drinking water				0.004, 0.952
Unimproved	84.9	15.1	186	
Improved	84.8	15.2	341	
Type of toilet facility				3.313, 0.069
Unimproved	90.3	9.7	113	
Improved	83.3	16.7	414	

Source: GDHS, 2014

4.8.1 Antenatal Care and infant mortality

Antenatal care attendance was a statistically significant at the 95% confidence level. From table 4.6, the highest proportion of infant deaths was recorded among infants born to mothers who had no antenatal visits (90.2%) while mothers who had 1-3 visits recorded 2.9% deaths among the infants born to them and mothers who had 4 or more antenatal visits recorded 7.9% infant deaths.

4.8.2 Breastfeeding and infant mortality

Breastfeeding was another statistically significant at the 95% confidence level. From table 4.4, 97.3% infants who were never breastfed died before age one while 9.2 % of infant deaths in those ever breastfed.

4.8.3 Place of delivery and infant mortality

Place of delivery was not statistically significant at the 95% confidence level. Though not significant, infant deaths were higher in delivery that occurred outside a health facility compared to health facility deliveries. Deaths to infant delivered in non-health facilities were 22.4 percent while deaths to infant's delivered in Public had the least percentage of 13.7. Infant deaths that occurred to deliveries that occurred in private facilities were 17.9%.

4.8.4 Type of toilet facility and source of drinking water and infant mortality

The type of toilet facility variable at the 95% confidence level was not a significant predictor of infant mortality in urban Ghana. As displayed in table 4.4 infant mortality in households with improved toilet facility was 9.7% while that of households with unimproved toilet facility was 16.7%. Also, the variable, source of drinking water at a 95% confidence level was not statistically significant after running the Pearson chi-square test. From table 4.4 infant death among parent who utilised improve water and unimproved water source was about 15%.

4.9 Maternal Characteristics and infant mortality

After the Pearson Chi-Square test, it was revealed (in table 4.6) that all the maternal characteristics employed in the study were not statistically significant at the 95% confident level.

Table 4.6: Percentage Distribution of Births During the Survey Period by Maternal Characteristics and Infant Mortality.

Maternal Characteristics	Infant mortality		Total	$X^{2,}$ P-value
	Alive	Dead		
Level of education				6.205, 0.102
No education	80.1	19.9	111	
Primary	89.7	10.3	87	
Middle/JHS/JSS	87.6	12.4	203	
Secondary/SSS/SHS/Higher	80.1	19.9	126	
Occupation				8.916, 0.112
Not working	85.8	14.2	141	
Professional/technical/managerial	72.7	27.3	44	
Clerical/service	72.2	27.8	18	
Sales	87.4	12.6	230	
Agricultural sector	88.2	11.8	34	
Manual labour	83.3	16.7	60	
Religion				4.907, 0.427
Catholics	89.1	10.9	46	
Anglicans/Presbyterian/ Methodist	90.3	9.7	62	
Pentecostal/Charismatic	85.6	14.4	188	
Other Christians	82.3	17.7	79	
Islam	80.5	19.5	133	
Other	89.5	10.5	19	

Wealth Index				4.546, 0.337
Poorest	91.5	8.5	47	
Poorer	81.3	18.7	48	
Middle	88.9	11.1	117	
Richer	82.9	17.1	158	
Richest	82.8	17.2	157	
Ethnicity				11.467, **0.043**
Akan	84.7	15.3	236	
Ga Dangbe	80.0	20.0	35	
Ewe	96.4	3.6	56	
Guan	64.3	35.7	14	
Mole-Dagbani	84.7	15.3	137	
Others	81.6	18.4	49	
Age				8.540, 0.201
15-19	96.2	3.8	26	
20-24	86.9	13.1	99	
25-29	87.4	12.6	151	
30-34	81.8	18.2	132	
35-39	81.3	18.7	80	
40-44	83.9	16.1	31	
45-49	62.5	37.5	8	
Preceding birth interval				0.119, 0.942
First births	84.1	15.9	138	
Less than 24 months	86.0	14.0	43	
24months and above	85.0	15.0	346	

Source: GDHS, 2014

4.9.1 Maternal Education and Maternal Age

From table 4.6, maternal education was not statistically significant at the 95% confidence level. it is worth noting that mothers with no education and secondary education and higher had the same proportion of infant's death (19.9%) followed by mothers with middle education and lastly primary education level. Maternal age was not statistically significant at the 95% confidence level. Younger mothers had the least proportion of infant deaths 3.8%, but mothers aged 45-49 years had the highest proportion of infant deaths 37.5%. Also 18.7% of infant deaths occurred amongst mothers aged 35-39 years.

