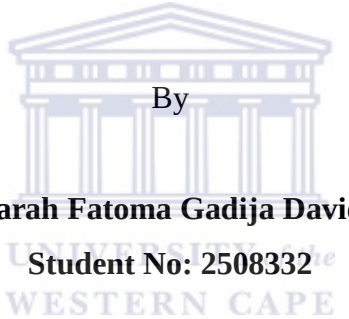
The correlation between the serious diseases affecting child mortality in Sierra Leone

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Philosophy in the Department of Statistics, Faculty of Natural Science, University of the Western Cape



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Keywords

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Declaration

I declare that *the correlation between the serious diseases affecting child mortality in Sierra Leone* is my own work, that it has not been submitted for any degree or examination in any other university and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

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Abstract

Child mortality in Sierra Leone is the highest ranked in the world. Government officials and researchers have tried to understand how and why this has become such a big phenomenon in Sierra Leone. Researchers have come up with three main causes for child mortality in Sierra Leone: maternal factors, environmental factors and health factors. The majority of research has been carried out on maternal, as well as environmental factors. However, minimal research has been carried out on health factors in Sierra Leone. Therefore, the objective of this study is to see how maternal and environmental factors have an effect on health factors, which in turn causes child mortality.

The data used was from the 2008 Sierra Leone Demographic and Household Survey (SLDHS). The child dataset was used as it contained the information required from both the mother and the child. Of the three categories that were used, the first was maternal factors, which included the mother's age, the mother's occupation, the mother's education, the sex of the child, the birth number and religion. The second category was environmental factors, which included the source of water, type of toilet, place of residence, source of energy and the dwelling material used for the household. The final category was health factors, which included whether the child had a fever in the last 2 weeks, short rapid breaths, a cough or fever, a problem in the chest or runny nose and whether the child had Diarrhoea recently and still has Diarrhoea.

The study showed that child mortality had four statistically significant factors associated with it: place of residence, birth number, religion and type of toilet facility. Furthermore, when it came to diseases affecting children, the SLDHS had not given much information, so we looked only at the effects it had on children. From our results, we concluded that ARI, Diarrhoea and Measles each had one variable that was statistically significant to it. As for Pneumonia, there were no variables associated with children contracting the disease.

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Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ALRI	Acute Lower Respiratory Infection
ARI	Acute Respiratory Infection
CIA	Central Intelligence Agency
CWIQ	Core Welfare Indicator Questionnaire
DHS	Demographic and Household Survey
FC	Facility
FP	Family Planning
GDP	Gross Domestic Product
HAI	Human Asset Index
HIV	Human Immunodeficiency Virus
IRIN	Integrated Regional Information Network
MARA/ARMA	Mapping Malaria Risk in Africa/ Atlas du Risque de la Malaria en Afrique
MDG	Millennium Development Goals
MICS	Multiple Indicator Cluster
MSF	Médecins Sans Frontières
NRF	National Research Foundation
ORC	Opinion Research Corporation
SLDHS	Sierra Leone Demographic and Household Survey
TB	Tuberculosis
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
US	United States
WHO	World Health Organization

Chapter I

Introduction

1.1 Introduction

"It is not enough to prepare our children for the world, we must prepare the world for our children "

– Luis J Rodriguez

Child mortality is a subject that has been looked at, but not really invested in by a number of governments worldwide. In 1970, it was estimated that 17 million children a year had died before the age of five (Gordon, Mackay & Rehfuess, 2004). This number had been reduced to about 9 million a year in 2009 (Morley, 2010). The reduction was good overall. However, the decline only affected certain countries, while others had done little or nothing to reduce their child mortality rates (Gordon, Mackay & Rehfuess, 2004). In 2010, the United Nations (UN) estimated that 16 third world countries had managed to reduce their child mortality rate by 40% in the last two decades (United Nations, 2010). This reduction, according to the Millennium Development Goals, is short of the target which the UN was aiming for (Steadland & Skoglund, 2008).

Furthermore, it has been estimated that one in five of the world's children resides in the sub-Saharan region (United Nations, 2010). Therefore, this has become a high priority to researchers since in sub-Saharan Africa, high fertility and the low priority towards tackling the child mortality rate has led to an increase in the number of child deaths from 4 million in 1990 to 4.4 million in 2008 (United Nations, 2010). In addition, the World Health Organization (WHO) global indicators show that the nations with the lowest child mortality rates in 2000 were all first world countries such as Iceland (3 deaths per 1000), Sweden (4 deaths per 1000), Singapore (4 deaths per 1000), Japan (5 deaths per 1000) and Norway (5 deaths per 1000) (World Health Orginization, 2010c). As for the five countries with the highest child mortality rates in 2000,

namely Mali (217 deaths per 1000), Chad (205 deaths per 1000), Angola (238 deaths per 1000), Afghanistan (257 deaths per 1000) and Sierra Leone (252 deaths per 1000) (World Health Orginization, 2010c), these are all considered to be developing countries. Some of the developed and developing countries were able to reduce their child mortality rate by a significant margin. An example of a developed and developing country that were able to reduce their child mortality rates are Singapore and Ethiopia. In Singapore, the government was able to reduce its child mortality rate from 8 per 1000 in 1990 to 2 per 1000 in 2008. As for Ethiopia, the government was able to reduce its child mortality rate from 202 deaths per 1000 to 101 deaths per 1000 over a period of 20 years (Institute for Health Metrics and Evaluation, 2010).

The developing countries, which are faced with high levels of child mortality rates, have two main concerns in common. Firstly, they have all faced war in the past few decades that has left their infrastructure in disarray. Secondly, diseases such as Pneumonia, Diarrhoea, Measles, Anaemia, Polio and Tuberculosis are affecting the child mortality rate in these countries, despite being curable through vaccination if detected early and treated immediately.

Sierra Leone has the highest child mortality rate (278.1 per 1000) in the world today. The child mortality rate in Sierra Leone between 1990 and 2000 was decreasing at an annual rate of 1.8 per 1000. This has subsequently increased between 2000 and 2010 to an annual rate of 3.5 per 1000 (Institute for Health Metrics and Evaluation, 2010). One reason for the child mortality rate being high is that diseases have become a major cause of death for children (Kandeh, 1986). In order to alleviate this problem in recent years, the UN has entered Sierra Leone and has been assisting with healthcare in areas that do not have adequate health care, as well as informing the people of diseases and what these diseases could do to them and their children if not treated correctly (International Center for Transitional Justice, 2010). Therefore, research looking at vulnerable diseases affecting children and how their atmosphere affects them will assist in determining how Sierra Leone could decrease its child mortality rate at a much quicker pace.

1.2 Statement of the problem

"The death of a child is the single most traumatic event in medicine. To lose a child is to lose a piece of yourself."

-Dr. Burton Grebin

The challenges that are evident when looking at vulnerable diseases affecting child mortality in Sierra Leone are related to three main components: the mother's background (maternal factors), the child's environment (environmental factors) and the vulnerable diseases affecting children (health factors).

In Sierra Leone, vulnerable diseases, such as Diarrhoea, Pneumonia, Measles and ARI are diseases that could easily be contracted by children in their living environments, no matter what conditions they may live in. However, the mother's characteristics also play a role, with her background, demographics and socio-economic factors determining whether or not the child would survive.

The population of Sierra Leone, which mainly consists of children, is affected by these vulnerable diseases, which in a number of cases, result in child deaths. These cases could have been avoided if adequate health care was made available to the people of Sierra Leone. These vulnerable diseases could be significant to the child mortality rate in Sierra Leone, as it was in Cuba. The Cuban government was able to decrease its child mortality rate from 38.8 to 22.3 per 1000 by reducing the number of children getting infected and properly treating children against the vulnerable diseases which they had contracted (Behm, 1983).

1.3 Background and need

Child mortality in the world is a great issue that concerns many governments and their populations. For this reason, it has been used to determine the health status of a country (Nannan & Hall, 2010). This means that if a large proportion of children are dying due to health issues, it is less likely that there would be enough people to repopulate the country for the future. If this were the case, the health status of the country would become poor, which would lead to little or

no growth in the country's population (Skolnik, 2008). In developed countries, child mortality has very low levels. This is shown by the rankings of child mortality by the UN (United Nations, Department of Economic and Social Affairs, Population Division, 2011). However, the five countries with the highest child mortality rates are all developing countries. The reason for this is that a first world country's government would allocate three basic needs to its entire population: basic health care, food and shelter. If these basic necessities were to be given to all people in less developed countries, the rate of child mortality might not be so high (Skolnik, 2008).

Sierra Leone is a country that has been labelled as developing. In Sierra Leone, the child mortality rate is 276 per 1000 children, which is the highest in the world (World Health Organization, 2009). For a country that has fewer than six million inhabitants, this does not look good for future growth in the country. There are a number of theories to explain why the child mortality rate is at this high level. Firstly, Sierra Leone had recently emerged from a civil war. Due to the fighting, the government's infrastructure had crumbled, making it difficult for basic needs to be distributed to its people. Secondly, the government has been switching hands for many decades due to political fighting, making it hard for the government to become stable. Thirdly, the level of poverty in Sierra Leone is at an all-time low, making this country one of the poorest countries in the world (Turay, 2010).

The last census that was held in Sierra Leone was in 2004. The Demographic and Household survey 2008 for Sierra Leone was used in this study (Measure DHS, 2008). The reason for using this survey is to determine the effects of serious diseases on child mortality, as 1 in 4 Sierra Leonean children are dying to preventable diseases. Diseases in Sierra Leone are a major concern for children under the age of five. The diseases affecting the population can be categorised into six groups namely: food disease, waterborne disease, vector borne disease, water contact disease, aerosolized dust disease and soil contact disease. For this case, we will be defining the following diseases that are affecting children under the age of five: Tuberculosis, Malaria, Polio, Measles, Diarrhoea and Pneumonia.

Tuberculosis (also known as TB): According to the WHO, Tuberculosis can be defined as follows: "Tuberculosis (TB) is a contagious disease. Like the common cold, it spreads through

the air. Only people who are sick with TB in their lungs are infectious. When infectious people cough, sneeze, talk or spit, they propel TB germs, known as bacilli, into the air. A person needs only to inhale a small number of these to be infected" (World Health Organization, 2010e). Tuberculosis is a disease which is spread through the air. People staying in the same household or who get in close contact to an infected person have a great chance of getting the disease. This is especially the case for babies and children under five as their immune systems are not properly developed. For children, it is hard to detect whether they have contracted the disease since x-rays do not show whether there is a shadow on the lungs and a child cannot cough up enough sputum to be tested (World Health Organization, 2010e). However, once the disease is detected, it becomes treatable with the required medication being taken throughout the treatment period. One way to detect whether a child has contracted TB is to see if an adult close to the child has the disease. If this is the case, the child would be treated for the disease.

Malaria: Malaria is a parasite that enters the body and then reproduces itself within the body (Davis, 2010). The most dangerous type of Malaria is the plasmodium falciparum. Plasmodium falciparum is the main cause of Malaria deaths in the world.
The main way in which Malaria is transferred is by the mosquito. The mosquito takes in the blood of the infected person and then the Malaria virus, Plasmodium falciparum, sends tiny cells to the saliva glands of the mosquito. When the mosquito goes to the next person, it infects that person with Malaria as well. The main victims of Malaria are said to be pregnant women and children under the age of five. The main reason for children under the age of five contracting the disease is that their bodies are still developing their own antibodies, which fight off disease, therefore making them more susceptible to contracting Malaria (Kakkilaya, 2008). In Sierra Leone in 2007, according to UNICEF, it was estimated that 12% of all child deaths were due to children contracting Malaria (UNICEF, 2007).

Poliomyelitis (also known as Polio): Polio is one of the most dangerous diseases to children. Polio is a disease that affects the nervous system and intestines. The disease is found in faecal material that is passed by the infected person. The Polio disease resembles flu like symptoms such as aches, pain and fever. This could result in permanent paralysis or even death (World Health Organization, 2010a).

Measles (also known as Rubeola): Measles is one of the leading causes of deaths in children under the age of five, even though there is a cost-effective vaccine available to combat this disease (World Health Organization, 2011b). Measles is a disease that is transmitted from child to child through the air. The symptoms of Measles are having a rash on the body, a runny nose, high fever, redness of eyes and coughing. Even when a person has had the disease, they can be reinfected. Therefore, a vaccine should be taken if there is a Measles outbreak. In sub-Saharan Africa, the percentage of children dying due to Measles is considerably low. In Chad, Equatorial Guinea and Niger, an estimated 7% of all children under five die to Measles. As for Sierra Leone, an estimated 5% of child deaths are due to Measles (UNICEF, 2007).

Diarrhoea: This is one of biggest reasons children under the age of five are dying. In Equatorial Guinea, an estimated 14% of all children died due to contracting Diarrhoea, while in Sierra Leone, the rate was 20% (UNICEF, 2007). Diarrhoea is due to a child having a gastrointestinal infection. This is caused by a virus, bacteria, or protozoa infecting the intestine. Diarrhoea causes the child to become dehydrated as they have a loss of bodily fluid, which is extremely dangerous. This disease is transmitted by what is known as "faecal-oral transmission" (Johansson & Wardlaw, 2009).

Pneumonia: Pneumonia is said to kill more children each year (1 in 5 children) than any other disease (Johansson, Newby, Renshaw, &Wardlaw, 2007). Pneumonia is a disease that affects one or both lungs, which is mainly caused by an infection. There are three causes of Pneumonia. The first could be through a virus, the second is bacteria and the third, by fungi. According to the National Institutes of Health website, people who are mostly affected by Pneumonia are those over the age of 65 and children under the age of two (National Institute of Health, 2010a). Furthermore, it was found that approximately 26% of children in Sierra Leone are affected by Pneumonia (UNICEF, 2007).

1.4 Purpose of the study

The purpose of the study is to investigate how maternal factors and environmental factors, combined with vulnerable diseases, affect child mortality in Sierra Leone.

1.5 Research Questions

1. How many children are affected by vulnerable disease?
2. How many children died due to maternal factors?
3. How many children died due to environmental factors?
4. Is there significance between maternal factors and vulnerable diseases?
5. Is there significance between environmental factors and vulnerable disease?

1.6 Significance

In Sierra Leone, there are a number of children affected by vulnerable diseases. There have been numerous studies carried out in Sierra Leone, as well as on other countries, focusing on maternal factors, such as background, demographics and socio-economics. This study will be contributing to an area that very few have researched. It will enable us to see how maternal factors, as well as environmental factors, are linked with diseases in Sierra Leone. Like in Cuba, the government could try and reduce the amount of children affected by diseases and decrease the child mortality rate (Behm, 1983).

1.7 Limitation

The study had a number of limitations:

- The researcher used the demographic and household survey. Although the sample had been randomly selected, it only constituted a section of the total population.
- The children dataset used came from the recollection of the mother. This could be biased as only mothers who are in the sample areas would have responded and not those who had emigrated or died prior to the survey taking place. Also, it would have depended on how well the mothers could recall their child's medical history.
- According to Lopez et al. (2002), only one third of the world's countries have adequate systems that capture the cause of death, which does not include Sierra Leone. Therefore, knowing exactly what the cause of death was is very unlikely.
- Sierra Leone has started to recover from a civil war that ended in early 2002. The country is still in the process of rebuilding its infrastructure and getting its population's documents in order.
- The survey did not record the cause of child death, making it hard to see exactly why these children had died.
- Data from the variables, age of mother, age of child and age of death are also sometimes miscommunicated. For example, if a child is 11 months old, some mothers would round the age to 1 year old. Another example that is very important is when a child dies. There are normally two classifications: a child dies before 12 month, or 12 months to 5 years. This could make the data skewed and the analysis could be incorrect.
- Malnutrition is also a limitation as it is does not form part of the survey. However, it is one of the leading causes of death.
- Due to this study looking at diseases that cause child mortality, a study limitation is using a survey and not looking at the diseases over a period of time. If a cohort study data was used, we could determine the cause of the disease and how to treat it.

1.8 Definitions

Under-5 mortality	• This is the probability of a child dying before the age of five • Under-five mortality is also known as child mortality
Vulnerable	• Open or exposed to disease
Infectious diseases	• A disease that tends to spread from one to another
Cross sectional design	• This is when data is collected for a population at a certain point in time • This is like taking a snap shot of the population at a certain point in time
Epidemiology	• This is the study of patterns of sickness and health as well as associated factors at the population level
Underdeveloped country	• Low-income criterion-based on 3 year average estimate of the gross national income per capital • Human resource criteria-involving a composite human assets index (HAI) based on indicators of (a) health (b) nutrition (c)education (d) adult literacy • Economic vulnerability criterion- based on indicators of the instability of agricultural production; the instability of exports of goods and services; share of manufacturing and modern services in Gross Domestic Product (GDP); merchandise export concentration and handicap of economic smallness
Disease Prevention	• Promote health before the development of disease • Establish early health detection and diagnosis leading to timely disease management • Prevention of death by delaying or reversing disease progression
Infrastructure	• Facilities that governments supply as a basic need to the population of the country such as water, electricity, sanitation etc.

Infant mortality	• The probability of an infant's deaths from the date of birth till one year of age
Mortality	• The cause of death due to different reasons • The person does not show any existence of life after birth, that is breathing

Chapter II

Review of literature

In the previous chapter, we discussed the background and need for a study on child mortality due to disease. Therefore, in this chapter, we will be looking at the main factors related to child mortality as was discussed in previous research papers, including demographics (current age of mother, birth number and sex of child), background (religion), socio-economic factors (place of residence, source of water, type of toilet, source of energy, mother's education, mother's occupation) and environmental factors (dwelling material used, namely, the roof, walls and floors). Furthermore, we will be addressing four diseases, which according to the WHO, are said to be the main causes of child mortality in the world (World Health Organization, 2010e).

