THE DETERMINANTS OF UNDER-FIVE MORTALITY IN MALAWI: EVIDENCE BASED ON DEMOGRAPHIC AND HEALTH SURVEY 2010

By

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A MINI-DISSERTATION SUBMITTED TO THE FACULTY OF HUMAN AND SOCIAL SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SOCIAL SCIENCES IN POPULATION STUDIES AND SUSTAINABLE DEVELOPMENT

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DECLARATION

I, Khathutshelo Valencia Maiwashe, hereby declare that this dissertation for the degree of Master of Social Sciences in Demography and Population Studies at the North-West University (Mafikeng Campus), hereby submitted by me, has not been previously submitted for a master's degree at this or any other university. It is my own work and design and all reference material contained therein has been duly acknowledged.

Student signature Maiwashe KV Date 10/02/2014

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ABSTRACT

Background: The study examined the effects of the determinants of under-five mortality in Malawi. It therefore aimed to estimate the rate or prevalence of under-five mortality in Malawi and to examine differentials in infant and child mortality by socio-economic, demographic, environmental, health-seeking behaviour and nutritional value.

Methods: This study involved a secondary data analysis of the 2010 Malawi Demographic and Health Survey (MDHS) data set of children under five years old and women who had given birth in the five years preceding the survey. The Kaplan-Meier survival analysis and multivariate hazard analysis were used to examine the relationship between under-five mortality and socio-economic, demographic, environmental, health-seeking behaviour and nutritional factors.

Results: The results show that birth order, mother's education, place of residence, region and exclusive breastfeeding were significantly associated with under-five mortality. The results also show that there was no significant association between under-five mortality and other indicators of socio-economic, demographic, environmental, health-seeking behaviour. The results also show that more deaths of under-fives occurred during infancy than during childhood.

Conclusion: The results show that more deaths occurred during the first months after birth than after 12 months of age. This showed that mother's education, birth order, place of residence, region and breastfeeding had a greater influence on the survival of the child.

Key words: Under-five mortality, socio-economic, environmental, demographic, health-seeking behaviour, nutritional value, Kaplan-Meier, Cox proportional hazards model.

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ABBREVIATIONS

AIDS	: Acquired Immune Deficiency Syndrome
HIV	: Human Immunodeficiency Virus
MDHS	: Malawi Demographic Health Survey
UN	: United Nations
UNICEF	: United Nations Children's Fund
VAD	: Vitamin A deficiency
WHO	: World Health Organisation

CHAPTER 1

BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Under-five mortality, which is commonly on the agenda of public-health and international development agencies, has received renewed attention as a part of the United Nations' Millennium Development Goals. Reducing child mortality has been identified as one of the eight Millennium Development Goals (MDGs) (UNICEF, 2010). The target for Goal 4 is to reduce childhood mortality (as measured by the infant and under-five mortality rates) by 2015 by at least two-thirds of the rate estimated in 1990. These indicators are not only an index of the health status of children, they are also an important component of life expectancy, and provide an indication of the overall health and development of the community.

Approximately 10 million children under five years old die each year, with large variations across regions and countries. Globally the number of deaths among children under five years of age was reduced from 12,4 million in 1990 to 8,1 million in 2009 (UNICEF, 2010), mainly due to interventions targeted at communicable diseases such as malaria, measles, diarrhoea, respiratory infections and other infections that have been major causes of childhood mortality. However, these health gains were short lived, especially in Africa, because disease-oriented vertical programmes alone were not effective (Mutunga, 2007).

This decline translates into an average annual decrease in child mortality of 2,5%, which remains insufficient to achieve the MDG 4 target of reducing under-five mortality rates by two-thirds between 1990 and 2015. The highest levels of under-five mortality continue to be found in sub-Saharan Africa, where one in eight children die before the age of five, nearly

twice the average in developing regions overall, and more than 17 times the average in developed regions (UNICEF, 2010).