4.9.2 Occupation and Preceding birth interval

Occupation again is not statistically significant at the 95% confidence level. On the five categories of the employment variable, mothers who were working in clerical/services at the time of the survey had the highest proportion of infant deaths (27.8%), followed by mothers employed in professional/technical/managerial (27.3%), while mothers engaged in agricultural activities had the least percentage of infant's deaths (11.8%). Also, mothers not engaged in any economic activity had a 14.2% proportion of infant deaths. Preceding birth interval was also not statistically significant at the 95% confidence level after running the Pearson's chi-square test. First births had the highest proportion of infant's death (15.9%) followed by children born with a birth interval of 24 or more months (15.0%) and lastly births with less than 24 months' interval (14.0%).

4.9.3 Wealth status, Religion and Ethnicity

Similarly, wealth status was not statistically significant at the 95% confidence level. The highest proportion of infant mortality was recorded among poorer mothers (18.7%), followed by mother in the richest wealth category (17.2%), then mothers in the richer wealth category. The poorest category had the least proportion of infant deaths (8.5%) as evident in table 4.6. Just like other

maternal characteristics, religion was also not statistically significant at a 95% confidence level. The proportion of infant deaths to mothers who ascribed to the Islam faith was the highest (19.5%) compared to all other categories. The second category with a higher proportion of infant deaths was the other Christian group with a 17.9% proportion of infant deaths. While Anglican/Presbyterian/ Methodist recorded the least infant mortality with a percentage of 9.7. Lastly, ethnicity at the 95% confidence level was the only statistically significant maternal characteristic. From table 4.6 that, children born to Guan mothers recorded the highest proportion of deaths (35.7%), followed by Ga/Adangbe, Other and Mole-Dagbani. Children born to Ewe mothers had the least proportion of infant deaths (3.6%).

4.10 Predictors of infant mortality among children in urban Ghana

The results from the multivariate analysis are discussed in this sub-section. Factors associated with infant deaths in urban Ghana is presented below. At the bivariate level, three variables namely breastfeeding, antenatal care attendance, and mother's ethnicity were significantly associated with infant mortality in urban Ghana. To test the strength of the earlier results from the bivariate level, a binary logistic regression model was specified. The relationship between maternal, child and proximate factors and the dependent variable (infant mortality) was tested by specifying a binary logistic regression model. A binary logistic regression model was used because the outcome variable is dichotomous. A single model was specified as all variables were regressed on the dependent variable to test their association together with the other variables in the study. The results from the binary logistic regression are presented in table 4.7 displaying the odds ratio, confidence interval and the p-values of each predictor variable and the model's summary. The results from the binary logistic regression indicate that breastfeeding was the only statistically significant predictor of infant mortality in urban Ghana.

Table 4.7: The Association Between Maternal Characteristics, Infant Characteristics, Proximate Variables, and Infant Mortality.

Indicator Variable	OR, CI		P-value
Sex of the child			
Male	1.000		
Female	1.425	[0.567, 3.581]	0.451
Birth Size			
Small	1.000		
Average	0.381	[0.108, 1.340]	0.133
Large	0.360	[0.105, 1.233]	0.104
Antenatal Care			
No visits (RC)	1.000		
1-3 visits	0.001	[0.000, 0.031]	**0.000**
4+ visits	0.003	[0.001, 0.016]	**0.000**
Breastfeeding			
Never breastfed (RC)	1.000		
Ever breastfed	0.000	[0.000, 0.007]	**0.000**
Place of delivery			
Not health facility (RC)	1.000		
Public health facility	1.012	[0.199, 5.152]	0.988
Private health facility	1.345	[0.159, 11.405]	0.786
Source of drinking water			
Unimproved (RC)	1.000		
Improved	0.716	[0.255, 2.012]	0.527
Type of toilet facility			
Unimproved (RC)	1.000		
Improved	1.844	[0.489, 6.953]	0.366