2.1 Demographics

2.1.1 Mother's age

According to Hossain et al. (2009), a mother's age is significantly associated with child mortality. In the report, *Socioeconomic Inequalities of Infant and Child Mortality*, it states that the older the mother, the higher the chance of child survival (Akoto & Tambashe, 2003). This was further established by Amin (1996), who said that younger women have a higher risk of their children dying than older women. This is not always the case, as Bailey (1988) determined in a study conducted in rural Sierra Leone. He showed that the mother's age had no statistical significance. Although the age of a mother plays a role, the age at which she gets married could also be a factor in child mortality. Similarly, in a study carried out in Nigeria, it was found that the age at which a mother gets married is quite significant towards child mortality (Folasade, 2000).

2.1.2 Place of residence

The place of residence could be considered a contributing factor to child mortality as the distance to medical centres could mean the difference between life and death. The 2003/2004 Demographic and Household survey of Sierra Leone showed that majority of the population, that being 61.41%, lived in the rural areas of Sierra Leone, of which 32.53% were female and 28.88% male (Statistics Sierra Leone, 2004b). This shows that more mothers would come from rural areas rather than urban areas. The MICS 2005 report shows that the child mortality rate in the urban areas of Sierra Leone is 207 per 1000 deaths, while in the rural areas this is much higher at 276 per 1000 deaths (Statistics Sierra Leone & United Nations Children's Fund, 2005). According to Bailey (1988), the place of residence, specifically the Western province of Sierra Leone, was significant to child mortality.

2.1.3 Birth number

The birth number of a child is defined as the order in which a child is born; that is, the first born child is considered to be first in the order of birth, while the child born 12^{th} would be the 12^{th} in order. As for child mortality associated with birth number, some researchers have concluded that birth number does play a role in determining child mortality. For example, Gunasekaran (2008) indicated that birth number was associated with child mortality. Furthermore, the researcher indicated that the chance of a child dying due to being first or of a higher birth number is much higher than children born in between. This was further established by Van Ginneken and Kembo (2009), who stated that the relationship between children under the age of five was indicated by a U-shape. This implies that first born and those children with a higher birth number would have a higher risk of dying. In addition, we looked at the research completed by Bailey (1988), who had taken into consideration the total number of children born to a mother in her life, the spacing of each child, as well as their timing. He concluded that these three factors had an impact on child mortality.

2.1.4 Sex of the child

According to statistics on the Central Intelligence Agency (CIA) website, child mortality throughout the world is higher amongst males than females (The World Factbook, 2009). However, in certain Asian countries, such as Nepal, China, India and Pakistan, child mortality amongst females is higher than their male counterparts (World Health Organization, 2010e). Furthermore, according to Arnold, Kim and Roy (1998), child mortality is of particular interest by sex, since after the age of five, mortality seems to be very low. As for sex degree of difference in developed countries, it was found that mortality for girls and boys were similar. Furthermore, the UN reported that of the 44 countries it looked at, 27 had higher child mortality rates for girls than boys (Arnold, Kim, & Roy, 1998). Some researchers have indicated that the sex of a child is linked with other factors which contribute towards child mortality.

2.1.5 Religion

It has been said that sub-Saharan Africa has had an increase in the number of people with religious involvement, which has led to a lot of decision-making based on their beliefs (Agadjanian & Menjivar, 2008; Ellis & Haar, 1998). A number of studies have shown that religion might have a possible connection to child mortality. Furthermore, Cau et al. (2010) stated that there is a connection between a child's health status and the religion they believed in. The researchers further elaborated that certain religions might not allow people to seek medical advice from medical centres, but rather go and see a prophet or maybe even try and heal themselves. However, not all researchers are under the impression that religion has an impact on child mortality. Bailey (1988) concluded that religion had no statistical significance in terms of child deaths in the Western region of Sierra Leone. In another journal article, it was stated that the characteristic of religion does not affect child mortality (Uddin, Hossain, & Ullah, 2009).

2.1.6 Source of water and sanitation

When it comes to the source of water for a household, many researchers have found this to be a main factor associated with child morbidity, as well as child mortality (UNICEF, 2010b). The

UN has developed a number of millennium goals in order to combat child mortality. One of the goals is to make the environment around children sustainable. Furthermore, Gunther et al. (2011) concluded that with proper investment in water and sanitation, child mortality could be reduced. Furthermore, these two authors stated that with the correct sanitation infrastructure, child mortality could be reduced by about 2.2 million child deaths per year in the less developed countries (Gunther & Fink, 2011). In addition, Diarrhoea is one of the diseases that are easily contractible by inadequate sanitation, as well as poor treatment of water. In 2008, the WHO estimated that around 1.5 million children under the age of five died due to Diarrhoea (UNICEF & World Health Organization, 2009). Furthermore, there are many studies that look at two main factors associated with water and sanitation. The first is the contamination of drinking water, while the second is the places from which households receive their water. In a study carried out by Clasen et al. (2003) in certain region of Sierra Leone, it was found that faecal contamination in the water was a major problem in all sources of water. This meant that the sanitation infrastructure of Sierra Leone is not of a proper standard and that there are leakages into the water sources accessed by the population.

2.1.7 Breastfeeding

Breast milk is said to be the best nutritional supplement for a child aged two years and under (Kramer & Kakuma, 2001). This nutritional supplement helps the child's immune system to fight off viruses and bacteria, which could ultimately reduce child mortality. However, too much or too little breast milk is not good for a child. The reason for this is that if a child is taken off the breast milk too early, they would need to eat other food. This food might not have the same nutritional value as breast milk and could upset the child's system, which in turn would cause Diarrhoea. The alternative is that if a child drinks breast milk for too long, the nutritional value decreases and the milk does not give the child any nutrition for their body. According to the 2005 MICS report, only 7.9% of mothers with children aged 0 to 5 months exclusively breastfed. As for children aged 6 to 8 months, 41.4% received breast milk and got food at least twice before. As for children aged 9 to 11 months, 30.9% had received food at least three times and had also received breast milk (Statistics Sierra Leone & United Nations Children's Fund, 2005). This

shows that not many mothers feed their children breast milk. This could show a lack of knowledge or a mother's refusal to breastfeed her children.

2.2 Socio-economic factors

2.2.1 Mother's education

There have been a number of studies carried out to examine how a mother's education affects child mortality. It is said that a mother's education plays a vital role in child mortality (UNICEF, 2010a). According to Bailey (1988), children born to women with some education had a higher chance of survival than children born to women who did not have any education. This was further shown in a study where the researchers stated that children born to mothers with a secondary or even higher education had a better chance of survival compared to those born to mothers with a primary or no education (Secretariat of the Pacific Community, 2007). In the 2004 Sierra Leone census, it was determined that 40% of females between the ages of 6 and 29 had never attended school (Statistics Sierra Leone, 2004a). The MICS 2005 results of Sierra Leone showed that the majority of mothers, that is 73.7%, had no education, while only15% had a secondary level of education (Statistics Sierra Leone & United Nations Children's Fund, 2005). The literacy rate is important as a mother might not have an education, but could have learnt to read by other methods. The 2004 census of Sierra Leone indicated that 70% of the female population was illiterate, while the rest were literate (Statistics Sierra Leone, 2004a). Furthermore, the MICS report of 2005 showed that 25% of females in the 15 to 24 age group were literate (Statistics Sierra Leone & United Nations Children's Fund, 2005). Despite previous research, many researchers have concluded that a mother's education is fundamental in reducing child mortality, as was believed by Bbaale & Buyiza (2011).

2.2.2 Household income

Household income is said to determine the likelihood of a mother's education, or even the type of health care sought when her child becomes ill. Kandeh (1986) determined that almost 70% of births in Sierra Leone were done by a traditional birth attended, who are said to have no

qualifications and to practice in unhygienic conditions. This shows that females do not have money to go to a clinic and give birth, which makes it very dangerous for both mother and child. The MICS report of 2005 further showed that the rate of child mortality in Sierra Leone was 275 per 1000 for people labelled as 'poor' under the poverty status. This status ('poor') accounts for approximately 60% of the respondents, while the other 40% were labelled 'rich' (Statistics Sierra Leone & United Nations Children's Fund, 2005).

2.2.3 Household materials

According to the National Population Commission of Nigeria, when looking at the place of residence, the household structure can normally tell you more about the type of household income the family has (National Population Commission and ORC Macro, 2004). The reason behind this is that the first things household members take care of are food and water. Secondly, they look at other basic needs such as electricity and maybe sanitation. Thirdly, they spend their money on their home. If the home keeps the rain and sun and heat and cold out, it is substantial for living, no matter what it is made of. According to the study conducted by Anderson et al. (2002) in South Africa, there is a relationship between the materials used to build the household and child survival. Furthermore, it has been established by Fayehun (2010) that the type of flooring in the household could become a high risk for children to contract diseases such as Diarrhoea, increasing the child mortality rate in sub-Saharan Africa. In rural Malawi, it was shown that there were a higher number of child deaths due to AIDS in homes that were better built than those that were substandard (Jahn et al., 2010).

2.4 Disease

There are many diseases affecting children in Sierra Leone. However, we will only be looking at a few. Many of these diseases that are vulnerable to children have a cure, but for a developing country like Sierra Leone, this is not always the case. Children living in the developing world do not always have access to cures for these diseases as funding and vaccines are not always readily available to them.

2.4.1 Respiratory disease

Most respiratory disease is a sub-element of a disease known as Acute Respiratory Infection (ARI). This infection infects the lungs and is easily contracted by children as it is an airborne disease. For this purpose, we will first describe what ARI is, as well as a sub-disease of the infection known as Pneumonia.

2.4.1.1 ARI

Acute Respiratory Infection, also known as ARI, is a disease that infects the lungs. ARI is said to be the principal cause of child deaths for children in the developing world (Boer, Black, & Mulholland, 2006). The ARI disease killed approximately 1.9 million children worldwide in 2002 (Williams, Gouws, Boschi-Pinto, Bryce, & Dye, 2002). However, 42% of all these deaths are from the Africa continent (Williams, Gouws, Boschi-Pinto, Bryce, & Dye, 2002). Furthermore, Madhi et al. (2006) stated that in order to reduce the level of child deaths in sub-Saharan Africa, certain factors needed to be addressed. The factors in question were access to water and electricity, smoking indoors, overcrowding of households and access to basic health care. Furthermore, in Cameroon, it was found that children living near waste disposal sites could have a higher risk of contracting a respiratory infection like ARI. This was due to the emissions from burning waste products in open pits and substandard incinerators near their households (Mochungong, Gulis, & Sodemann, 2011). Although ARI is deadly, there are different types of ARI or ALRI, known as Acute Lower Respiratory Infection. These infections include Pneumonia, bronchiolitis and bronchitis (World Health Organization, 2011a).

2.4.1.2 Pneumonia

In the world today, Pneumonia is the leading cause of child mortality (World Health Organization, 2010b). Pneumonia is set to cause an estimated 1.6 million child deaths each year, of which 98% are from developing countries (Onoja, 2010). In Nigeria, an estimated 177,000 children die yearly due to Pneumonia (Onoja, 2010). According to some researchers, the amount

of children dying due to Pneumonia is higher than HIV/AIDS, Malaria and Tuberculosis combined (World Health Organization, 2010b). In Sierra Leone, Pneumonia claims at least 8500 children's lives each year. This is an estimated 23 children dying each day of this curable disease (Turay, 2010).

Pneumonia is a subgroup of ARI. Ninety percent of ARI deaths are due to Pneumonia. When a person is infected with Pneumonia, the lungs fill with pus, mucous and other liquids, making it hard for a person to breathe (Slowik, 2011b). According to Slowik (2011b), children are more likely to develop Pneumonia as they have an immature immune system and narrow airways making breathing more difficult for them if they contract Pneumonia. The chance of a child contracting Pneumonia tends to be higher than a child who is malnourished, has a low birth weight, or was not breastfeed (Markle, Fisher, & Smego, 2007). It is noted that industrialized countries have fewer cases of Pneumonia, which are mostly treated and only on rare occasions, would lead to a child dying. The opposite effect occurs in developing countries, especially those like Sierra Leone that was recently plagued by war. Even though treatment for Pneumonia is inexpensive, it is still hard to come by as developing countries do not always have adequate healthcare, making it harder to come by treatments than in industrialized countries (Markle, Fisher, & Smego, 2007).

Studies carried out in some developing countries, including the Gambia, Zaire, Kenya and Nigeria, showed that fatal cases of Pneumonia were due to two bacterial organisms, namely Streptococcus Pneumonia and Haemophilus influenzae (National Research Council, 1993). According to Wilkinson, in 1969, Pneumonia was the highest cause of death out of 10,000 cases in Freetown, Sierra Leone. Twenty-four per cent of all infant deaths were due to Pneumonia (Wilkinson, 1969). This percentage is extremely high. A number of decades later, two researchers conducted a study on Pneumonia affecting child mortality, naming it 'the forgotten killer of children'. Their study concluded that 25% of all child deaths in Sierra Leone in 2005 were due to Pneumonia (Wardlaw, Johansson, & Hodge, 2006). The study also showed that more emphasis was put on other diseases rather than Pneumonia. In a further study conducted by Steadland and Skoglund (2008), it was determined that 21% of children under the age of five that were diagnosed with Pneumonia would receive antibiotics between 2000 and 2006. Due to this

being the case, we would need to look at socio-economic variables to determine why only 21% would receive antibiotics.

2.4.2 Diarrhoea

Diarrhoea is said to be the second highest cause of child mortality in the world today (Johansson & Wardlaw, 2009). A few decades ago, it was estimated that 5 million children had died due to having some form of Diarrhoea. However, this was reduced to about 1.5 million children in 2006 (Johansson & Wardlaw, 2009). Although Diarrhoea is the second highest cause of child mortality, combined with the leading cause of death, Pneumonia, it accounts for at least 40% of the total child deaths (Johansson, Newby, Renshaw & Wardlaw, 2007). According to UNICEF, 80% of child deaths in Africa and Asia are due to an occurrence of Diarrhoea (Johansson & Wardlaw, 2009).

Furthermore, it was established by medical experts that there are two ways of contracting Diarrhoea. The first is by contracting a virus in public places. The second is a bacterium that infects the intestines, which makes the balance in the intestines unsettling and subsequently causes Diarrhoea (National Institutes of Health, 2010b).

As explained in an article by UNICEF, there are 3 main types of acute child Diarrhoea: acute watery Diarrhoea, bloody Diarrhoea and persistent Diarrhoea (Johansson & Wardlaw, 2009). So the question would be asked, why is it that children are contracting Diarrhoea more easily than adults? One reason why children would contract such a disease more easily is that a large proportion of a child's body is made up of water compared to an adult, making the child more susceptible to becoming dehydrated (Nicaragua, 1997).

In Sierra Leone, Diarrhoea happens to be one of the leading causes of child death. In 1969, Wilkinson carried out research in a hospital in the capital of Sierra Leone, concluding that Diarrhoea (17%) was the second highest cause of death (Wilkinson, 1969). He also determined that during the first year of life, more children were likely to die of Diarrhoea than after the age of one. This percentage of children dying is extremely high. According to the results of the MICS report of Sierra Leone, 14.4% had developed Diarrhoea, of which 19.37% where under the

age of one and the other 80.63% were between the ages one and five years old (Statistics Sierra Leone & United Nations Children's Fund, 2005). In 1986, Kandeh had concluded what was previously determined by Wilkinson, that Diarrhoea was the second highest cause of child death. Kandeh's results indicated that the last phase of infancy had the highest number of child deaths compared to the rest of the children under the age of four (Kandeh, 1986).

Further research by Hodges (1993) showed that more children under the age of five developed Diarrhoea in a shorter period of time than previously shown by Kandeh in 1986. When comparing the results of Kandeh and Hodges, there was an approximate 0.12% increase in the number of children who died of Diarrhoea between 1987 and1991 compared to the 1969 to 1979 period.

Gee (2002) reiterated what Kandeh said about more children dying in the last 6 months of infancy compared to the rest of the childhood years. However, she further stated that in the last 6 months of infancy, children who were breastfed had double the chance of not contracting Diarrhoea compared to those who were not breastfed (Gee, 2002). Gee (2002) further established that mothers and fathers who had an education and received a good salary tended to have a better knowledge on sanitation, health services and acquiring proper food compared to parents who had no education and who were not receiving a good salary.

2.4.3 Malaria

Malaria is a disease that is contracted by getting bitten by an anopheles mosquito. It will transfer the Malaria parasite into the blood, which causes a person to contract the virus (Davis, 2010). In 2008, 1 million children in Africa died due to Malaria (World Health Organization, 2010d). According to the WHO, young children are the ones who are mainly at risk of contracting the disease. This is due to their immune system still developing. This is why the majority of deaths caused by Malaria happen to be young children (World Health Organization, 2010d). It has been estimated that 3 billion people live in areas where the risk of contracting Malaria is extremely high (Johansson, Newby, Renshaw & Wardlaw, 2007).

Furthermore, it was established that 99.9% of Sierra Leone is Malaria endemic. This means that people living in Sierra Leone have a higher chance of contracting Malaria as it is the perfect breeding ground for mosquitoes (MARA/ARMA, 2005). In a report conducted by the MSF in September 2008, it was determined that providing free testing and treatment for Malaria had dramatically increased the amount of people seeking care and surviving in Sierra Leone (Integrated Regional Information Network, 2009). The world communities have taken a stand towards fighting Malaria, including committing governments to control Malaria, environmental manipulation, the use of chemical agents and other measures of vector control (Bavdekar, Nadkarni, & Deshmukh, 1996).

In 2007, a report released by Core Welfare Indicators Questionnaire (CWIQ) showed that 65.9% of children in Sierra Leone under the age of five slept under a bed net prior to the survey being conducted. One important thing to note is that in Sierra Leone, Malaria is more often misdiagnosed as fever. For this reason alone, the amount of deaths caused by Malaria is skewed and misreported (Statistics Sierra Leone, 2007).

Likewise, zinc deficiency increases the risk of mortality from Diarrhoea, Pneumonia and Malaria by 13% to 21% (Skolnik, 2008). This has made it harder to determine the number of cases in which children had died due to Malaria.