According to the WHO (2006), over 70% of all child deaths occur in Africa and South-East Asia. Within countries under-five mortality is higher in rural areas, and among poorer and less educated families. Sub-Saharan Africa has doubled its average rate of reduction from 1,2% a year over 1990–2000 to 2,4% a year over 2000–2010. More than three million babies die every year in their first month of life, and a similar number are stillborn. Within the first month, one quarter to one half of all deaths occur within the first 24 hours of life, and 75% occur in the first week immediately following birth, which is the most crucial period for new-born survival. This is when the mother and child should receive follow-up care to prevent and treat illness (WHO, 2000).

Mothers can increase their child's chance of survival and good health by breastfeeding, being immunised against diseases, and avoiding smoking and the use of alcohol. At the time of birth, a baby's chance of survival increases significantly with the presence of a skilled birth attendant. More than half of under-five child deaths are due to diseases that are preventable and treatable through simple, affordable interventions, and strengthening health systems to provide such interventions to all children will save many young lives.

In 2010 about 20 million children worldwide were estimated to suffer from severe acute malnutrition, leaving them more vulnerable to serious illnesses and early death. Most of these children can be successfully treated at home with ready-to-use therapeutic foods. A child's death is emotionally and physically damaging for the mourning parents. Many deaths in the Third World go unnoticed, since many poor families cannot afford to register their babies in the government register (UNICEF, 2010).

Under-five mortality rates are staying high or even increasing in many sub-Saharan African countries despite action plans and interventions made. Mortality rates among children under the age of five remain strikingly high throughout most of sub-Saharan Africa, while other areas of the world have experienced declining rates of child deaths over the past 30 years. As the world enters the 21st century, under-five mortality remains a big issue for developing countries, especially as researchers attempt to determine what factors contribute to the high levels.

1.2 MALAWI'S GEOGRAPHICAL BACKGROUND

Malawi is a sub-Saharan African country located south of the equator. It is bordered to the north and north-east by the United Republic of Tanzania; to the east, south, and south-west by the People's Republic of Mozambique; and to the west and north-west by the Republic of Zambia. The country is 901 kilometres long and 80 to 161 kilometres wide. The total area is approximately 118 484 square kilometres, of which 94 276 square kilometres . The remaining area is mostly composed of Lake Malawi, which is about 475 kilometres long and delineates Malawi's eastern boundary with Mozambique (MDHS, 2010).

Malawi's most striking topographic feature is the Rift Valley, which runs the entire length of the country, passing through Lake Malawi in the Northern and Central Regions to the Shire Valley in the south. The Shire River drains the water from Lake Malawi into the Zambezi River in Mozambique. To the west and south of Lake Malawi lie fertile plains and mountain ranges whose peaks range from 1700 to 3 000 metres above sea level. The country is divided into three regions: the Northern, Central, and Southern Regions. There are 28 districts in the country. Six districts are in the Northern Region, nine are in the Central Region, and 13 are in the Southern Region (MDHS, 2010).

Malawi has a tropical continental climate with maritime influences. Rainfall and temperature vary, depending on altitude and proximity to the lake. From May to August, the weather is cool and dry. From September to November, the weather becomes hot. The rainy season begins in October or November and continues until April (MDHS, 2010).

1.3 PROBLEM STATEMENT

Under-five mortality has been identified as one of the crucial developmental challenges that needs to be taken seriously, especially in the sub-Saharan countries. The global community has approved the decrease of mortality as one of the Millennium Development Goals, Goal 4, to be achieved by every country in 2015 (UNICEF, 2010).

Poor children and caregivers in Malawi have limited access to services that can improve children's health and nutrition. Malnutrition is widespread and nearly half of all children under five have stunted development. While Malawi is one of only a few African countries on track to reach the reduction in under-five mortality set out in Millennium Development Goal 4, neonatal, infant and child mortality rates are still unacceptably high. Seven out of 10 child deaths in Malawi are due to preventable causes such as malaria, diarrhoea, pneumonia, anaemia, malnutrition and neonatal causes. Malaria and pneumonia alone account for nearly half of those deaths (WHO, 2000).