Type of Occupation			
Not working	1.000		
Professional/technical/managerial	3.960	[0.683, 22.942]	0.125
Clerical/service	0.413	[0.022, 7.753]	0.554
Sales	0.620	[0.191, 2.016]	0.427
Agricultural sector	1.030	[0.139, 7.607]	0.977
Manual labour	2.157	[0.543, 8.571]	0.275
Mothers Ethnicity			
Akan	1.000		
Ga/Dangbe	0.295	[0.036, 2.405]	0.254
Ewe	0.880	[0.138, 5.593]	0.892
Guan	8.855	[1.342, 58.423]	0.023
Mole-Dagbani	0.962	[0.236, 3.919]	0.957
Others	1.359	[0.289, 6.390]	0.698
Wealth Index			
Poorest	1.000		
Poorer	2.459	[0.390, 15.514]	0.338
Middle	0.660	[0.097, 4.505]	0.671
Richer	0.536	[0.083,3.466]	0.513
Richest	0.547	[0.068, 4.379]	0.569
Maternal education			
No education	1.000		
Primary	0.313	[0.061,1.608]	0.164
Middle/JSS/JHS	1.046	[0.237, 4.619]	0.953
Secondary/SSS/SHS/Higher	0.789	[0.106, 5.872]	0.817
Preceding Birth Interval			
First births	1.000		
Less than 24 months	0.369	[0.038, 3.554]	0.388
24 months or more	2.099	[0.617, 7.147]	0.235
Mothers Religion			
Catholics	1.000		

Anglican/Presbyterian/Methodist	0.472 [0.046, 4.900]	0.530
Pentecostal/Charismatic	0.986 [0.176,5.510]	0.987
Other Christians	0.376 [0.043, 3.281]	0.376
Islam	0.916 [0.150, 5.602]	0.924
Other religion	0.054 [0.002, 1.571]	0.090
Model Summary		
Constant	10.818	**0.000**
Percent correct prediction	95.8%	
Nagelkerke	72.0%	
Chi-square (df)	280.486 (34)	**0.000**
Hosmer and Lemeshow test (df)	4.495 (8)	0.810

Source: GDHS 2014; RC: Reference Category

4.10.1 Child characteristics

The sex of the infants in the study and their birth size were not statistically significant predictors of infant mortality. This finding is contrary to the findings of most studies in the infant mortality scholarship. Also, from table 4.7 birth size was not statistically significant after specifying the binary logistic regression model.

4.10.2 Findings on the Proximate variables

Breastfeeding was one of the statistically significant predictors of infant mortality after specifying the binary logistic regression. As displayed in table 4.7 breastfeeding reduced the risk of infant deaths as infants who were ever breastfed had a 0 % likelihood of dying before age one compared to infants who were never breastfed. In addition, antenatal care attendance was also statistically significant at the 95% confidence level after specifying the binary logistic regression. From table 4.7 compared to the no antenatal visits category, having 4 or more antenatal care attendance reduced the likelihood of infant mortality by 0.997 times. Thus, antenatal care attendance reduces the odds of infant mortality. Paradoxically, place of delivery was not a significant predictor of

infant mortality at the multivariate level. Similarly, source of drinking water and type of toilet facility were not statistically significant in predicting infant mortality after specifying the logistic regression.

4.10.3 Findings on maternal characteristics

All the maternal characteristics employed in this study were not statistically significant in predicting infant mortality urban Ghana. Maternal education, occupation, religion, ethnicity, wealth index, age, and preceding birth interval were all not significant predictors of infant mortality in Urban Ghana.

CHAPTER FIVE

5.0 DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter is dedicated to discussing the findings of this study from the multivariate analysis. The discussion of the result will be guided by the study's research questions.