2.4.4 Measles

Measles is a highly contagious respiratory condition. Any person could contract the disease by just being in the same room as another person who is infected (Ehrlich, 2008). In a recent article published by World Vision, it was stated that Measles causes at least 500 child deaths per day, of which 95% are from low income countries that have little or no health infrastructure (World Vision International, 2010). One of the reasons why child mortality due to Measles is so high is that children from these low income countries are malnourished, making their immune system weak and unable to fight off the disease (Gordon, Mackay, & Rehfuess, 2004).

When looking at figures from 1969 to1979, it is shown that 34 per 1000 children had died from Measles. However, this changed to about 14 per 1000 between 1987 and1991 (Hodges, 1993; Kandeh, 1986). In 1969, Wilkinson determined from in patients at a hospital in Freetown that Measles was the seventh highest cause of death among children. The 8% was made up of children who had died, as well as child who were taken away due to them being near death (Wilkinson, 1969).

Furthermore, according to Williams, Gouws, Boschi-Pinto, Bryce and Dye(2002), reported in an article published by The Lancet, the number of children infected and killed by certain diseases was found to have decreased in the world. One of these diseases was Measles, which now only accounts for 1% of child deaths in the world (John Hopkins University Bloomberg School of Public Health, 2010). The reason for this is that more vaccinations have become available, making it easily treatable (Seisay, 2008). This has caused the percentage of child deaths due to the Measles to decrease by 74% in the past few decades. From the overall number of children dying in Sierra Leone, 48% are dying due to being infected by Measles. According to Kandeh (1986), 40% of all early childhood deaths are contributed to by nutritionally related disease like Measles.

Chapter III

Data and Methodology

3.1 Introduction

This chapter will discuss the study design, target population as well as the sample size. It will also show the description of variables as well as the operational definitions for both the independent and dependent variables. Furthermore, the statistical tools as well as the conceptual framework will be discussed.

3.2 Study design

Sierra Leone is a country that is still feeling the after-effects of the civil war that took place in the late 20th century. Due to this, the country's Home Affairs Department had not kept their records updated. If we were to use this data there would be a lot of missing entries. Another source of information is the health care system. This would also not be a reliable source of data as not all people go to hospitals, clinics and medical centres when in need of medical attention. Therefore, we will be using secondary data from the Sierra Leone Demographic and Household Survey (SLDHS), especially looking at the children dataset. The SLDHS was completed in 2008, making the data collected recent and accurate of the country's population. The census would also have been a good source. However, this was completed in 2004. The survey was based on a cross-sectional design as it allows researchers to assess the prevalence of conditions in the population. However, since both the outcome and the variables are measured at a particular point in time, the study is not strong in showing cause-effect relationships. This means that when it comes to diseases, it is hard to determine what the causes are, as well as their effects, due to this design not being over a period of time, but rather a single point in time.

The SLDHS will help achieve the aim of this study. This is due to the relevance of the data. The survey looks at many topics such as fertility, mortality, employment, medical background and environment.

3.3 Target population

Sierra Leone is a country situated west on the African continent, forming part of sub-Saharan Africa. Sierra Leone has an estimated population of about 5,696,471 million people, of which 48% are male and 52% are female (UNAIDS, 2010).

Figure 3.1 Map of Sierra Leone

Source: Map of Sierra Leone, 1997

The majority of the population is situated in the rural areas of Sierra Leone. Two-thirds of the population is part of the agricultural sector. The agricultural sector contributes to about 52.5% of the national income. Although this industry contributes to a large part of the country's income, the mining sector is also a great contributor. This is due to the country's diamond mines. The mining sectors are located in the rural areas of Sierra Leone. The target population is children aged from birth to five year olds and their mothers. The child mortality rate, according to the World Bank development indicators, is 190.4 per 1000 children for 2007 (World Data Bank, 2010). There are many theories to explain why child mortality is extremely high. However, the main focus in this research paper will be vulnerable diseases.

3.4 Sample size

The sample was taken from the children data set of the SLDHS. The dataset consisted of 5631 children, of which 588 had died and 5043 were alive.

3.5 Description of variables

The method in which to determine child mortality could be described by using the variable groups: demographics, environment, socio-economics and health. Each category has a number of variables that could be associated with child mortality.

3.5.1 Demographic variables

Child survival is the main variable to be used in the study. This variables is the survival of the child, that is the child is either alive or not. These values will be run against the rest of the variables to determine whether the other variables are a factor of child mortality.

As for mother's age the variable was redefined. Mother's age had 7 categories; however we have redefined this into 3 categories. Firstly we have mothers under the age of 20, which consists of mother's aged 15 to 19. Secondly, we had mother's aged between 20 and 34. And thirdly, we have mothers between the ages of 35 to 49.

Birth number was redefined into 4 categories. The first category was children born in the order of 1 to 3. The second category was children with the birth order 4 to 6, while the third category was those in the order of 7 to 9. The final category was those children in the birth order of 10 to 13.

The variable religion had 6 variables namely Christianity, Islam, Baha'i, Traditional, none and other. For the purpose of this study we have redefined the variable religion into 3 categories that is Christianity, Islam and Other. The category Other included the religions such as Baha'i, Traditional, none and other.

3.5.2 Socio-economic variables

Mother's education was left as defined in the survey. The categories for mother's education were as follows: no education, primary, secondary and tertiary.

As for the occupation of a mother it had 11 categories. For our purpose we have redefined these categories into 5 categories. The first category was for mothers who were 'not working'. The second category was for those working in the modern sector. This category included mothers who worked as a professional, technical, manager, clerical or in sales. The third category was named farming. Mother's working in this sector was either working in agricultural self-employed or agricultural employee. The fourth category was mothers working in the traditional sector. The traditional sector was defined as mothers working in services or as a house domestic. The fifth category was labeled manual, which included mothers who were skilled or unskilled in manual labor.

3.5.3 Environmental variables

The place of residence has only two outcomes, either they live in the rural areas or they live in the urban areas. This allows us to see which places of residence circum to most child deaths. The household environment forms part of a child surroundings. This is where the child lives, plays and is taken care of. Also this is the potential place of where a child could contract any vulnerable diseases. Therefore we have also included other variables that pertain to the household environment.

The source of drinking water could determine a number of diseases depending on where the person collected the water from and how it was treated. This variable was grouped as follows: the first category was labeled as piped. This included water being piped into dwelling, piped to a yard or plot, public tap or standpipe. The second category is tube well. This includes the tube well or borehole. The third category was named dug well, which included the following categories; protected well and unprotected well. The forth category is labeled as surface water. This included categories such as protected spring, unprotected spring and river/dam/lake/ponds/stream/canal/irrigation channel. The fifth category was called a tanker, which includes the categories tanker truck and cart with small tank. The sixth category was named bottled water and the final category named other.

The type of toilet facility is important. For example an underground pit might leak in the ground water supply. This will contaminate the water and could easily make the people sick. The type of toilet facility is grouped as follows: firstly we have the category flush. This includes the categories flush to piped sewer system, flush to septic tank, flush to pit latrine, flush to somewhere else and flush but don't know where to. Secondly, we have the category pit latrine which includes the following categories: pit latrine ventilated improved pit, pit latrine with slab, pit latrine without slab and open pit. Thirdly, we have the category no facility which included the following categories: no facility/bush/field. The fourth category was composting toilet and included the categories bucket toilet and hanging toilet/latrine. The fifth category was named stream/river, while the final category was labeled as other. As

for those who answered ‘not *dejure* resident’ those people were excluded that they were not part of the household or probably just visiting for the day.

Furthermore we would have also wanted to look at the dwelling material used to build the household. There were three main aspects we looked at from the household, as well as the material used to build them with, that was the: floors, walls and roof. For the floor material we have three main groups which are: Natural [earth/sand, dung and stone], Rudimentary [wood planks, palm/bamboo], Finished [parquet or polished wood, ceramic tiles, cement, carpet] and other. The walls were group in a similar way. This included: Natural[no walls, cane / palm / trunks, dirt, mud bricks], Rudimentary [bamboo with mud, stone with mud, uncovered adobe, plywood, cardboard, reused wood, clay blocks, corrugated iron sheets, tarpaulin], Finished [cement, stone with lime / cement, bricks, cement blocks, covered adobe, wood planks / shingles] and other. And finally the roof, which was coded as follows: Natural [no roof, thatch / palm leaf, sod], Rudimentary [rustic mat, palm / bamboo, wood planks, cardboard, tarpaulin] and Finished [metal, wood, ceramic tiles, cement, roofing shingles, asbestos].

3.5.4 Health variables

As for health variables, the following variables were looked at due to them being either the disease itself, or a symptom of the disease looked at in the study.

The first variable is ‘had Diarrhoea recently’. This had 4 possible answers which were either: no, yes in last 24 hours, yes in last 2 weeks and don’t know. The answer ‘don’t know’ was taken out of the sample.

The next variable was ‘still has Diarrhoea’. This variable had 3 possible answers, which were: no, yes and don’t know. The answer ‘don’t know’ was taken out of the sample as it would have a possible effect on the results.

The third variable was ‘had fever in last 2 weeks’. This variable was redefined as having only two possible answers rather than the original three. The two answers that was kept was no and yes, while don’t know was taken out as this was used as a symptom to determine whether a child had contracted a possible disease.

The fourth variable was ‘short, rapid breathe’. This variable was left as ease, except that the answer ‘don’t know. This answer was taken out due to it possibly giving the data a negative effect.

As for the fifth variable labeled ‘has fever or cough now’, this had five possible answers which were: no, yes fever only, yes cough only, yes both fever and cough and don’t know. The answer ‘don’t know’ was taken out of the sample as it would cause a possible problem in the data analysis.

The sixth variable was ‘problem in chest or blocked or runny nose’. This question was given 5 possible options for answering. The answers were: chest only, nose only, both chest and nose, other and don’t know. The two answers other and don’t know was taken out of the sample as to make the data more accurate.

3.6 Operational definitions

The variables below are the variables that were used in the study and are divided into independent variables and dependent variables.

3.6.1 Independent variables

3.6.1.1 Current age of mother

Current age of mother was reassigned into 3 age groups. The age groups ranged from age 15 to 49. The categories were assigned as follows: under 20, 20 to 34 and 35 to 49.

3.6.1.2 Place of residence

This variable is dichotomous and has only two categories, that is 1 being urban and 2 being rural

3.6.1.3 Birth number

The birth number of the child was redefined into 4 categories. The categories are: 1 to 3, 4 to 6, 7 to 9 and 10 to 13.

3.6.1.4 Sex of child

Sex of child is a dichotomous variable and had only two outcomes, that being male or female.

3.6.1.5 Religion

Religion was defined into three categories that being Christian, Islam and Other.

3.6.1.6 Source of water

The source of water is the place in which the household accessed water. There were 18 categories used in the survey, however this was redefined into 8 categories. The categories were as follows: piped water, tube water, dug well, surface water, tanker water, bottled water and other source.

3.6.1.7 Type of toilet

The type of toilet facility was defined as the facility used by the household at the time of the survey. This variable was redefined into 6 categories, that being: flushing toilet, pit latrine, no facility, composting toilet, river or stream and other.

3.6.1.8 Source of energy

The variable, source of energy, looks at whether the household has electricity or not. Therefore, were only two outcomes coded as 0 for yes, they do have electricity and 1 for no, they do not have electricity.

3.6.1.9 Mother's education

Mother's education has four options available that is no education, primary, secondary and higher. This variable has been left the same as the survey.

3.6.1.10 Mother's occupation

Mother's occupation was redefined into 5 categories. The 5 categories were as follows: 1. Modern, 2. Farming, 3. Traditional, 4. Manual and 5. Not-working

3.6.1.11 Dwelling material

There are three main areas in the household that is the floors, walls and roof.

3.6.1.11.1 Floor material

This is the material used to construct the flooring of the household. The same categories used in the survey, except other, will be used in this analysis. There are three main categories which includes: natural, rudimentary and finish.

3.6.1.11.2 Wall material

This is the material used to construct the walls. The same categories used in the survey, except other, will be used in this analysis. There are three main categories which includes: natural, rudimentary and finish.

3.6.1.11.3 Roof material

This is the material used to construct the roof. The same categories used in the survey, except other, will be used in this analysis. There are three main categories which includes: natural, rudimentary and finish.

3.6.2 Dependent Variable

3.6.2.1 Child alive

This is a dichotomous and the dependent variable for this study. There were only two outcomes for this category that is 1 being yes, that the child is alive and 2 being No, that the child has died.

3.6.2.2 Age at death (in months)

This is the age at the time of death. It was placed into 6 categories that being: 1 – age 0 to 11 months, 2- 12 to 23 months, 3 – 24 to 35months, 4- 36 to 47 months and 5- 48 to 60 months.

3.6.2.3 Had a fever in last 2 weeks

This is a dichotomous variable which only has two outcomes that is no, coded as 0 and yes, coded as 1.

3.6.2.4 Short, rapid, breaths

This is a dichotomous variable with only two outcomes that is no, coded as 0 and yes, coded as 1.

3.6.2.5 Has fever or cough now

The outcomes look at whether the child has a fever, cough or both at the time of survey. They were coded as 0 being no, 1- yes fever only, 2- yes cough only and 3- has both fever and cough.

3.6.2.6 Problem in chest or blocked or runny nose

The coding for this variable we have kept the same as the survey. There are four outcomes defined as: 1- chest only, 2- nose only, 3- Both chest and nose and 4-other

3.6.2.7 Had Diarrhoea recently

The variable had three outcomes, this included the child: not having Diarrhoea, having Diarrhoea in last 24 hours and having it in the last two weeks

3.6.2.8 Still has Diarrhoea

This is a dichotomous variable with only two outcomes that is no, coded as 0 and yes, coded as 1.

3.7 Statistical tools

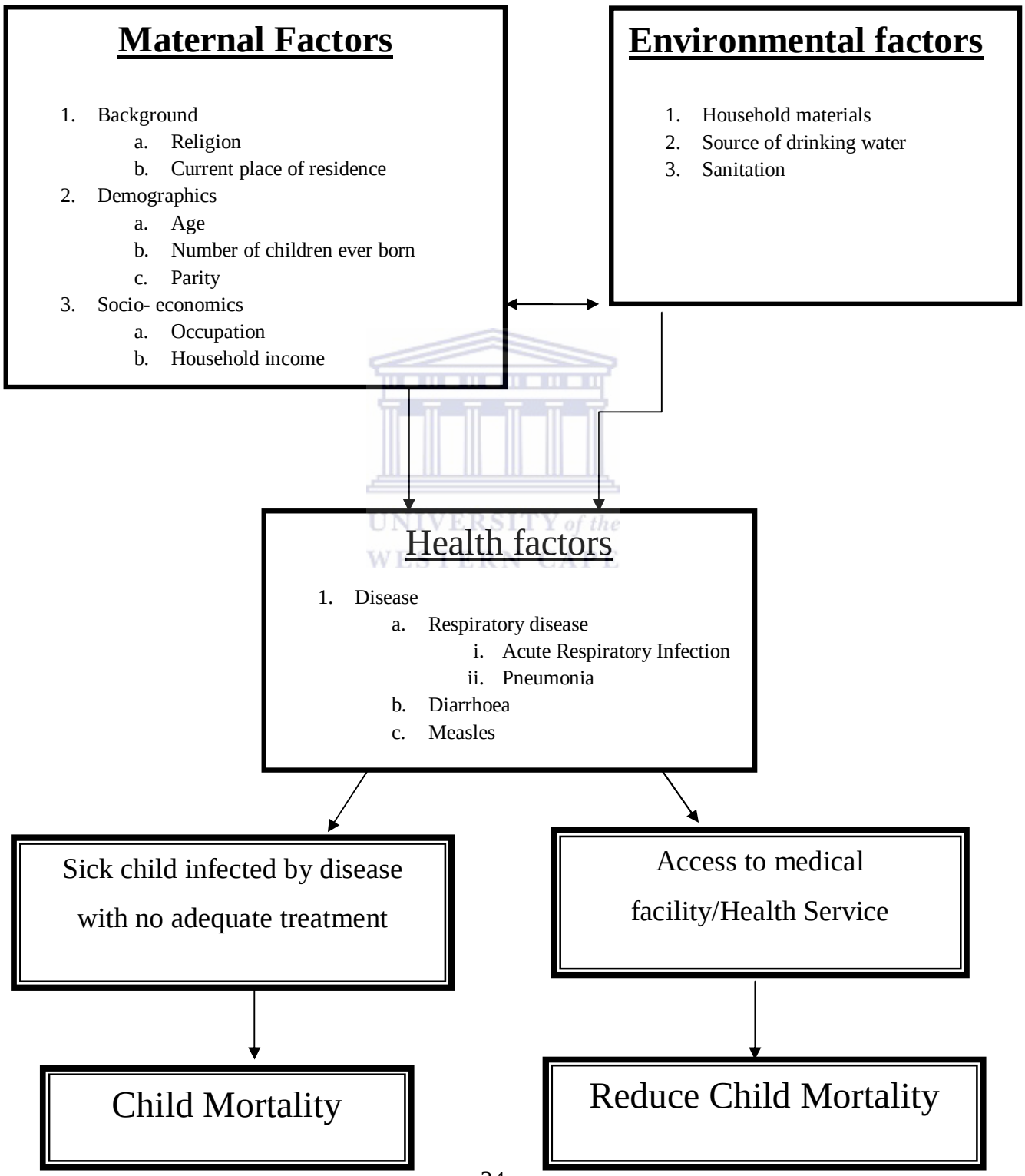
The statistical procedures we have used for this study are cross-tabulation, chi-square test for association, graphical representation and logistic regression. This is because we are using nominal variables in this study. The cross-tabulation shows the distribution of two or more variables in a table. Each cell in the table shows the number of respondents who gave a specific combination of responses in each single cell. The chi-square test for independence, also called Pearson's chi-square test or the chi-square test of association, is used to discover if there is a relationship between two categorical variables, which are ordinal or nominal (categorical data). The graphical representation is a way in which the data could be displayed visually to a reader for quick and better understanding. For this thesis, we have used some of the graphs to interpret the data. As for logistic regression, we will use this in our thesis to predict the occurrence of a disease contracted by a child, the dependent variable, by factors associated with child mortality, the independent variables.