In Malawi the survival of children is influenced by access to basic health services and the quality of socio-economic services and environmental conditions that are made available to the population. The environmental health threats facing the world's population today stem mostly from traditional problems long since solved in the wealthier countries, such as a lack of clean water, sanitation, and protection from mosquitoes and other insect and animal disease vectors that are the most common factors contributing to under-five mortality (WHO, 2010).

Undoubtedly, illiteracy is the primary cause of under-five mortality in Malawi. Illiteracy acts as a stimulating agent to other factors that cause child mortality, such as malaria, malnutrition, parental negligence, HIV/AIDS-related infections and lack of parental education. Although common causes of under-five mortality and morbidity include diarrhoea, malaria, measles and acute respiratory infections, studies have shown that in Malawi, many children die mainly from malaria, diarrhoea, whooping cough, tuberculosis and bronchopneumonia (WHO, 2002). Another cause of under-five mortality in Malawi is malnutrition, which increases the risk of children dying from those infectious diseases that contribute to more than half of all deaths amongst children under the age of five years. Malnutrition has been identified as the most common cause of death of the mother and foetus, and can result in babies with a low birth weight. It has been established that poverty results in under-nutrition (UNICEF, 2009).

1.4 AIM AND OBJECTIVES OF THE STUDY

The main aim of the study was to examine the effects of the determinants on under-five mortality in Malawi. To achieve this aim, the following specific objectives were pursued. Specifically the study sought to:

i. Estimate the rate or prevalence of under-five mortality in Malawi
ii. Examine differentials in infant and child mortality by socio-economic, demographic, environmental, health-seeking behaviour and nutritional factors.

1.5 RESEARCH HYPOTHESES

- Children whose mothers have higher education experience lower mortality than children whose mothers have less or no education.

- Children of employed mothers are more likely to survive than children of unemployed mothers.
- Children whose mother's age at first birth is less than 24 years of age are more likely to die than those with older mothers.
- Children with a low birth order are more likely to die than those with a higher birth order.
- Female children are more likely to survive than male children.

1.6 RATIONALE OF THE STUDY

Socio-economic, environmental conditions and demographic factors threaten the life of infants and children, especially in the most remote rural areas. Lack of clean water, poor access to sanitation and childhood infectious diseases are the major causes of mortality.

Studies such as this one are important to assess the current situation of the country in terms of the health and survival of children and how their deaths can be prevented. This study was also relevant because only a few investigations had been carried out on this topic in Malawi. This study provided valuable insights into unexplored aspects of socio-economic, household environmental factors and demographic determinants on under-five mortality in Malawi. This study contributed to a better understanding of how mortality change related to such factors. The study could also be used as a frame of reference for dealing with future determinants of under-five mortality in Malawi and also to evaluate existing policies on childhood mortality and improve them.

1.7 DEFINITION OF TERMS

1.7.1 Under-five mortality

- Under-five mortality refers to all deaths occurring before the age of five.

- Child mortality refers to all deaths occurring between 1 year and 4 years.

- Infant mortality refers to all deaths occurring between birth and the first birthday.

1.8 ORGANISATION OF THE STUDY

The study is organised into five chapters; following this introductory chapter is chapter two on literature review where relevant published works are reviewed. This is followed by chapter three on methodology which presents sources and types of data, methods of analysis as well as the limitations of the study. Chapter four presents the analysis and results of the study. Finally, in chapter five conclusion and recommendations of the study was presented.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter is to present the review of literature used to explain socio-economic, environmental, biological and health determinants of child mortality, as well as the theoretical framework that forms part of the analysis in this study.