5.2 Discussions of Child Characteristics and infant mortality

On the child characteristics that predisposes infants to mortality, the two variables namely sex of the child and birth size included in the study were not significant predictors of infant mortality. Also, the odds of infant deaths were higher in females compared to males. This finding deviates from the literature as most studies have asserted that male infants are at a higher risk of dying before age 1 because of their biological make up which make them more susceptible to infectious disease due to immunodeficiency (Ezeh et al., 2015; Sari et al., 2016; Sarkodie, 2021). In addition, studies posit that male infants are at a higher risk of respiratory diseases due to delayed development (Titaley et al., 2008). Similarly, Aheto, Baraki et al, Annan and Aseidu and Kayode et al, support this assertion as their study also revealed that male infants die in the early stages of life compared to female infants (Aheto, 2019; Annan & Aseidu, 2018; Baraki et al., 2020; Kayode et al., 2015). However, the findings from this study are contrary to the existing literature. The reason behind this finding may be because of some socio-economic variation like unemployment, poorer wealth status, breastfeeding and, antenatal care attendance which may affect female infants. Again, on birth size the finding avows that of other studies that states that, infants with smaller birth size have a lower chance of survivorship compared to children with average and large birth size (Adekola, 2016; L. Dube et al., 2013; Ezeh et al., 2015; Lamichhane

et al., 2017; Titaley et al., 2008; Vijay & Patel, 2020). Smaller birth size predisposing infants to deaths maybe because of low birth weight and poor nutrition all important to the healthy growth of a child.

5.3 Discussions on Proximate factors and infant mortality

Breastfeeding and antenatal care attendance were the only significant predictors of infant mortality. This finding was in line with the literature on the infant mortality discourse. Breastfeeding provides the infant with the required nutrients for growth, boosts baby's immunity and promotes healthy weight gain in infants. The findings of this study are in line with Kayode et al, 2014 who also affirms that breastfeeding had a strong association with neonatal mortality. In their study 70% of infants who were never breastfed died compared to 2% deaths from infants breastfed in the similar era (Kayode et al., 2015). Jarde et al's study in Gambia also revealed that no breastfeeding was a risk factor of infant mortality (Jarde et al., 2021). Other studies that affirm the importance of breastfeeding to an infant's health are (Aheto, 2019; Baraki et al., 2020; Sari, et al., 2016; Titaley et al., 2008). Antenatal care being a significant predictor of infant deaths is to be expected as regular antenatal visits help keep the mother and baby in check which can result in delivering a healthy baby. The result from this study is similar to several studies that revealed that antenatal care visit is a significant predictor of infant mortality (Dadi, 2015; L. Dube et al., 2013; Lamichhane et al., 2017; Vijay & Patel, 2020). Also, from the study the proportion of mothers who had no antenatal visit was close to one-tenth, which suggest that majority of the respondents visited the hospital for antenatal care. This finding may be because the study setting is urban areas of Ghana were, majority of the mothers are educated and have access to health facilities. This finding also confirms the hypotheses that, Children born to mothers who never visited the hospital for antenatal care are more likely to die before age one compared to children born to mothers who

had four or more antenatal visits and children born to mothers who ever breastfed them are less likely to die before age one compared to children born to mothers who never breastfed them. Lastly the place of delivery variable not being a significant predictor of infant mortality is contrary to literature as most studies posit that place of delivery is a significant predictor of infant death. For example, Kayode et al avows that delivery of a baby at a health facility increases the probability of the infant surviving during the neonatal period (Kayode et al., 2015). Studies conducted by Aseidu and Annan, 2018, corroborate this finding. In their study in Ashanti region, they found that there is a significant relationship between place of delivery and infant survival. They thus concluded that infants delivered at home had a lower chance of survival compared to infant delivered in a medical facility. The explanation behind this finding maybe that because of the free maternal health care, most people use health facilities when they are due for delivery but may neglect other factors like breastfeeding, postnatal care and protecting infants from infections imperative for infant survival. Also, with most deliveries occurring in the health facility infant deaths will also be higher. Lastly private and public facilities lacking technology and the personnel to provide excellent care may result in such finding.