3.8 Conceptual framework

There have been a number of factors showing a possible influence on the child mortality rate. One of these factors is maternal factors, which includes areas of a mother's life, which is her age, education, occupation and other aspects of her life. Another possible factor is that of the environment. The environment of the child could also determine whether a child would survive.

In figure 3.1, we see that maternal factors are made up of a number of elements. These elements are background, demographics and socio-economic.

Figure 3.2 Conceptual framework diagram



These elements revolve around the daily life of the mother, which in turn revolves around her children. Furthermore, the environmental factors have a certain number of elements. These elements include dwelling materials (this being what the house is built from), the source of drinking water, type of toilet, source of energy and place of residence. These elements could be seen as a possible cause oaf child's death if parents are unaware of the dangers that lurk around them.

Despite this, both maternal and environment factors could lead to a child contracting a disease. There are a number of symptoms that children would show for a parent to tell if the disease is serious or not. Parents would need to monitor their child or children if they start showing these symptoms. If these symptoms are overlooked, it could cause the child to become severely sick. In such cases, there might not be adequate medical assistance, especially in a country like Sierra Leone, which could inevitable cause a child's death.

Chapter IV

Data Analysis

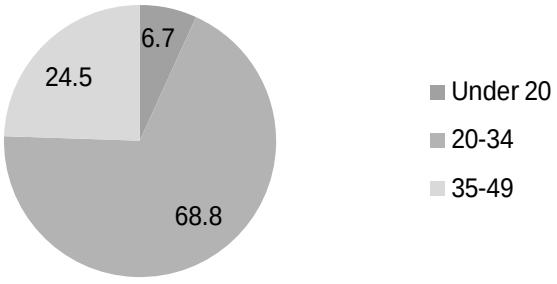
4.1 Child mortality

The sample used for child mortality included living and deceased children. However, we focused on deceased children, examining which factors showed a higher precedence

4.1.1 Current age of mother

Figure 4.1 shows the frequency of current age of mothers who took part in the survey. From the figure, we could conclude that the majority of mothers were aged between 20 and 34. Furthermore, the figure shows that almost a quarter of mothers were between the age of 35 and 49. As for mothers under 20, they accounted for approximately 6.7% of the sample of mothers.

Figure 4. 1 Frequency of current age of mother



In addition, we examined the current age of mothers and the number of children who had died. In Table 4.1, we can see that the majority of children had died to mothers under the age of 20. In addition, the data shows that mothers between the ages of 35 and 49 had the second highest percentage of child deaths. As for mothers aged between 20 and 34, the data indicated that these had the lowest percentage of child deaths among the age groups (Table 4.1).

Furthermore, a chi-square test of association was carried out between the variables: current age of mother and child survival. From the chi-square test in Table 4.1, we could conclude that there is no statistical significance between current age of mother and child survival.

Table 4.1 Proportion of current age of mother affecting child mortality

Characteristics	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Current age of mother					
Under 20	11.58	88.42	380		
20-34	10.17	89.83	3873	1.115	0.573
35-49	10.89	89.11	1378		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.2 Place of residence

Table 4.2 shows the distribution of child mortality by place of residence. From the Table, we could conclude that more children had died while residing in the rural areas rather than in the urban areas. However, when looking at the total sample, that is, children who are alive and deceased, the results in Table 4.3 indicate that more children had died in the urban area compared to those living in the rural area. In addition, from the chi-square test of association in Table 4.3, we could conclude that there is a statistical significance between place of residence and child survival.

Table 4.2 Frequency of place of residence by children who have died

Characteristics	Number of cases	Percentage
Place of residence		
Rural	358	60.9
Urban	230	39.1

Source: Demographic and Household survey, Sierra Leone 2008

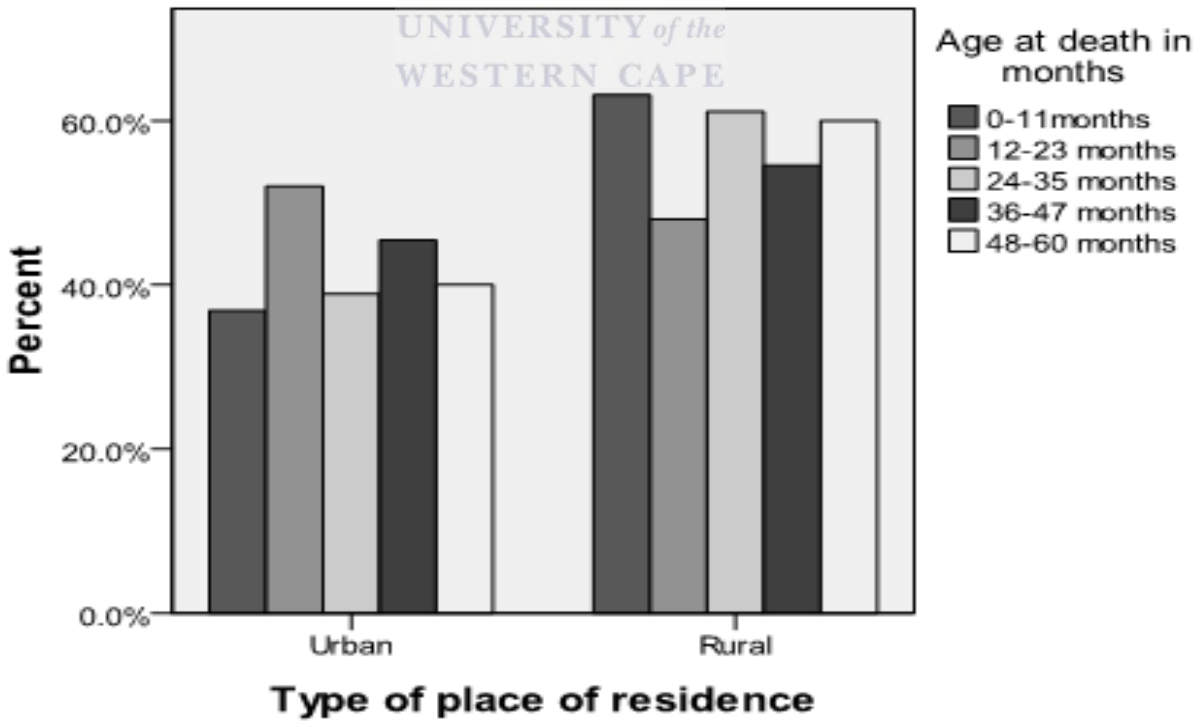
Table 4.3 Proportion of place of residence affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Place of residence					
Rural	9.65	90.35	3711	7.359	0.007
Urban	11.98	88.02	1920		

Source: Demographic and Household survey, Sierra Leone 2008

As for age at death, the majority of children had died in their first year of life (figure 4.2). However, for the 12 to 23 month age range, the data shows that 52.0% of all deaths for this age group were from the urban areas. As for the other age groups, ranging from 24 to 60 months, the majority were from rural areas. From the chi-square test of association between the variables (Table 4.4), we could conclude that there is no statistical significance between age at death and place of residence.

Figure 4.2 Place of residence by age at death



Source: Demographic and Household survey, Sierra Leone 2008

Table 4.4 Age at death in months by place of residence

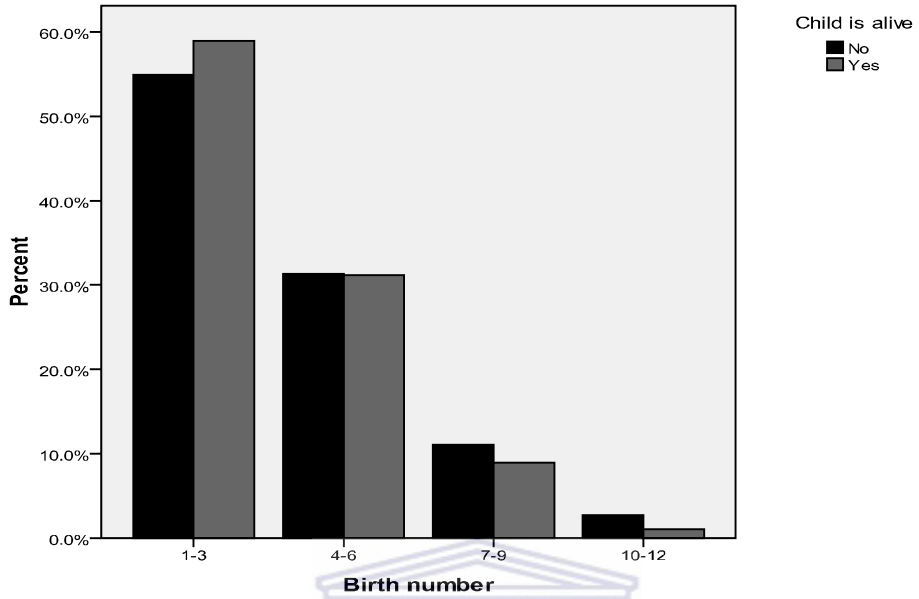
Age at death in months	Place of residence		Number of cases	Chi-square	P-value
	Urban	Rural			
0-11 months	36.9%	63.1%	461		
12-23 months	52.0%	48.0%	75		
24-35 months	38.9%	61.1%	36	6.387	0.172
36-47 months	45.5%	54.5%	11		
48-60 months	40.0%	60.0%	5		
Total	39.1%	60.9%	588		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.3 Birth number

Figure 4.3 shows that more children died whose birth number was between 1 and 3 than those whose birth number was between 10 and 12. Furthermore, the figure shows that as the child's birth number increases, the number of deaths decreases. As for Table 4.5, we see that from the total sample, more children had died whose birth number was between 10 and 12 than those whose birth number was between 1 and 9. As for the chi-square test of association in Table 4.5, we could conclude that there is a statistical significance between the birth number of a child and child mortality.

Figure 4.3 Birth number by child survival



Source: Demographic and Household survey, Sierra Leone 2008

Table 4.5 Proportion of birth number affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Birth Number					
1-3	9.8	90.2	3295		
4-6	10.48	89.52	1755	17.052	0.001
7-9	12.65	87.35	514		
10-12	23.88	76.12	67		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.4 Sex of child

Table 4.6 shows the results between sex of child and child mortality. From the data in the Table, we can conclude that more female children had died compared to their male counterparts. Furthermore, from the chi-square test of association in Table 4.6, we could conclude that there is no statistical significance between the sex of a child and child mortality.

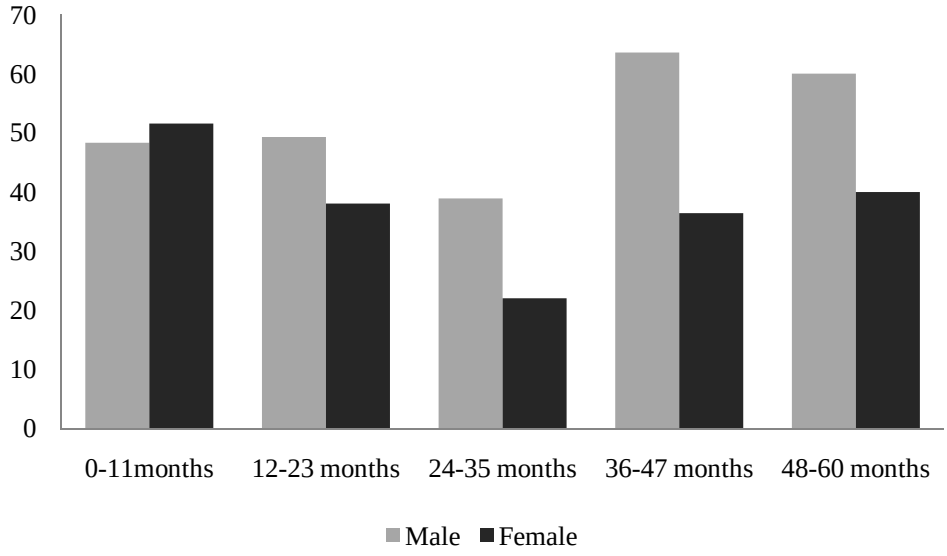
Table 4.6 Proportion of sex of child affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Sex of child					
Male	10.01	89.99	2836	1.12	0.29
Female	10.88	89.12	2795		

Source: Demographic and Household survey, Sierra Leone 2008

As for children's age at death, the results indicate that the majority of children had died in the first year of life. From the children who died in their first year of life, more females died than their male counterparts (figure 4.4). Furthermore, the data indicates that after the age of 12 months, more males had died compared to females. In addition, the figure shows that the highest amount of male deaths was among the 36 to 47 month age group. Also, in figure 4.4, we cans see that after the age of 11 months, the number of female deaths had decreased. However, from age 36 months, this was shown to increase again.

Figure 4.4 Age at death in months by sex of child

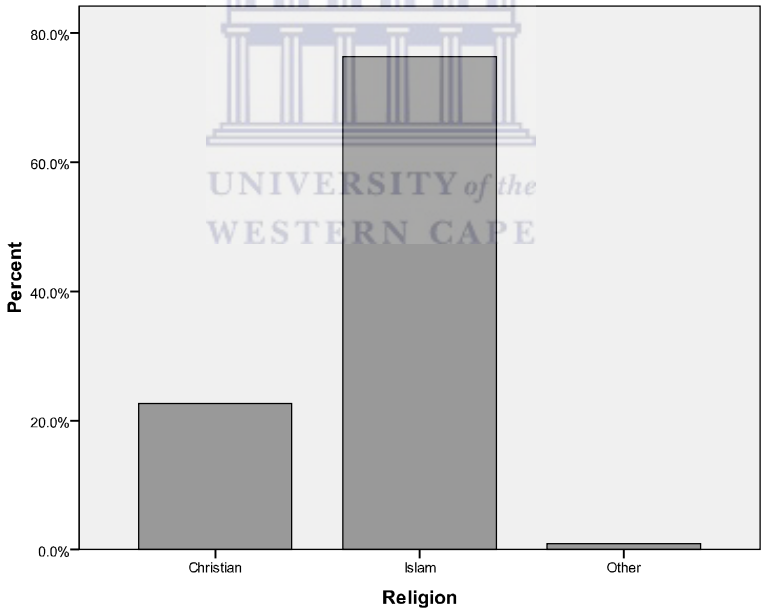


Source: Demographic and Household survey, Sierra Leone 2008

4.1.5 Religion

In 2008, the percentage of children living in households with Christianity as their belief system was 22.6%, while Islam accounted for 76.4% and Other religions approximately 1% (figure 4.5). Furthermore, Table 4.7 shows the results between religion of a child and child mortality. The results indicate that the majority of child deaths were from Other religions. As for Islam and Christianity, they represented approximately 11.0% and 8.26% of child deaths from the total sample. In addition, the chi-square test of association indicates that there is a statistical significance between religion and child mortality (Table 4.7). This implies that the amount of child deaths is dependent on the religious beliefs of the household.

Figure 4.5 Frequency of religion



Source: Demographic and Household survey, Sierra Leone 2008

Table 4.7 Proportion of religion affecting child mortality

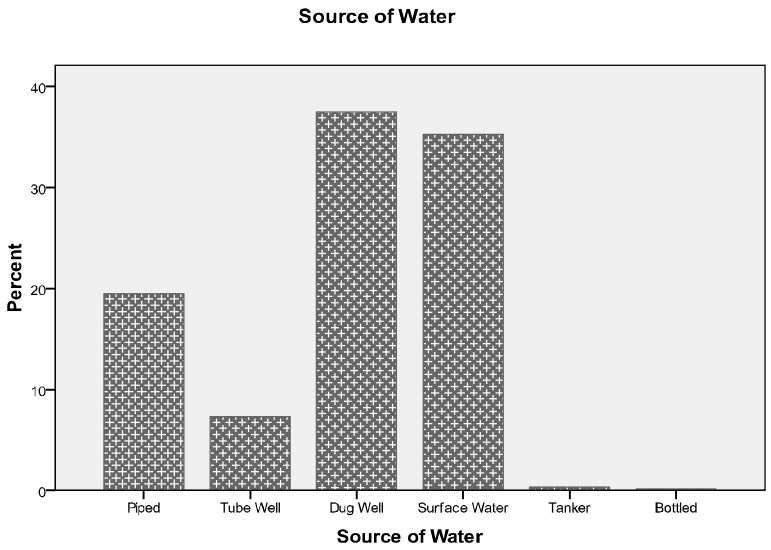
	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Religion					
Christian	8.26	91.74	1271		
Islam	11	89	4289	13.364	0.02
Other	18.52	81.48	54		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.6 Source of water

Figure 4.6 shows the frequency of the water source amongst the household that partook in the survey. The results show that the majority of the households received their water from dug wells, whereas surface water was shown to be the second highest and piped water third highest. As for households who received their water from tube wells, this only accounted for 7.3%. Approximately 0.3% and 0.2% of households used either tanker or bottled water.

Figure 4.6 Water source by child survival



Source: Demographic and Household survey, Sierra Leone 2008

Furthermore, when we looked at the proportion of child survival due to water source, the results indicated that households getting water from tube wells had the highest number of child deaths (Table 4.8). Bottle water showed the second highest number of child deaths, while those drinking from piped water were the third highest (Table 4.8). As for the dug well, 10.36% of all children using this source of water had died. Furthermore, other sources of water, namely surface water and tanker, accounted for 9.70% and 5.26% respectively. In addition, the test of association between source of water and child mortality indicates that there is no statistical significance between source of water and child survival (Table 4.8).