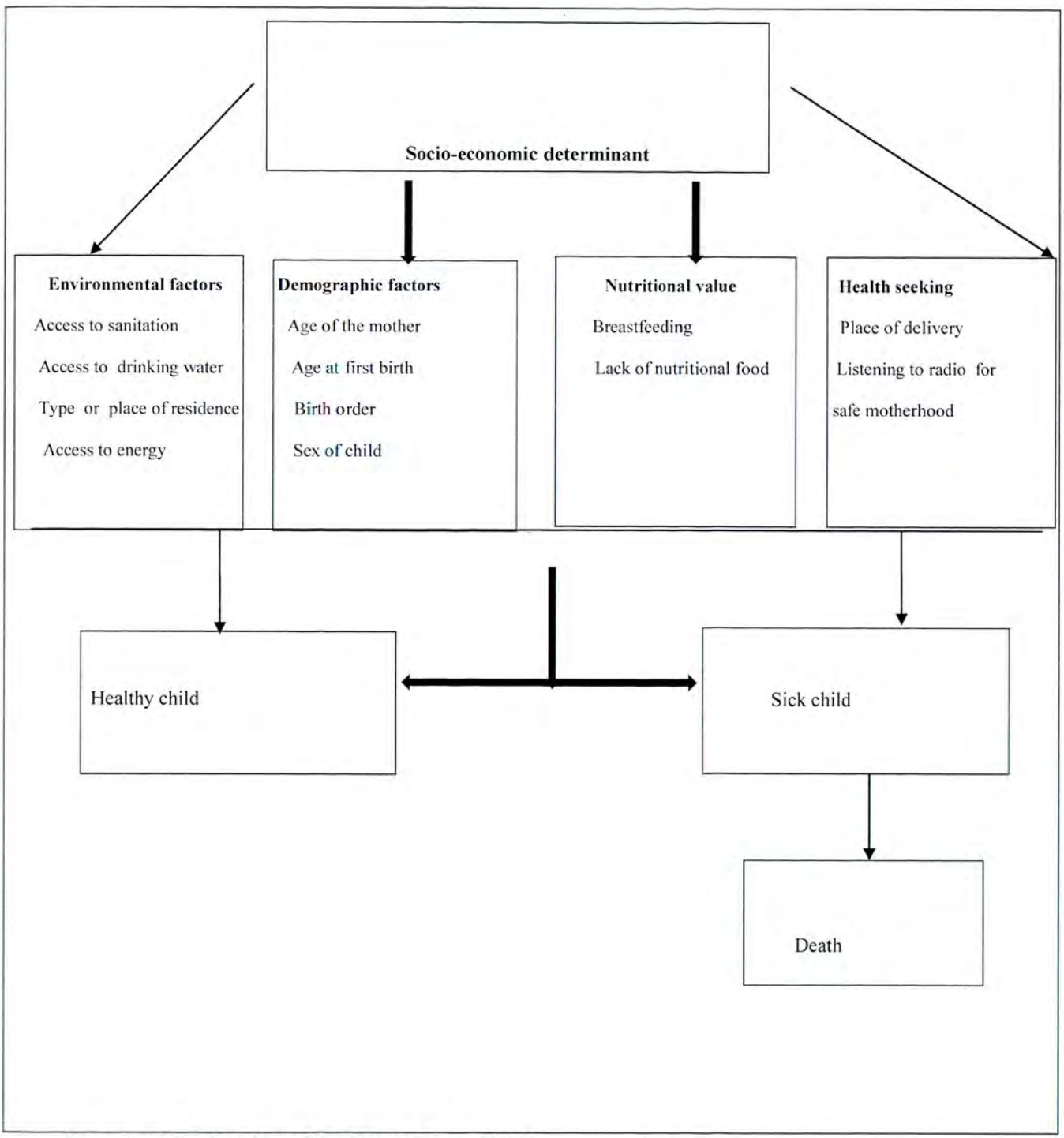
Mosley and Chen (1984) and Schultz (1984) have made a clear distinction between variables considered to be exogenous or socio-economic (i.e. cultural, social, economic, community, and regional factors) and endogenous or biomedical factors (i.e. breastfeeding patterns, hygiene, sanitary measures and nutrition). The effects of the exogenous variables are considered to be indirect because they operate through the endogenous biomedical factors. Likewise, the biomedical factors are called intermediate variables or proximate determinants because they constitute the middle step between the exogenous variables and child mortality (Jain, 1988; Mosley & Chen, 1984; Schultz, 1984; UN, 1985).