5.4 Household characteristics and infant mortality

Two household characteristics that affect infant health are source of drinking and presence of toilet facility. Sanitation is important to infant survival as they are most susceptible to their environment. Source of drinking water and presence of toilet facility are proxy measure of household sanitation. However, source of drinking water and type of toilet facility were not statistically significant in predicting infant mortality in this study. The odds of using improved drinking water resulted in a reduction in infant deaths but, the odds of using improved toilet facility result in an increase in infant deaths The former finding is in line with numerous studies, having access to improved water

sources reduces the risk of infectious diseases (Acheampong & Avorgbedor, 2017; Adekola, 2016; Mekuriaw & Mohamed, 2021). But the finding on type of toilet facility deviates from most studies. Studies by Adekola et al, 2014 found that there were differences in infant mortality in Ibadan North due to the diversities in water and toilet facility. They also found that infant mortality is higher in low class residential areas with poor toilet facilities, waste management, drainage and quality water but in high class residential areas with improved water, proper waste management and improved toilet facilities there are limited diarrhoeal diseases (Adekola, 2016).

5.5 Discussions on maternal characteristics and infant mortality

On the maternal factors associated with infant mortality in urban areas of Ghana, the study found that, maternal education, wealth status, mother's religion and ethnicity, preceding birth interval and a mother's occupation were not significant predictors of infant mortality in urban areas of Ghana. On maternal education, the findings from this study is contrary to the literature. In a study by Ezeh et al.., 2015 in Nigeria, they found that compared to mothers with secondary education and higher children born to mothers with no education are more likely to die. In explaining this position, they asserted that educated parents are knowledgeable in the health of the child, modern healthcare, more likely to immunise their children and live in clean and neighbourhoods with good sanitation and sophisticated health facilities (Ezeh et al., 2015). Studies that reaffirm this position are (Kumar et al., 2021; Mekuriaw & Mohamed, 2021; Patel et al., 2018; Sarkodie, 2021; Yaya et al., 2019). However, the findings corroborate with a study by Baraki et al, who found that education is not a significant predictor of infant deaths. The possible reason behind education not being a significant predictor of infant mortality on urban Ghana may be the interplay of factors affecting infant deaths. Thus, being highly educated alone cannot improve the chances of infant survivorship. With the high rate of unemployment in urban centres, educated mothers not gainfully

employed may not be able to cater adequately for their infants in terms of good nutrition, hygienic surroundings, and good health care. Also, the differences in the quality of education across the world may result in such findings. The first hypothesis of the study "compared to infants born to mothers with no education, those born to mothers with higher levels of education have a lower risk of mortality" is therefore rejected as the findings are contrary.

Again, on the wealth status, the higher odds of mortality in the poorer and poorest category compared to the other categories is similar to the literature. Thus, children born to wealthier households are less likely to die before age 1. Studies that buttress these claims are (Adjei et al., 2021; Ezeh et al., 2015; Sarkodie, 2021; Yaya et al., 2019). Also, the finding affirms the hypothesis that, compared to children born into wealthy households, infants in lower-income families have a higher chance of dying before turning one. This is because wealthy families are able to give their infants the best health care, nutrition, and proper sanitary conditions pivotal to infant health and survival.

Though some studies posit religion as a significant predictor of infant mortality, for example a study in rural Bangladesh by Pal and Jaamee postulated that religion is a significant predictor of infant mortality and infant of Muslim mothers are more likely to die before year one (Pal & Jaamee, 2021). This study found otherwise. The findings of this study are in line with a study by Eke and Ewere that a mother's religion was not a statistically significant predictor of infant mortality (Eke & Ewere, 2022). Muslim mothers having higher infant deaths than Christians can be attributable to socio-economic factors than religious factors. For example, in Ghana most urban poor communities have a higher percentage of Muslim resident than Christians. These informal settlements lack the basic amenities and sanitation facilities that promote good health. Lastly on the preceding birth interval the finding is similar to a study by Acheampong and Avorgbedor. They

found that the risk of dying increases with increasing birth interval, a result different from other studies on the infant mortality discourse (Acheampong & Avorgbedor, 2017). This finding is however not consistent with most literature which posit that longer birth interval help the mother regain loss nutrients and blood which is beneficial to preventing infant deaths (Aheto, 2019; Baraki et al., 2020; Ezeh et al., 2015). This finding may be as a result of the mothers age at birth as some studies posit that longer birth interval is more effective when mothers are within the early twenties (R. Afeworki, J. Smits, J. Tolboom, 2015), but in this study 18.8 percent of women where below 25 years.

CHAPTER SIX

6.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents a summary of key findings of the study, draws conclusions, and make recommendations for policy and future studies to help reduce infant deaths in urban areas of Ghana.