Table 4.8 Proportion of source of water affecting child mortality

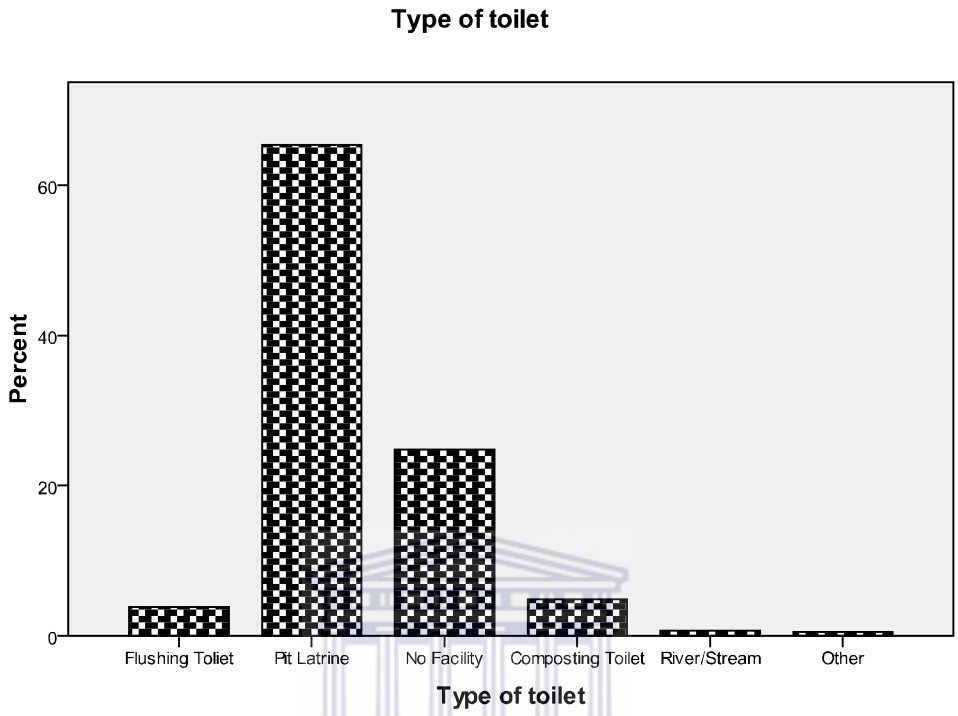
	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Source of water					
Piped	10.56	89.44	1089		
Tube well	13.2	86.8	409		
Dug well	10.36	89.64	2095	5.067	0.408
Surface	9.7	90.3	1969		
Tanker	5.26	94.74	19		
Bottle	11.11	88.89	9		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.7 Type of toilet facility

Figure 4.7 shows that the main toilet facility used by households was the pit latrine, which accounted for 65.33% of the total number of households. The second highest toilet facility used by households was those with no facility. Furthermore, 3.8% of households had flushing toilets and 4.9% used composting toilets. The remaining 1.2% of households had either used the river/stream or 'other' type of facility.

Figure 4.7 Type of toilet by child survival



Source: Demographic and Household survey, Sierra Leone 2008

In addition, 24.32% of children who died were from households that used a river or stream as their toilet facility. As for those households that had a flushing toilet, these accounted for the second highest proportion of child deaths (Table 4.9). The third highest toilet facility was the pit latrine toilet, with approximately 10.46% of the children using this facility. As for those households with no toilet facility, it was shown that 9.81% of all children using this type of facility had died. Furthermore, 8.06% of children using the composting toilet had also died.

The chi-square test (Table 4.9) shows that there is a statistical significance between child survival and type of toilet facility. This allows us to conclude that the type of toilet facility used by children is a factor in child mortality.

Table 4.9 Proportion of type of toilet affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Type of toilet					
Flush	12.62	87.38	214		
Pit latrine	10.46	89.54	3652		
No facility	9.81	90.19	1387	11.269	0.046
Composting	8.06	91.94	273		
River/stream	24.32	75.68	37		
Other	7.41	92.59	27		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.8 Source of energy

In Table 4.10, the results indicate that more children died in households that had electricity than those who did not have electricity. The chi-square test of association in Table 4.10 reveals that there is no statistical significance between source of energy and child mortality.

Table 4.10 Proportion of source of energy affecting child mortality

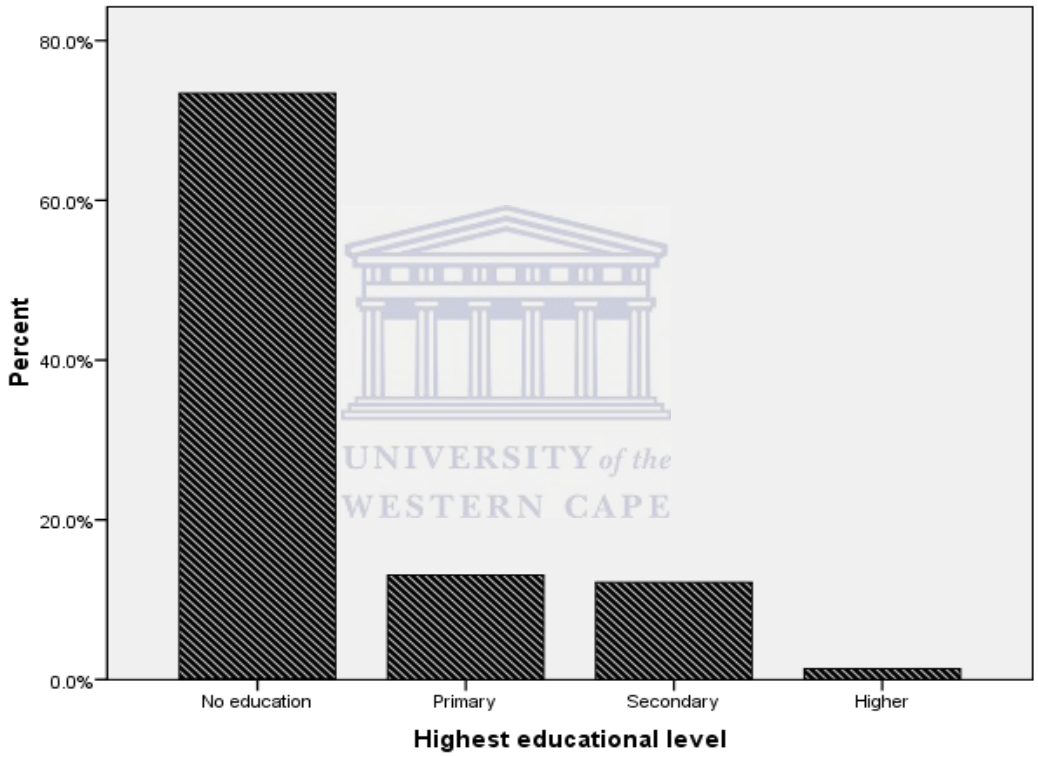
	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Source of energy					
Yes	10.37	89.63	5026	0.016	0.898
No	10.19	89.81	569		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.9 Mother's education

When examining the mothers in the sample, we looked at the level of education they had attained. In figure 4.8, the results indicate that 73.4% of mothers had no education. Furthermore, we observed that as the level of education increases, the amount of mothers attaining those levels were decreasing.

Figure 4.8 Frequency of mother's education



Source: Demographic and Household survey, Sierra Leone 2008

In addition, we looked at how significant mother's education is on child survival. Hence, when we looked at child survival compared with mother's education, the results indicated that the majority of children died to mothers with a primary education (Table 4.11). Furthermore, the results show that the proportion of children who died to mothers with a secondary and higher education was 10.51% and 9.21% respectively. As for those children who died to mothers with

no education, this was the lowest percentage of child deaths compared to mothers with other levels of education (Table 4.11). The chi-square test in Table 4.11 indicates that there is no statistical significance between child survival and mother's occupation. This signifies that there is no association between mother's education and child mortality.

Table 4.11 Proportion of mother's education affecting child mortality

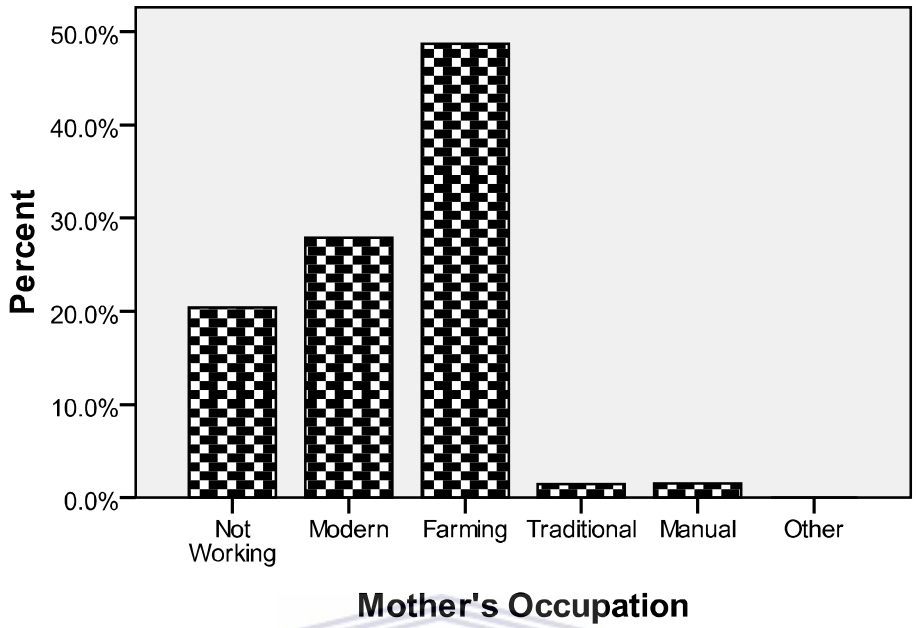
	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Mother's education					
No education	1.02	98.98	4133		
Primary	11.53	88.47	737	1.213	0.75
Secondary	10.51	89.49	685		
Higher	9.21	90.79	76		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.10 Mother's occupation

According to the results in figure 4.9, from the total sample of mothers in the survey, the majority of mothers were working in the farming sector, while mothers working in the modern sector were the second largest group (figure 4.9). The third highest sector was mothers who were not working.

Figure 4.9 Frequency of mother's occupation



Source: Demographic and Household survey, Sierra Leone 2008

Furthermore, when looking at the results between mother's occupation and child survival in Table 4.12, the majority of children had died to mothers working in the manual sector. As for mothers who had no job, they had the second highest percentage of child deaths (Table 4.12). In addition, mothers who worked in the modern sector accounted for the third highest percentage of child deaths. The farming and traditional sectors had the fourth (9.88%) and fifth (8.54%) highest percentage of child deaths respectively.

The chi-square test of association in Table 4.12 indicates that there is no statistical significance between mother's occupation and child survival. This implies that child mortality does not depend on the type of occupation a mother has.

Table 4.12 Proportion of mother's occupation affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Mother's occupation					
Not working	10.95	89.05	1142		
Modern	10.63	89.37	1561		
Farming	9.88	90.12	2724		
Traditional	8.54	91.46	82	7.633	0.178
Manual	18.39	81.61	87		
Other	0	100	1		

Source: Demographic and Household survey, Sierra Leone 2008

4.1.11 Dwelling material

The household is divided into three parts: floors, walls and roofs. These three aspects were assessed to determine if they had a statistical significance in child mortality.

i. Floor materials

The first aspect we looked at was the floors of the household. The most common type of material used among children who had died was in those households using rudimentary materials (Table 4.13). This accounted for 25.00% of the total households in which rudimentary flooring was used. The second most common material used was finished materials, which accounted for 10.77%. As for natural materials, 10.11% of children had died from the overall sample of children living in households which used this type of material. From the chi-square test in Table 4.13, we could conclude that there is no statistical significance between the floor materials and child mortality.

Table 4.13 Proportion of main floor materials affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Main floor Materials					
Natural	10.11	89.89	3669		
Rudimentary	25	75	8	2.443	0.295
Finished	10.77	89.23	1912		

Source: Demographic and Household survey, Sierra Leone 2008

ii. Wall materials

The data for walls in Table 4.14 shows that 192 households had not responded regarding the type of walling material that was used in the household. As for those who responded, the results indicate that the majority of the households in which children had died used rudimentary materials. The second most common type of material used for the walls of the household was natural, with 11.34% having died in households which used this type of material. Furthermore, the results revealed that 11.27% of all households that used finished materials had children who had died.

The chi-square test of association was run to determine if there was an association between the walls materials used in the household and child mortality (Table 4.14). From the test, we could conclude that there is no statistical significance between wall materials used in the household and child mortality.

Table 4.14 Proportion of main wall materials affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Main Walls Materials					
Natural	11.34	88.66	1517		
Rudimentary	11.9	88.1	462	0.145	0.93
Finished	11.27	88.73	1499		

Source: Demographic and Household survey, Sierra Leone 2008

iii. Roof materials

When looking at children who have died, the results show that the majority of households had finished roofing (Table 4.15). As for rudimentary material, it was shown to be the second most common among children who had died. Furthermore, when examining the total sample, the results suggest that the roofing of most households in which children had died was made from natural material (Table 4.15). Only 10.34% had died in households which used rudimentary material. In addition, it was determined that out of the total number of households in which children had died, 44 households had not responded to this question.

A test of association was carried out to determine whether there was any statistical significance between the roofing material and child mortality. From the results, we could conclude that there is no statistical significance between the materials used to build the roof and child mortality.

Table 4.15 Proportion of main roof materials affecting child mortality

	Child is alive		Number of cases	Chi square	P-value
	No (%)	Yes (%)			
Main Roof Materials					
Natural	11.01	88.99	1399		
Rudimentary	10.34	89.66	348	1.806	0.405
Finished	9.74	90.26	3634		

Source: Demographic and Household survey, Sierra Leone 2008

4.2 ARI (Acute Respiratory Infection)

In the SLDHS of 2008, there were no questions asked concerning the disease, ARI. However, symptoms of ARI were collected and used in the analysis to determine the proportion of children with ARI. In addition, the survey did not provide any conclusions regarding the cause of death, making it hard to determine if children had died due to ARI. Therefore, the sample used to determine ARI in children was only taken from children who were alive, to see how it affects children. The symptoms used to determine whether a child had contracted ARI was short, rapid breathing, whether a child had contracted a fever two weeks prior to the survey and whether they still had a fever

4.2.1 Current age of mother

The current age of the mother in Table 4.16 indicates that children whose mothers are older, that is, 35 to 49, had a slightly higher chance of contracting ARI.As for those mothers younger than 35, the data indicated that at least 0.6% of children had shown symptoms of contracting ARI.
The chi-square test of association in Table 4.16 indicates that there is no statistical significance between mother's age and the symptoms of ARI.

Table 4.16 Proportion of current age of mother by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Current age of mother					
Under 20	0.6	99.4	336		
20-34	0.6	99.4	3479	0.036	0.982
35-49	0.65	99.35	1228		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.2 Place of residence

As for the child's place of residence (Table 4.17), the data points out that just a little over double the percentage of children residing in the rural areas are likely to contract ARI compared to those living in the urban areas. In addition, the test of association indicated that there is no statistical significance between a child's place of residence and whether they would contract ARI (Table 4.17). This indicates that children have an equal chance of developing ARI in both rural and urban areas.

Table 4.17 Proportion of current place of residence by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Place of residence					
Rural	0.75	99.25	3353	2.806	0.094
Urban	0.36	99.64	1690		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.3 Birth number

As for the birth number of the child, Table 4.18 identifies that children born in the order of 7 to 9 were more likely to contract ARI than those with a birth number between 1 and 6. Furthermore, we could establish that those children with a birth number between 10 and 12 had shown no cases of infection.

In addition, the test of association suggests that there is no statistical significance. From this we could conclude that all children, no matter what their birth number, have an equal chance of contracting ARI.

Table 4.18 Proportion of birth number by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Birth number					
1-3	0.44	99.56	2972		
4-6	0.83	99.17	1571	4.838	0.184
7-9	1.11	98.89	449		
10-12	0	100	51		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.4 Sex of child

Table 4.19 indicates that almost double the amount of male children had shown signs of contracting ARI than females. The male sample shows that at least 0.74% had shown symptoms of ARI, while in the female sample only 0.48% had shown symptoms. However, a test of association was carried out to determine if the sex of a child is a determinant of whether the child would contract ARI (Table 4.19). The results show that there is no statistical association between the sex of the child and symptoms of ARI.

Table 4.19 Proportion of sex of child by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Sex of child					
Male	0.74	99.26	2552	1.425	0.233
Female	0.48	99.52	2491		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.5 Religion

In Table 4.20, the results indicate that the majority of children showing symptoms of ARI were those who belonged to the Christianity faith. At the same time, those who were from the Islamic faith had shown approximately 0.60% of children with signs of ARI. As for those who had Other beliefs, there were no cases reported. Furthermore, the chi-square test of association indicates

that there is no statistical significance between religious beliefs and contracting ARI (Table 4.20).

Table 4. 20 Proportion of religion by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Religion					
Christian	0.69	99.31	1166		
Islam	0.6	99.4	3817	0.377	0.828
Other	0	100	44		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.6 Source of water

In Table 4.21, the results illustrate that the majority of children showing signs of ARI are those receiving their drinking water from surface water. The second highest percentage of children showing signs of ARI were those receiving their water from a dug well. As for those children receiving water from the pipe, the results indicate that 0.41% had shown signs of contracting ARI, while those receiving water from a tube well was 0.28%. In addition, the results show that there were no cases for children who had received their water from a tanker or from bottled water.

A chi-square test of association was carried out to determine whether there was an association between where children had received their drinking water and those showing symptoms of ARI. From the test, we could conclude that there is no statistical significance (Table 4.21). This means that the source of water does not determine whether a child would contract ARI.

Table 4.21 Proportion of source of water by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Source of water					
Piped	0.41	99.59	974		
Tube well	0.28	99.72	355		
Dug well	0.59	99.41	1878	3.000	0.700
Surface	0.84	99.16	1778		
Tanker	0	100	18		
Bottle	0	100	8		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.7 Type of toilet facility

In Table 4.22, the evidence shows that there are only two cases known of children showing symptoms of ARI. The first, which reflected0.70% of the sample, was from children using a pit latrine toilet. As for the other case, which reflected households with no facility, 0.56% of children had signs of ARI. All the other toilet facilities had no cases of children showing signs of ARI. In addition, the test of association indicates that there is no statistical significance (Table 4.22). This shows that the type of toilet facility does not indicate whether a child would contract ARI.

Table 4.22 Proportion of type of toilet by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Type of toilet					
Flush	0	100	187		
Pit latrine	0.7	99.3	3270		
No facility	0.56	99.44	1251	2.145	0.829
Composting	0	100	25128		
River/stream	0	100	25		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.8 Source of energy

From the sample it is made clear that very few households have access to electricity. When looking at the proportion of children who had shown symptoms of ARI and had access to electricity, the data shows that only 0.39% had electricity. As for those who did not have electricity and had shown symptoms of ARI, the data shows that there were approximately 0.64% children. The chi-square test of association (Table 4.23) shows that source of energy has no statistical significance on children contracting ARI.

Table 4.23 Proportion of source of energy by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Source of energy					
Yes	0.39	99.61	511		
No	0.64	99.36	4505	0.476	0.490

Source: Demographic and Household survey, Sierra Leone 2008

4.2.9 Mother's education

In Table 4.24, the results indicate that children whose mothers had no education have a higher chance of contracting ARI than those mothers who had a primary education. Furthermore, the data shows that children whose mothers had a secondary education (0.33%) had almost double the chance of contracting ARI than those whose mothers had a primary education (0.15%). From Table 4.24, we see that chi-square (3) = 4.726, $P = 0.193$. This tells us that there is no statistical significance between a mother's education and children contracting ARI. That is, no matter the level of education of a mother, all children have an equal chance of contracting ARI.

Table 4.24 Proportion of mother's education by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Mothers Education					
No education	0.75	99.25	3709		
Primary	0.15	99.85	652	4.726	0.193
Secondary	0.33	99.67	613		
Higher	0	100	69		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.10 Mother's occupation

As for a mother's occupation (Table 4.25), the highest chance of contracting the disease comes from mothers working in the traditional sector. As for mothers working in the farming sector, the data showed this to have the second highest percentage of children with signs of ARI. The third highest percentage of children with signs of ARI was from mothers working in the modern sector. As for mothers who had no jobs, this accounted for approximately 0.39% of children showing signs of ARI. In addition, we ran a test of association to determine whether there was an association between a mother's occupation and children contracting ARI. From Table 4.25, we could conclude that there is no statistical significance between a mother's occupation and children contracting ARI.

Table 4.25 Proportion of mother's occupation by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Mothers Occupation					
Not working	0.39	99.61	1017		
Modern	0.43	99.57	1395		
Farming	0.81	99.19	2455	4.255	0.513
Traditional	1.33	98.67	75		
Manual	0	100	71		
Other	0	100	1		

Source: Demographic and Household survey, Sierra Leone 2008

4.2.11 Dwelling materials

We looked at the household structure in which the children were living. The data shows that the majority of children affected by ARI have natural flooring materials in their homes, while only 0.29% had finished (Table 4.26). As for the walls, Table 4.27 shows that more children with natural wall materials (1.04%) had contracted the disease compared to those with rudimentary (0.49%) and finished wall material (0.38%). As for the roof material, Table 4.28 showed that more children had contracted the disease with rudimentary materials (1.60%) compared to those who had natural roof (0.80%) and finished walls (0.43%).

A chi-square test of association was carried out for all three areas of the household: floors, walls and roof. From the data we could conclude that there is no statistical significance between the floors and children contracting ARI (Table 4.26), as well as the walls and children contracting ARI (Table 4.27). As for the roof, the chi-square test of association shows that there is a statistical significance between the roof materials and children contracting ARI (Table 4.28). This implies that the roof materials used in the household is a factor in determining whether a child would contract ARI.

Table 4.26 Proportion of main floor material by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Main Floor Material					
Natural	0.79	99.21	3298		
Rudimentary	0	100	6	4.523	0.104
Finish	0.29	99.71	1706		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.27 Proportion of main wall material by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Main Wall Materials					
Natural	1.04	98.96	1345		
Rudimentary	0.49	99.51	407	4.619	0.099
Finish	0.38	99.62	1330		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.28 Proportion of main roof material by children with ARI

Characteristic	Has ARI (%)	No ARI (%)	Number of cases	Chi-Square	P-value
Main Roof Materials					
Natural	0.8	99.2	1245		
Rudimentary	1.6	98.4	312	7.775	0.020
Finish	0.43	99.57	3280		

Source: Demographic and Household survey, Sierra Leone 2008

4.3 Pneumonia

Pneumonia was one of the diseases looked at as a possible cause of death. However, due to there being no cause of death stated, we looked at the proportion of children affected by Pneumonia instead. Furthermore, the question of children having contracted Pneumonia was not asked out right in the survey. Therefore, symptoms of Pneumonia were looked at to determine the proportion of children showing signs of contracting the disease. The symptoms most associated with Pneumonia are short, rapid breaths, having a fever and cough, as well as having a problem in the chest. We compared the symptoms that included all these attributes to factors associated with child mortality.

4.3.1 Current age of mother

In Table 4.29, the results indicate that the majority of children showing signs of contracting Pneumonia were from mothers aged between 20 and 34. However, the data further shows that older mothers had approximately 0.33% of children showing signs of Pneumonia. As for the children whose mothers were under the age of 20, there were no cases indicating signs of Pneumonia.

The chi-square test of association in Table 4.29 indicates that there was no statistical significance between the current age of the mother and children showing signs of Pneumonia. This implies that the current age of the mother is not a determining factor of children contracting Pneumonia.

Table 4.29 Proportion of current age of mother by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Current age of mother					
Under 20	0.00	100.00	336		
20-34	0.60	99.40	3479	3.214	0.200
35-49	0.33	99.67	1228		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.2 Place of residence

The place of residence indicated that there was a difference between children living in the rural and urban areas which were affected by Pneumonia. From Table 4.30, the results show that Pneumonia is higher among children living in the rural areas compared to the children living in the urban areas. Furthermore, we found that chi-square (1) = 1.020, $P = 0.312$. This tells us that there is no statistical significance between place of residence and children contracting Pneumonia.

Table 4.30 Proportion of current place of residence by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Place of residence					
Rural	0.57	99.43	3353	1.020	0.312
Urban	0.36	99.64	1690		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.3 Birth number

As for the birth number of a child, the results in Table 4.31 indicate that children showing symptoms of Pneumonia was higher among children whose birth number was between 4 and 6. As for the children with a birth number between 1 and 3, the data indicated that approximately 0.37% had shown signs of Pneumonia, while those whose numbers were between 7 and 9 had about 0.67% of children showing symptoms of Pneumonia. Furthermore, in Table 4.31, we see that children with a birth number between 10 and 12 had shown no cases related to Pneumonia.
In addition, the chi-square test in Table 4.31 indicates that there is no statistical significance between the two variables. Therefore, we could conclude that no matter what the birth number is, each child has an equal chance of contracting Pneumonia.

Table 4.31 Proportion of birth number by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Birth number					
1-3	0.37	99.63	2972		
4-6	0.70	99.30	1571	2.807	0.422
7-9	0.67	99.33	449		
10-12	0.00	100.00	51		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.4 Sex of child

In Table 4.32, the sex of the children illustrates that more male children (0.63%) showed symptoms of Pneumonia compared to the female children (0.36%). As for the chi-square test, it showed that chi-square (1) = 1.804, *P*=0.179. This implies that the sex of the child is not a contributing factor towards children showing signs of Pneumonia.

Table 4.32 Proportion of sex of child by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Sex of child					
Male	0.63	99.37	2552	1.804	0.179
Female	0.36	99.64	2491		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.5 Religion

The data displayed in Table 4.33 shows that there is a difference between the different religions. The highest proportion of children showing symptoms of Pneumonia was from the Christianity faith. As for those children belonging to the Islamic faith, this had the second highest proportion of children displaying signs of Pneumonia. As for the Other faiths, no signs of Pneumonia were displayed amongst these children. The chi-square test (Table 4.33) shows that there is no statistical significance between a child's religion and those displaying signs of Pneumonia.

Table 4.33 Proportion of religion by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Religion					
Christian	0.69	99.31	1166		
Islam	0.45	99.55	3817	1.268	0.531
Other	0.00	100.00	44		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.6 Source of water

The data from Table 4.34 indicates that children receiving water from surface water had the highest proportion of children showing signs of Pneumonia. As for the dug well source of water, this was shown to have the second highest proportion of children with signs of Pneumonia. The third highest proportion of children got their source of water from piped water, while the fourth got theirs from a tube well. As for the tanker and bottled water source, the data indicated that there were no cases of children showing signs of Pneumonia. Furthermore, the chi-square test in Table 4.34 indicated that there is no statistical significance between the source of water and children showing signs of Pneumonia. This means that the source of water does not influence whether a child would contract Pneumonia.

Table 4.34 Proportion of source of water by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Source of water					
Piped	0.31	99.69	974		
Tube well	0.28	99.72	355		
Dug well	0.43	99.57	1878	3.316	0.651
Surface	0.73	99.27	1778		
Tanker	0.00	100.00	18		
Bottle	0.00	100.00	8		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.7 Type of toilet facility

The toilet facility in Table 4.35 showed that Pneumonia was highest among children using the pit latrine facility. As for those using no facility, it showed that 0.40% of children who had Pneumonia had used this type of facility. The composting toilet was the third highest (0.02%) among children who had symptoms of Pneumonia. As for those using a flushing toilet and river/stream, no cases of children showing signs of Pneumonia were reported. Furthermore, the test of association was completed and concluded that there was no statistical significance between type of toilet facility and children showing symptoms of Pneumonia.

Table 4.35 Proportion of type of toilet by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Type of toilet					
Flush	0.00	100.00	187		
Pit latrine	0.49	99.51	3270		
No facility	0.40	99.60	1251	7.519	0.185
Composting	0.02	99.98	25128		
River/stream	0.00	100.00	25		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.8 Source of energy

Table 4.36 shows that there was a difference between children whose households had access to electricity and those who had not. The results show that more children showing signs of Pneumonia had no access to electricity compared to those who had access to electricity in their household. As for the chi-square test, it showed that chi-square (1) = 0.131, *P*= 0.717. We could conclude that there is no statistical significance. Thus, the source of energy is not a factor in determining whether a child would contract Pneumonia or not.

Table 4. 36 Proportion of source of energy by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Source of energy					
Yes	0.39	99.61	511	0.131	0.717
No	0.51	99.49	4505		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.9 Mother's education

In Table 4.37, the results display the proportion of mother's education by children showing signs of Pneumonia. From the Table, we could determine that the highest proportion of children with signs of Pneumonia were from mothers who had a primary education. Furthermore, we could conclude that mothers with no education had approximately 0.49% of children showing signs of Pneumonia, while those with a secondary level of education had 0.33% of children with symptoms of Pneumonia. As for mothers with a higher education, no cases of Pneumonia were reported. As for the chi-square test in Table 4.37, we could conclude that a mother's education does not have a statistical significance on children contracting Pneumonia.

Table 4.37 Proportion of mother's education by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Mother's education					
No education	0.49	99.51	3709		
Primary	0.77	99.23	652	1.661	0.641
Secondary	0.33	99.67	613		
Higher	0.00	100.00	69		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.10 Mother's occupation

Table 4.38 displays mother's occupation by children showing signs of Pneumonia. From the data we could establish that children displaying symptoms of Pneumonia was highest amongst mothers working in the traditional sector. As for mothers working in the farming sector, approximately 0.65% of children had shown signs of Pneumonia. Mothers in the modern sector had the third highest percentage of children with signs of Pneumonia, while mothers with no work had 0.29%. In addition, children whose mothers worked either in the manual or Other sectors had shown no cases of children with signs of Pneumonia. Furthermore, from the test of association (Table 4.38), we could conclude that a mother's occupation is not a factor in children contracting Pneumonia.

Table 4.38 Proportion of mother's occupation by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Mother's occupation					
Not working	0.29	99.71	1017		
Modern	0.36	99.64	1395		
Farming	0.65	99.35	2455	3.977	0.553
Traditional	1.33	98.67	75		
Manual	0.00	100.00	71		
Other	0.00	100.00	1		

Source: Demographic and Household survey, Sierra Leone 2008

4.3.11 Dwelling materials

When investigating the dwelling structure, we first looked at the floors. From the data in Table 4.39, we could conclude that the majority of households had used natural materials for their flooring. This had also shown to be the highest percentage among children who had signs of contracting Pneumonia. Furthermore, finished materials were shown to be the second highest amongst children with symptoms of Pneumonia. The chi-square test determined that there was no statistical significance between flooring materials used for the household and children who had contracted Pneumonia.

The second dwelling structure we investigated was the wall materials. It was shown in Table 4.40 that majority of children showing signs of Pneumonia were from children whose households used natural wall material. As for finished material, this was the second highest amongst children showing signs of Pneumonia, while rudimentary materials were the third highest. The chi-square test indicated that there was no statistical significance between the household's wall materials and children contracting Pneumonia.

The third dwelling structure was the roof. From Table 4.41 we could conclude that most households with children showing signs of Pneumonia had used natural material. As for finished materials, this was shown to be the second highest. The rudimentary materials were shown to have no cases of children with signs of Pneumonia. Furthermore, the chi-square test indicated that there was no statistical significance between the roof materials of the household and children showing symptoms of Pneumonia.

Table 4.39 Proportion of main floor material by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Main floor material					
Natural	0.61	99.39	3298		
Rudimentary	0.00	100.00	6	2.254	0.324
Finish	0.29	99.71	1706		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.40 Proportion of main wall material by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Main wall material					
Natural	0.82	99.18	1345		
Rudimentary	0.25	99.75	407	3.180	0.204
Finish	0.38	99.62	1330		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.41 Proportion of main roof material by children with Pneumonia

Characteristics	Has Pneumonia (%)	No Pneumonia (%)	Number of cases	Chi-square	P-value
Main roof material					
Natural	0.56	99.44	1245		
Rudimentary	0.00	100.00	312	1.743	0.418
Finish	0.46	99.54	3280		

Source: Demographic and Household survey, Sierra Leone 2008

4.4 Diarrhoea

For this analysis we look at two variables associated with Diarrhoea to find acute cases. The two variables we merged together were children who had Diarrhoea 2 weeks prior to the survey and children who still had Diarrhoea at the time of the survey. These two variables were compared to possible factors associated with child mortality to determine which of these factors were also associated with Diarrhoea.

4.4.1 Current age of mother

When examining the current age of mother and the number of children affected by Diarrhoea, it can be seen that mothers under the age of 20 had 2.98% of children with Diarrhoea. Furthermore, the results in Table 4.42 indicate that mothers between the ages of 20 to 34 had the second highest percentage of children affected by Diarrhoea. As for older mothers between the ages of 35 and 49, the results indicated that there were approximately 1.55% of children who had contracted Diarrhoea.

The chi-square test of association in Table 4.42 shows that there was no statistical significance between the current age of mother and children with Diarrhoea.

Table 4.42 Proportion of current age of mother by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Current age of mother					
under 20	2.98	97.02	336		
20-34	2.21	97.79	3479	3.294	0.193
35-49	1.55	98.45	1228		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.2 Place of residence

In Table 4.43 we examined the results concerning place of residence and the number of children affected by Diarrhoea. The data indicated that the majority of children affected by Diarrhoea were living in the urban areas compared to those living in the rural areas. The chi-square test in Table 4.43 indicates that there is no statistical significance between place of residence and children affected by Diarrhoea.

Table 4. 43 Proportion of place of residence by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Place of residence					
Rural	2.03	97.97	3353	0.265	0.606
Urban	2.25	97.75	1690		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.3 Birth number

The results in Table 4.44 show that there is a difference between the birth number of a child and those having contracted Diarrhoea. From Table 4.45 we could determine that children with Diarrhoea was highest among children with a birth number of 7 to 9, while the second highest was those with a birth number of 1 to 3. As for those children with a birth number of 4 to 6, the data indicated that 1.91% of children had contracted Diarrhoea, while those with the birth number of 10 to 12 had only 1.96% of children contracting the disease. In Table 4.44, the chi-square test indicates that there is no statistical significance between birth number and children affected by Diarrhoea.

Table 4.44 Proportion of birth number by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
birth number					
1-3	2.19	97.81	2972		
4-6	1.91	98.09	1571	0.426	0.935
7-9	2.23	97.77	449		
10-12	1.96	98.04	51		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.4 Sex of child

The results in Table 4.45 had indicated that there is a difference between the sex of a child and whether they had contracted Diarrhoea. The data had indicated that more males had contracted Diarrhoea than their female counterparts. Furthermore, the chi-square test indicated that there was no statistical significance between sex of child and children contracting Diarrhoea (Table 4.45).

Table 4.45 Proportion of sex of child by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
sex of child					
male	2.27	97.73	2552	0.732	0.392
Female	1.93	98.07	2491		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.5 Religion

When examining the data in Table 4.46 between religion and children who have contracted Diarrhoea, the results indicated that Diarrhoea was higher among those children belonging to the Christian faith. As for those who belonged to Other faiths, approximately 2.27% of children were infected by Diarrhoea. Islam had the lowest percentage of children affected by Diarrhoea. In addition, the chi-square test indicated that there was no statistical significance between a child's religion and contracting Diarrhoea (Table 4.46).

Table 4.46 Proportion of religion by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Religion					
Christian	2.40	97.60	1166		
Islam	2.02	97.98	3817	0.644	0.725
Other	2.27	97.73	44		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.6 Source of water

When studying the results of the source of water and children contracting Diarrhoea, it was found that the majority had accessed their water from a tube well (Table 4.47). As for piped water, the results had indicated this to be the second highest percentage of children receiving their water from this source. As for surface water, this was the third highest amongst children who had contracted Diarrhoea. The dug well had shown that approximately 1.49% of children affected by Diarrhoea had accessed their source water from here. The chi-square test in Table 4.47 indicates that there is a statistical significance between source of water and children contracting Diarrhoea.