6.2 Summary

The main objective of the study was to examine the determinants of infant mortality in urban Ghana. With this, four objectives were set to guide the study and they were to; explore household characteristics that influence infant mortality in urban Ghana; investigate some maternal socio-economic and demographic factors associated with infant mortality in urban Ghana; explore some infant characteristics that predispose them to mortality; examine some proximate factors that affect infant mortality in Urban Ghana.

In a bid to achieve the research objectives, the study set out to find answers questions which pertained to the household characteristics that influence infant mortality in urban Ghana; socio-economic and demographic factors of the mother that affect infant mortality in urban Ghana, the infant characteristics that predispose them to mortality in urban Ghana and proximate factors that affect infant mortality in urban areas of Ghana. Variables employed in the study to help were grouped under three major categories namely, maternal characteristic, infant characteristics, and proximate variable. Variables under the maternal characteristics were educational level, occupational status, preceding birth interval, religion, ethnicity, age, and wealth status. Under the categories infant and proximate factors there are the following variables respectively, sex of the

child, birth size, place of delivery, breastfeeding, antenatal care attendance, type of toilet facility and source of drinking water.

In this study there were four hypotheses proposed; The first was that infants born to mothers who ever breastfed them are less likely to die before age one compared to infants born to mothers who never breastfed them. And the others are as follows, compared to infants born to mothers with no education, those born to mothers with higher levels of education have a lower risk of mortality. infants born to mothers who never visited the hospital for antenatal care are more likely to die before age one compared to those born to mothers who had four or more antenatal visits and compared to children born into wealthy households, infants in lower-income families have a higher chance of dying before turning one.

The 2014 Ghana demographic and health survey dataset was used to analysed data to find answers the research questions in other to meet the study's objective. For this study, only singleton births in urban Ghana within the survey period was included in the analysis so as to meet the study's objective of examining the determinant of infant mortality in urban Ghana. For this study, 527 single births in urban Ghana were chosen from the 2014 GDHS data.

The association between the various predictors and the outcome variable was established using three levels of analyses. At the univariate level a description of the background characteristics of the mothers and children were given. Cross tabulations and Pearson chi-square were utilised to test the association between the dependent and independent variables at the bivariate level. The last level of analysis employed the binary logistic regression as the outcome variable was dichotomous. 14.9 percent of the infant included in the survey died before age one at the univariate level. At the bivariate one independent variable (mother's ethnicity) and two proximate factors (breastfeeding and antenatal care attendance) were statistically significant while two proximate were statistically

significant at the 95% confidence level after running the specifying the binary logistic regression. These variables are breastfeeding and antenatal care attendance under. Again, after running the analysis three out of the four hypotheses were in line with the finding but the hypothesis on maternal education was not statistically significant hence its rejection.

6.3 Conclusion

Infant mortality has seen a reduction all around the world, however, it is still endemic in the developing world of which Ghana is a part. From the bivariate and multivariate analysis of this study it is discernible that breastfeeding and antenatal care attendance are significant predictors of infant deaths in urban Ghana. Thus, breastfeeding, and antenatal care attendance are relevant to preventing infant deaths in urban Ghana and the country at large. These factors are also imperative for the country to meet the SDG 3 target of lowering under five and new-born deaths to 25 and 12 deaths per 1000 live birth respectively.

6.4 Recommendations

From the finding of this study, breastfeeding and antenatal care attendance were statistically significant predictors of infant mortality in Urban Ghana. This study recommends that,

- There should be continued sensitisation of mothers on the importance of exclusive breastfeeding for infant in the first six months of life. The Ministry of Health, Ghana Health Service and the media should collaborate to champion this cause.
- Pregnant women should be encouraged to visit the hospital for antenatal care as it is imperative for mother and infant survival. In urban poor residents, community health personnel should be deployed to educate pregnant women on nutrition, health and also check their vitals. Also there can be the adoption of “tele nurse” a data free mobile app

where pregnant mothers can have access to antenatal care without necessarily visiting the hospital.

- Health facilities particularly government facilities should be equipped with the required technology and personnel to administer care efficiently.
- Lastly in the long-run work environment should be made convenient for nursing mothers to be able to bring their infants to work and give them the needed attention while being productive.

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