Table 4.47 Proportion of source of water by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
source of water					
Piped	2.46	97.54	974		
tube well	4.23	95.77	355		
dug well	1.49	98.51	1878	12.355	0.030
Surface	2.19	97.81	1778		
Tanker	0.00	100.00	18		
Bottle	0.00	100.00	8		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.7 Type of toilet facility

The data in Table 4.48 showed that the type of toilet facility used by children with Diarrhoea was highest amongst children whose households used the pit latrine toilet. As for those who had no facility, the data had shown that 1.76% of children had contracted Diarrhoea using this type of facility. The flush toilet (1.60%) was the third highest among children who had contracted Diarrhoea, while the composting toilet was the fourth highest. The chi-square test had indicated that there was no statistical significance between type of toilet facility and children who have contracted Diarrhoea.

Table 4.48 Proportion of type of toilet by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
type of toilet					
flush	1.60	98.40	187		
pit latrine	2.23	97.77	3270		
no facility	1.76	98.24	1251	3.760	0.584
Composting	0.03	99.97	25128		
river/stream	0.00	100.00	25		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.8 Source of energy

When examining the data in Table 4.49 between the source of energy and the number of children who had contracted Diarrhoea, it showed that more children with no access to electricity had contracted Diarrhoea compared to those who had access to electricity. Furthermore, the chi-square test (Table 4.49) had shown that there was no statistical significance between source of energy and children who have contracted Diarrhoea.

Table 4.49 Proportion of source of energy by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
source of energy					
Yes	1.96	98.04	511	0.067	0.795
No	2.13	97.87	4505		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.9 Mother's education

The results displayed in Table 4.50 showed that children with Diarrhoea were highest amongst mothers with a higher education. As for primary education, this was the second highest with 2.45% of children contracting Diarrhoea. Mothers with no education was the third highest (2.05%) and mothers with a secondary education showed the lowest percentage of children affected by Diarrhoea. The chi-square test in Table 4.50 reveals that there is no statistical significance between a mother's education and children who contracted Diarrhoea.

Table 4.50 Proportion of mother's education by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
mother's education					
no education	2.05	97.95	3709		
Primary	2.45	97.55	652	0.718	0.869
Secondary	1.96	98.04	613		
Higher	2.90	97.10	69		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.10 Mother's occupation

In Table 4.51, we examined a mother's occupation and children who have contracted Diarrhoea. The data explained that mothers that held a job in the traditional sector had the highest number of children affected by Diarrhoea, while those in the manual sector had the second highest percentage of affected children. As for the third highest, this was from those mothers working in the modern sector, with those working in the farming sector being placed fourth. The lowest

percentage of children affected by Diarrhoea was from those mothers who held no job. From the chi-square test of association in Table 4.51, we could conclude that there is no statistical significance between mother's occupation and children who have contracted Diarrhoea.

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Table 4.51 Proportion of mother's education by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
mother's occupation					
not working	1.77	98.23	1017		
Modern	2.15	97.85	1395		
Farming	2.08	97.92	2455	4.587	0.468
traditional	5.33	94.67	75		
Manual	2.82	97.18	71		
Other	0.00	100.00	1		

Source: Demographic and Household survey, Sierra Leone 2008

4.4.11 Dwelling material

As for the structure of the household, Diarrhoea was found highest among children whose floors were made from natural material (2.27%), walls from natural material (2.08%) and roof from finished materials (2.20%). As for the second highest, this was from children who lived in a house with a finish floor (1.70%), finished walls (2.03%) and natural roof (1.93%). As for the rest, they come from homes which had rudimentary walls (1.97%) and rudimentary roofs (1.60%). The chi-square test of association in Table 4.52 indicated that there was no statistical significance between flooring material and children who had contracted Diarrhoea. As for the chi-square test, in Table 4.53, for wall materials, we could conclude that there is no statistical significance. That is, the wall materials are not a contributing factor to those children contracting Diarrhoea. Furthermore, the chi-square test, in Table 4.54, indicated that there was no statistical significance between the roof material and children who have contracted Diarrhoea.

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Table 4.52 Proportion of main floor material by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Main floor material					
Natural	2.27	97.73	3298		
Rudimentary	0.00	100.00	6	1.951	0.377
Finish	1.70	98.30	1706		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.53 Proportion of main wall material by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Main wall material					
Natural	2.08	97.92	1345		
Rudimentary	1.97	98.03	407	0.023	0.988
Finish	2.03	97.97	1330		

Source: Demographic and Household survey, Sierra Leone 2008

Table 4.54 Proportion of main roof material by children with Diarrhoea

Characteristics	Has Diarrhoea (%)	No Diarrhoea (%)	Number of cases	Chi-square	P-value
Main roof material					
Natural	1.93	98.07	1245		
Rudimentary	1.60	98.40	312	0.700	0.705
Finish	2.20	97.80	3280		

Source: Demographic and Household survey, Sierra Leone 2008

4.5 Measles

From the data collected in the SLDHS, we have taken known symptoms of Measles and compared them to a number of factors to determine the link between Measles and child mortality. The symptoms used to determine whether a child had contracted Measles was as follows: they had a runny or block nose and had a cough and fever.

4.5.1 Current age of mother

The results in Table 4.55 indicate that the current age of the mother and the number of children who showed signs of Measles was highest amongst mothers under the age of 20.The second highest percentage of children was from mothers aged between 35 and 49. As for the lowest percentage of children who showed symptoms of Measles, the Table had indicated that these children had come from mothers aged between 20 and 34. Furthermore, from the chi-square test in Table 4.55, we could conclude that there is no statistical significance between the current age of the mother and children with symptoms of Measles.

Table 4.55 Proportion of current age of mother by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
Current age of mother					
Under 20	0.89	99.11	336		
20-34	0.03	99.97	3479	2.909	0.233
35-49	0.33	99.67	1228		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.2 Place of residence

In Table 4.56, we could determine that there was a difference between the place of residence and children showing symptoms of Measles. From the results, we could see that there were a higher percentage of children in the urban areas showing signs of Measles than those children living in

the rural areas. Furthermore, the chi-square test in Table 4.56 indicates that there is a statistical significance between place of residence and children showing signs of Measles.

Table 4.56 Proportion of place of residence by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
Place of residence					
Rural	0.51	99.49	3353		
Urban	0.89	99.11	1690	6.336	0.012

Source: Demographic and Household survey, Sierra Leone 2008

4.5.3 Birth number

The results in Table 4.57 between the birth number of a child and the percentage of children showing signs of Measles indicates that Measles was highest amongst children with a birth number between 4 and 6. Furthermore, the results showed that the second highest percentage of cases were amongst children with the birth number between 1 and 3. As for the third highest, this was among children in the order of 7 to 9. Furthermore, there were no cases of Measles for children with the birth number between 10 and 12.The chi-square test of association in Table 4.57 indicates that there is no statistical significance between a child's birth number and a child showing signs of Measles.

Table 4.57 Proportion of birth number by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
birth number					
1-3	0.30	99.70	2972		
4-6	0.51	99.49	1571	1.679	0.642
7-9	0.22	99.78	449		
10-12	0.00	100.00	51		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.4 Sex of child

When examining the data in Table 4.58 between sex of the child and children showing signs of Measles, it indicates that there were more male children showing signs of Measles than their female counterparts. Furthermore, the chi-square test in Table 4.58 indicates that there is no statistical significance between sex of child and children showing signs of Measles.

Table 4.58 Proportion of sex of child of mother by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
sex of child					
male	0.47	99.53	2552		
Female	0.24	99.76	2491	1.864	0.172

Source: Demographic and Household survey, Sierra Leone 2008

4.5.5 Religion

In Table 4.59, the data indicated that 0.45% of children belonging to the Islamic faith had shown signs of Measles. Furthermore, the data indicated that children belonging to the Christianity faith had approximately 0.09% of children with signs of Measles. As for those belonging to Other faiths, the data had indicated that there were no cases of Measles. In addition, the chi-square test of association had shown that there is no statistical significance between religion and children showing signs of Measles (Table 4.59).

Table 4.59 Proportion of current age of mother by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
Religion					
Christian	0.09	99.91	1166		
Islam	0.45	99.55	3817	3.397	0.183
Other	0.00	100.00	44		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.6 Source of water

When examining the source of water and the number of children who had signs of Measles, the data in Table 4.60 shows that majority had accessed their source water from surface water. As for the second highest, these were from those children who had received their source water from a dug well, while the third highest was getting their water from a tube well. Furthermore, 0.10% of children who showed signs of Measles had accessed their water from a piped source. In addition, the chi-square test of association indicated that there was no statistical significance between source of water and children showing signs of Measles (Table 4.60).

Table 4.60 Proportion of source of water by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
source of water					
piped	0.10	99.90	974		
tube well	0.28	99.72	355		
dug well	0.37	99.63	1878	3.027	0.696
surface	0.51	99.49	1778		
tanker	0.00	100.00	18		
bottle	0.00	100.00	8		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.7 Type of toilet facility

In Table 4.61, we examined the type of facility used by children in the household and children showing signs of Measles. From the data, we could conclude that majority of households with children showing signs of contracting Measles had no facility available to them. As for the second highest number of children with signs of Measles, they were using a pit latrine toilet. Furthermore, the other toilet facilities named had no cases of children showing signs of Measles. In addition, the chi-square test in Table 4.61 indicates that the type of toilet facility has no statistical significance on children with signs of Measles.

Table 4.61 Proportion of type of toilet by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
type of toilet					
flush	0.00	100.00	187		
pit latrine	0.37	99.63	3270		
no facility	0.48	99.52	1251	2.283	0.809
composting	0.00	100.00	25128		
river/stream	0.00	100.00	25		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.8 Source of energy

In Table 4.62, the data indicates that the only cases of children showing signs of Measles were from households without electricity. Furthermore, the chi-square test indicated that there was no statistical significance between source of energy and children with signs of Measles (Table 4.62).

Table 4.62 Proportion of source of energy by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
source of energy					
yes	0.00	100.00	511		
no	0.40	99.60	4505	2.049	0.152

Source: Demographic and Household survey, Sierra Leone 2008

4.5.9 Mother's education

In Table 4.63, a mother's education was looked at and indicated that children showing symptoms of Measles was highest with those mothers with a higher education (1.45%). As for mothers with no education, this was shown to be the second highest amongst children showing signs of Measles. As for mothers with primary and secondary education, the data had indicated that approximately 0.31% and 0.16% of children had shown signs of Measles. In addition, the chi-square test indicated that a mother's education is not statistically significant on children showing signs of Measles (Table 4.63).

Table 4.63 Proportion of mother's education by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
mother's education					
no education	0.38	99.62	3709		
Primary	0.31	99.69	652		
Secondary	0.16	99.84	613	3.052	0.384
Higher	1.45	98.55	69		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.10 Mother's occupation

As for mother's occupation, children who had symptoms of Measles was highest among those mothers working in the modern sector (0.36%). As for mothers with no work, the data had indicated this to be the second highest percentage amongst children with Measles (0.10%). The lowest was from mothers working in the farming sector (0.04%). As for the other sectors, that is, traditional, manual and other, these sectors had no reported cases of children showing signs of Measles. Furthermore, in Table 4.64, the chi-square test indicates that there is no statistical significance between a mother's occupation and children showing signs of Measles.

Table 4.64 Proportion of mother's occupation by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
Mother's occupation					
not working	0.10	99.90	1017		
Modern	0.36	99.64	1395		
Farming	0.04	99.96	2455	3.618	0.606
traditional	0.00	100.00	75		
Manual	0.00	100.00	71		
Other	0.00	100.00	1		

Source: Demographic and Household survey, Sierra Leone 2008

4.5.11 Dwelling material

When it came to the household structure, this was divided into three parts: floors, walls and roofs.

Firstly, we looked at the flooring, which showed that 0.96% came from households that had used rudimentary materials for the flooring, while 0.48% had used natural materials. From the chi-square test in Table 4.65, we could conclude that there is no statistical significance between the floor materials used in the household and a child showing signs of Measles.

Table 4.65 Proportion of main floor material by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
main floor material					
Natural	0.36	99.64	3298		
rudimentary	0.00	100.00	6	0.026	0.987
Finish	0.35	99.65	1706		

Source: Demographic and Household survey, Sierra Leone 2008

Secondly, we looked at the wall material, which showed that 0.74% had their house walls made from natural materials, while 0.30% was made from finished and 0.25% from rudimentary materials. In addition, the chi-square test in Table 4.66 indicates that there is no statistical significance between the materials used for the walls in the household and children showing signs of Measles.

Table 4.66 Proportion of main wall material by children with Measles

Characteristics	Has Measles (%)	No Measles (%)	Number of cases	Chi-square	P-value
main wall material					
natural	0.74	99.26	1345	3.269	0.195
rudimentary	0.25	99.75	407		
finish	0.30	99.70	1330		

Source: Demographic and Household survey, Sierra Leone 2008

Thirdly, we looked at the roofing, which showed that the majority of children with symptoms of Measles had rudimentary roofing. Furthermore, the data had indicated the natural material was the second and finish material third highest amongst children showing signs of Measles (Table 4.67). In addition, the chi-square test had shown that there was no statistical significance between the roofing materials used in the households and children with signs of Measles (Table 4.67).

Table 4.67 Proportion of main roof material by children with Measles

Characteristics	**Has Measles (%)**	**No Measles (%)**	**Number of cases**	**Chi-square**	**P-value**
main roof material					
Natural	0.48	99.52	1245		
rudimentary	0.96	99.04	312	4.174	0.124
Finish	0.27	99.73	3280		

Source: Demographic and Household survey, Sierra Leone 2008

4.6 Logistic regression

Logistic regression was used for the selected background variables chosen from the children dataset. There were three dependent variables: children having cough for the last 24 hours, children having problems in the chest and children having Diarrhoea. Several diseases influenced child mortality in the study area. Interestingly, our major concern reflects data consistency and the quality of the data. These three dependent variables play a major role with the independent variables. These variables were used to evaluate the significance between each of the independent variables on the dependent variables. The dependent variables were dichotomous: if 'Yes', coded as '1'; if 'No', coded as '0'. In other words, one of two outcomes, that is, either they had not contracted the disease (0 =No) or they had contracted the disease (1 =Yes).

As for the independent variables, there were two groups: one dichotomous and the other categorical, which was mentioned in the methodology section. The dichotomous group consisted of eight variables, namely type of place of residence, sex of household head, currently pregnant, visited by family planning workers in last 12 months, visited health facilities in last 12 months, currently breastfeeding, currently amenorrhea and currently abstaining. As for the categorical variables, these included a mother's age (from 15-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45 and above), region (eastern, northern, southern and western regions), highest educational level, religion and wealth index (poorest, poorer, middle, richer and richest).

4.6.1 Model 1: Children having a cough

Table 4.68 shows that there are 6 background variables which are highly significant with children having a cough. A statistically significant association is seen between the regions and children having a cough (p = 0.000). The level of significance for this variable was p <0.005. Furthermore, the results indicate that children living in the northern regions of Sierra Leone have a 0.7 times greater chance of contracting a cough than those living in the eastern region.

The results for an association between the highest educational level of the mother and children having cough are presented in the same Table. The data indicates that mothers that had no

education was statistically highly significant due to $p < 0.001$. Interestingly, for other levels of education, there was no significance effect with children having a cough. The third variable used was dichotomous, namely place of residence. The results in the Table indicate that it has a significant effect with children who have a cough. Furthermore, we could conclude that children living in the rural areas are 1.2 times more likely to contract a cough than those children living in the urban areas. This result might be due to there being more health facilities in urban areas. Another interesting influence is mothers currently breastfeeding, which is statistically highly significant to the dependent variable. In addition, we could conclude from the data that children drinking breast milk are 1.3 times less likely to have a chance of contracting a cough than those children who had not been feed breast milk. In terms of the association between currently amenorrhea and children having cough, the result showed a highly significant effect with an Exp β value of 1.38.

Furthermore, the results indicate that children whose mothers are currently amenorrhea have a 0.8 times greater likelihood of contracting a cough. The results in Table 4.68 indicated that currently abstaining was highly significant to children having a cough due to $p < 0.01$. Furthermore, the Table shows that children whose mothers had abstained had a 1.2 times greater likelihood of contracting a cough than those whose mothers were not abstaining. In addition, we need to note that religion had shown null values. This could indicate missing values, a possible bias, or even inconsistency in the dataset.

Table 4.68 The odds ratio of children having cough by background characteristics in Sierra Leone, 2008

Selected Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Age 5-year groups *(Ref: 15-19)*							
15-19					1.000		
20-24	0.243	0.278	0.763	0.383	1.275	0.739	2.2
25-29	0.299	0.256	1.367	0.242	1.348	0.817	2.225
30-34	0.22	0.251	0.767	0.381	1.246	0.762	2.038
35-39	0.369	0.256	2.077	0.15	1.446	0.876	2.386
40-44	0.089	0.26	0.117	0.732	1.093	0.656	1.821
45-49	0.066	0.288	0.052	0.819	1.068	0.607	1.88
Region *(Ref: Eastern)*							
Eastern					1.000		
Northern	-0.304	0.126	5.792	0.016	0.738	0.576	0.945
Southern	-0.178	0.129	1.888	0.169	0.837	0.65	1.079
Western	-0.027	0.129	0.042	0.837	0.974	0.756	1.255
Highest educational level *(Ref: No education)*							
No education					1.000		
Primary	-0.049	0.325	0.023	0.879	0.952	0.504	1.798
Secondary	0.371	0.329	1.267	0.26	1.449	0.76	2.763
Higher	0.164	0.325	0.255	0.614	1.178	0.623	2.228
Wealth Index *(Ref: Poorest)*							
Poorest					1.000		
Poorer	0.128	0.115	1.25	0.263	1.137	0.908	1.424
Middle	0.176	0.114	2.391	0.122	1.193	0.954	1.491
Richer	0.228	0.124	3.387	0.066	1.256	0.985	1.6
Richest	0.232	0.163	2.023	0.155	1.261	0.916	1.735
Type of place of residence *(Ref: Urban)*							
Urban					1.000		
Rural	0.186	0.106	3.067	0.08	1.204	0.978	1.483
Sex of Household head *(Ref: Male)*							
Male					1.000		
Female	0.028	0.091	0.096	0.757	1.029	0.86	1.23
Currently pregnant *(Ref: No or unsure)*							
No					1.000		
Yes	0.066	0.151	0.19	0.663	1.068	0.795	1.435
Visited by a FP worker in last 12 months *(Ref: No)*							
No					1.000		
Yes	-0.064	0.119	0.291	0.589	0.938	0.743	1.184
Visited health FC in last 12 months *(Ref: No)*							
No					1.000		
Yes	0.11	0.074	2.19	0.139	1.116	0.965	1.291
Currently breastfeeding (*Ref: No)*							
No					1.000		
Yes	0.286	0.111	6.638	0.01	1.331	1.071	1.655
Currently amenorrhea *(Ref: No)*							
No					1.000		
Yes	-0.217	0.09	5.86	0.015	0.805	0.675	0.959
Currently abstaining *(Ref: No)*							
No					1.000		
Yes	0.199	0.112	3.153	0.076	1.220	0.98	1.52
Constant	-21.948	13256		0.999			

Source: SLDHS, 2008

4.6.2 Model 2: Children having a problem in the chest

When looking at the results in Table 4.69, we found that the region was considered significant to children contracting problems in the chest due to $p<0.001$. Furthermore, the odds ratio shows that children living in the southern region of Sierra Leone are 1.4 times more likely to have a problem in the chest than those living in the eastern region ($p < 0.01$). The highest educational level of a mother was shown to be significant to mothers who had no education and children having a problem in the chest. As for the other levels of education, there was no relationship shown. According to Table 4.69, religion had shown to be significant to children having a problem in the chest. However, this was only shown for children who belonged to the Christianity faith. As for the other religions (Islam, Baha'i, Traditional, None and Other), the significance values suggest that there was an error in the data, which could be due to one of the following reasons: missing values, a bias, or an inconsistency in the data.

Type of place of residence indicates that there is significance to children with a problem in the chest ($p <0.005$). The odds ratio shows that a child who lives in a rural area is 1.7 times more likely to have problems in the chest than a child living in an urban area. Sex of the household showed that there was a relationship with children having a problem in the chest ($p < 0.05$). As for the odds ratio, the results had shown that children who had come from a household whose head was a female are 1.4 times more likely to have a problem in the chest than those children who had come from a household whose head was a male. Furthermore, according to Table 4.69, mother's 'currently breastfeeding', which is statistically highly significant to the dependent variable ($p< 0.05$). In addition, we could conclude from the data that children drinking breast milk are 1.4 times less likely to have a chance of contracting a cough than those children who had not been feed breast milk.

Table 4.69 The odds ratio of children having problem in the chest by background characteristics in Sierra Leone, 2008

Selected Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Age 5-year groups *(Ref: 15-19)*							
15-19					1.000		
20-24	0.049	0.372	0.018	0894	1.051	0.507	2.177
25-29	0.214	0.336	0.406	0.524	1.239	0.641	2.394
30-34	0.050	0.331	0.023	0.879	1.052	0.550	2.011
35-39	0.252	0.337	0.561	0.454	1.287	0.665	2.491
40-44	0.011	0.343	0.001	0.975	1.011	0.516	1.980
45-49	0.109	0.376	0.084	0.772	1.115	0.534	2.329
Region *(Ref: Eastern)*							
Eastern							
Northern	-0.209	0.197	1.123	0.289	0.811	0.551	1.194
Southern	0.348	0.192	3.292	0.070	1.416	0.972	2.062
Western	0.088	0.199	0.198	0.657	1.092	0.740	1.612
Highest educational level *(Ref: No education)*							
No education					1.000		
Primary	0.198	0.612	0.104	0.747	1.218	0.367	4.045
Secondary	0.556	0.618	0.811	0.368	1.744	0.520	5.853
Higher	0.620	0.612	1.029	0.310	1.860	0.561	6.167
Wealth Index *(Ref: Poorest)*							
Poorest					1.000		
Poorer	0.047	0.152	0.097	0.755	1.049	0.778	1.412
Middle	0.223	0.148	2.270	0.132	1.250	0.935	1.672
Richer	-0.053	0.172	0.093	0.760	0.949	0.677	1.330
Richest	0.120	0.238	0.254	0.615	1.127	0.707	1.797
Type of place of residence *(Ref: Urban)*							
Urban					1.000		
Rural	0.502	0.159	10.027	0.002	1.653	1.211	2.256
Sex of Household head *(Ref: Male)*							
Male					1.000		
Female	0.297	0.121	5.980	0.014	1.345	1.061	1.707
Currently pregnant *(Ref: No or unsure)*							
No					1.000		
Yes	0.000	0.220	0.000	0.998	1.000	0.650	1.541
Visited by a FP worker in last 12 months *(Ref: No)*							
No					1.000		
Yes	0.089	0.162	0.301	0.583	1.093	0.796	1.500
Visited health FC in last 12 months *(Ref: No)*							
No					1.000		
Yes	0.126	0.104	1.485	0.223	1.135	0.926	1.391
Currently breastfeeding (*Ref: No)*							
No					1.000		
Yes	0.335	0.157	4.571	0.033	1.398	1.028	1.900
Currently amenorrhea *(Ref: No)*							
No					1.000		
Yes	-0.195	0.122	2.551	0.110	0.823	0.647	1.045
Currently abstaining *(Ref: No)*							
No					1.000		
Yes	0.166	0.157	1.126	0.289	1.181	0.868	1.606
Constant	-23.232	13280.308	0.000	0.999	0.000		

Source: SLDHS, 2008

4.6.3 Model 3: Children having Diarrhoea

Table 4.70 indicates that only one variable had shown a relationship with children having Diarrhoea. The region of the child had shown to have a significance of p <0.001. Firstly, the Table shows that the eastern region of Sierra Leone has a higher significance for children to contract Diarrhoea than any of the other regions. Secondly, it shows that the western region had the second highest significance level, with the northern region ($p < 0.01$) being the third. As for the southern region, this was shown not to be significant. Furthermore, the odds ratios indicate that children living in the western region are 0.3 times more likely to contract Diarrhoea than those living in the eastern region. As for those in the northern region, the results showed that there is a 0.5 times greater likelihood of a child contracting Diarrhoea from this region than from the eastern region.

In summary, the regional variation was found only for the children having a cough, but there were no effects with Diarrhoea and problems in the chest.

Table 4.70 The odds ratio of children still having Diarrhoea by background characteristics in Sierra Leone, 2008

Selected Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Age 5-year groups *(Ref: 15-19)*							
15-19					1.000		
20-24	0.584	0.799	0.536	0.464	1.794	0.375	8.582
25-29	0.600	0.747	0.646	0.421	1.823	0.422	7.877
30-34	0.544	0.736	0.546	0.460	1.722	0.407	7.284
35-39	-0.215	0.779	0.076	0.782	0.806	0.175	3.714
40-44	0.016	0.773	0.000	0.983	1.017	0.223	4.625
45-49	-0.143	0.875	0.027	0.871	0.867	0.156	4.814
Region *(Ref: Eastern)*							
Eastern					1.000		
Northern	-0.694	0.364	3.642	0.056	0.500	0.245	1.019
Southern	0.055	0.345	0.025	0.873	1.057	0.537	2.078
Western	-1.238	0.427	8.415	0.004	0.290	0.126	0.669
Highest educational level *(Ref: No education)*							
No education					1.000		
Primary	-0.553	0.786	0.494	0.482	0.575	0.123	2.686
Secondary	-0.392	0.806	0.236	0.627	0.676	0.139	3.281
Higher	-0.609	0.794	0.588	0.443	0.544	0.115	2.580
Wealth Index *(Ref: Poorest)*							
Poorest					1.000		
Poorer	0.177	0.325	0.297	0.586	1.194	0.631	2.257
Middle	0.151	0.319	0.223	0.637	1.163	0.622	2.175
Richer	-0.190	0.367	0.269	0.604	0.827	0.403	1.697
Richest	-0.854	0.487	3.077	0.079	0.426	0.164	1.105
Type of place of residence *(Ref: Urban)*							
Urban					1.000		
Rural	-0.411	0.282	2.114	0.146	0.663	0.381	1.154
Sex of Household head *(Ref: Male)*							
Male					1.000		
Female	0.183	0.250	0.536	0.464	1.201	0.736	1.958
Currently pregnant *(Ref: No or unsure)*							
No					1.000		
Yes	-0.066	0.426	0.024	0.876	0.936	0.406	2.158
Visited by a FP worker in last 12 months *(Ref: No)*							
No					1.000		
Yes	-0.183	0.378	0.235	0.628	0.833	0.397	1.747
Visited health FC in last 12 months *(Ref: No*							
No					1.000		
Yes	-0.055	0.210	0.068	0.795	0.947	0.627	1.429
Currently breastfeeding (*Ref: No)*							
No					1.000		
Yes	0.147	0.314	0.218	0.640	1.158	0.625	2.145
Currently amenorrhea *(Ref: No)*							
No					1.000		
Yes	-0.410	0.256	2.576	0.109	0.664	0.402	1.095
Currently abstaining *(Ref: No)*							
No					1.000		
Yes	0.097	0.322	0.090	0.764	1.101	0.586	2.069
Constant	-19.528	13219.992	0.000	0.999	0.000		

Source: SLDHS, 2008

Chapter V

Discussion and Policy Implications

In this chapter, we will discuss what we have found and possible policies that could be implemented in order to reduce child mortality in Sierra Leone.

5.1 Discussion

In this study, we had attempted to look at how vulnerable diseases affect child mortality in Sierra Leone. Unfortunately, we were using secondary data from the SLDHS, which does not state exactly what the cause of death of a child is. However, we have looked at the vulnerable diseases that could cause death and how children are affected by it.

5.1.1 Child mortality

The first aspect we looked at was factors associated with child mortality. From our results, we had concluded that there are four factors that are statistically significant to child mortality. The first was place of residence. In 1988, Bailey had found that the place of residence was a contributing factor towards child mortality in Sierra Leone. In our results, we also found this to be true. It was interesting to find that a higher percentage of children had died in the urban areas compared to those in the rural areas, even though the rural areas are the places where most of the economic wealth comes from. As for possible reasons for the higher percentage of children dying in urban areas, we concluded that: firstly, there could have been possible migration and the place of residence at the time of death was not the real onset of death. Secondly, the medical centres in the urban areas could have not been well equipped or had no medication available. As for the rural areas, the distance to a medical facility or lack of medication at the facility might have been the problem.

The second factor was birth number. From our review of the literature, we found that birth number is significant to child morality, as we have also concluded in our study. However, the researchers Van Ginneken &. Kembo (2009) had stated that a U-shaped relationship was found between a child's birth number and death, but in our study, this is not the case. In our results, we found that even though fewer children had a birth number higher than 10, this showed the highest percentage of deaths. While those children with a birth number between 1 and 3 had the smallest percentage of deaths. Furthermore, we found that as the birth number of a child increases, so does the percentage of deaths. The possible reason for this is that a mother who has their first child tends to be more overprotective and well cared for than children born after that. Furthermore, it could be found that caregivers to children with a higher birth number were either inexperienced, the child's older siblings, or both.

The third significant factor associated with child morality was religion. In our results we found that the country is predominantly Muslim, while the second highest religion was Christianity. As for other religions, which included Baha'i, Traditional, none and other, there were a very small percentage of these. Furthermore, in our results, we found it surprising that Other religions had the highest percentage of deaths, while Muslims (who were the majority) had the smallest percentage of deaths. The potential motivation for this is that some people use their religion as a decision-making tool, as stated by certain researchers (Agadjanian & Menjivar, 2008; Ellis & Haar, 1998). These types of decisions include whether a child could be taken to a medical facility or receive any treatment when sick.

In addition, our study found that the type of toilet facility used by a child is statistically significant to child mortality. From our results, we found it interesting that even though there were a small number of children using a flushing toilet, the percentage of children that died compared to those who had no facility was much higher. The possible explanation for the type of toilet facility being used by a child as a factor in child mortality is that the infrastructure in Sierra Leone is not of a high standard. In addition, when we looked at the highest percentage of child deaths, it was found that they were from children using the river/stream as a toilet facility. The rivers/streams are breeding grounds for potential virus and bacteria. This was shown in a study by Clasen and Bastable (2003) when they explained how people's water sources were being

contaminated by faecal. Also, there could have been leakages from the sewage system that people were unaware of that caused those children who died to contract a vulnerable disease.

5.1.2 Disease

Further, in the study, we looked at four vulnerable diseases associated with children dying, which were ARI, Pneumonia, Diarrhoea and Measles. However, since no data was available on cause of death, we looked at the effects of these diseases on children in Sierra Leone. From our results, we could conclude that for ARI there was only one factor statistically significant for children who showed signs of ARI, which was the roof material of the household. In our study, there were a number of cases that had not answered this question. However, from those who did answer, it was made clear that the highest percentage of child deaths were from households using rudimentary material. The rudimentary material used was wood and palms/bamboo, which people used in their households. These materials may not have been treated correctly and the child might have inhaled something from it while in the household, causing the child to become sick. Sierra Leone is a country that has vast forests and this could be a reason why rudimentary material was used. Madhi & Klugman (2006) had stated 5 factors that could help reduce the number of children being infected with ARI. However, in our study we found none of these factors to be significant.

As for Pneumonia, there were no factors associated with children showing signs of Pneumonia. This is surprising since Onoja (2010) had stated that at least 1.6 million children had died due to pneumonia, of which 98% had come from developing countries.

Diarrhoea was the third disease we looked at. In our results, we found that one known factor was associated with children contracting the disease, which was the source of the household's water. The potential reason for this is that some areas of Sierra Leone people use the rivers/streams as their toilet facility, which contaminates the water and without proper purification of it, we would find a lot of children getting sick as stated by Clasen and Bastable (2003). This was reiterated by Gunther & Fink (2011), who stated that if proper investment in water purification is made, child mortality could be reduced. Furthermore, we have established in Chapter 1, page 4, that Sierra

Leone has emerged from a civil war and is trying to build its infrastructure. This means that water purification and sanitation plants are being upgrade or built and therefore water contaminated is still happening in the country.

The last disease we looked at was Measles. This disease also had one factor statistically significant to children contracting the disease. This factor was the place of residence. Measles is a disease that has been under control for years as vaccinations are available. However, in developing countries, this is not always the case, as stated by World Vision International (2010). In our study, we found that more children had shown signs of Measles in the urban areas rather than in the rural areas. The potential cause of the Measles is people coming into the country and passing it on to other people. Another is that the virus was always there, but in rural villages and as the people go to medical centres or to the market place, it is passed on and therefore spreads.

Furthermore, we have found that children who had contracted a cough and those with a problem in the chest had 6 and 5 variables significant to each respectively. What makes this interesting is that these two symptoms are signs for the diseases Pneumonia and ARI. In addition, we found it interesting that both these two variables had three factors in common, which were region, place of residence and currently breastfeeding. From the region, it was shown that children were 0.7 times more likely to contract a cough in the northern region, while children living in the southern region had a 1.4 times greater likelihood of having problems in the chest. As for place of residence, it was found that 1.2 times more children would contract a cough and 1.7 times more children would have a problem in the chest from staying in the rural area. In the case of mothers currently breastfeeding, it was found that 1.3 times more children would contract a cough, while 1.4 times would have problems in the chest.

As for children who still had Diarrhoea, it was shown that only one variable was significant. This was the variable, region. There were two regions that had shown that children who still had Diarrhoea were significant, that is, the southern and northern regions of Sierra Leone.

5.2 Policy implications

This study has shown a path for the Sierra Leone government to help them reduce the high child mortality rate. In order for the government to help reduce child mortality, there are a few key issues that they would need to be implemented. Firstly, the government would need to distribute basic needs to its people, especially in the rural area. Access to clean drinking water, proper toilet facilities and access to medical treatment should be the highest concern for the government. Secondly, there should be at least two types of campaigns run to promote, firstly, basic amenities sanitation and proper healthcare and secondly, immunisation to reduce the occurrence of children contracting vulnerable diseases.

Furthermore, there is genocide of girls occurring throughout the world. An informative workshop should be run throughout the rural and urban areas of Sierra Leone to stress the importance of girls in society and how a girl is an asset to any area, city, or country in the world. Finally, the study showed how maternal and environmental factors have significance on whether a child would contract a vulnerable disease. Therefore, the government should start to rebuild its infrastructure, as well as implement or improve programs currently running to aid in decreasing the amount of children contracting diseases. This will allow child mortality levels to decrease in Sierra Leone.

5.3 Conclusion

In Sierra Leone, there have not been many studies carried out on epidemiology effecting child mortality. However, if we look at the selected disease patterns mentioned in this thesis, it shows that Diarrhoea is the disease that affects most children, while Pneumonia and ARI are second and third respectively. However, as for Measles, a disease that in the 21st century is rarely contracted, the study shows there are a fair number of children contracting this disease, making it clearer that some children are not being vaccinated. Due to this, we would recommend that the country keep promoting child vaccination and how important it is. This will aid in reducing the number of children contracting Measles. Also, we would like the country to run a campaign on hygiene in the household, as well as grant the most basic of needs to the rural areas, which is the provision

of proper toilets and purified piped water. This will aid in reducing the number of children being infected by Diarrhoea. Furthermore, free testing of ARI and Pneumonia should be available for adults. This will allow children who contracted this airborne disease to be treated, or if not, prevent the child from contracting it. The concerned government should tyro implement universal education system to prevent the spread of vulnerable diseases. Health care providers should give proper propaganda for pulse Polio vaccination, whilst more attention to these issues should be given by the mass media, newspapers and so forth. This will be of immense worth in this juncture. Therefore, further research is urgently needed in this country.

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