Mosley and Chen (1984) were among the first to study the intermediate biomedical factors affecting child mortality, labelled proximate determinants, and categorised them into five groups: maternal (fertility) factors, environmental factors, availability of nutrients to infant, injuries, and personal illness control factors. In this framework a set of proximate determinants or intermediate variables that directly influence the risk of morbidity and mortality are identified. Socio-economic determinants must operate through these variables to affect child survival.

Figure 2.1 illustrates the path to either a healthy child or a sick child and eventually death. The socio-economic factors operate through biological variables, maternal, environmental,

nutritional and health-seeking behaviour factors leading to a healthy child or a sick child. Nevertheless, with modern medical intervention through prevention or treatment, a child may remain healthy, the sick ones could recover and become healthy, or treatment may fail and the child dies. Each of the factors is discussed in the following section.

Figure 2.1 Determinants of mortality among children in less developed countries



(Source: Adapted from Mosley & Chen, 1984)

2.2 SOCIOECONOMIC FACTORS

Socio-economic characteristics of the mother play a key role in determining child mortality. They both directly and indirectly influence childhood mortality both directly and indirectly. Indirectly, they operate through demographic or housing conditions and environmental factors to influence infant and child mortality. The framework adopted from Mosley and Chen (1984) in this study uses mother's education, type or place of residence and occupation of the mother as socio-economic factors that may influence child survival. These factors will be discussed in more detail below.

2.2.1 Mother's education

The education level of the mother can affect child survival by influencing the mother's decisions and increasing her ability in healthcare relating to nutrition, hygiene, contraception, preventative care and disease treatment. According to Hobcraft et al. (1984), the relationship between the mother's education and child survival frequently controls other socio-economic variables. Maternal education is usually associated with improved chances of child survival. Nevertheless, some studies have shown that the relationship between maternal education and child survival were weaker in sub-Saharan Africa than in Asia and Latin America, where socio-economic differentials were generally higher.

Educated mothers, when compared with uneducated ones, are more likely to insist on something being done about their child's sickness and wellbeing without waiting for a decision from their husbands or mothers-in-law, are more likely to be allowed to decide on treatment, more likely to go to private health centres for better and faster service and are likely to spend more time discussing the case of their children with the doctors. In most cases educated mothers are more likely to persist with the prescribed treatment and are more likely

to report back if the treatment is not working. Illiterate mothers, on the other hand, seem to fail to report back if the child's health is not improving mostly because they fear being accused of incompetence, and somehow they think the doctor has provided the best treatment for their babies (Caldwell, 1979).

The mother's education contributes to the children enjoying better diets and better overall care than the children of non-educated mothers, and there is a strong inverse relationship between the mother's education and child mortality. The mother's education has a stronger influence on child survival in Bangladesh than the father's education (Rafiqul, 2013).

Education improves a mother's ability to make use of government and private healthcare resources and it may increase the autonomy necessary to advocate for her child in the household and the outside world. The mother's education is often a good indicator of other socio-economic factors that affect under-five mortality directly (Desai & Alva 1998; Hobcraft, 1993).

2.2.2 Employment status of the mother

The employment status of the mother and her husband or partner is important, but the income received is the most important factor. The amount of money received determines how the family is able to provide for their basic needs and is also likely to affect the child's survival in many ways. For the mothers who work outside the home, the chances of child survival are affected directly, because the mother will not be able to provide adequate care for the child if her income is too low. Lack of proper feeding, especially breastfeeding, for the first few months may affect the chances of child survival (Hobcraft et al., 1984). Nevertheless, a working mother can be associated with high family income, which can actually play a positive role in increasing child survival.

According to Short et al. (2002), the mother's employment status can negatively affect child survival if the mother works away from home or lives in the city. This means it is not the employment status of the mother, but rather the absence of the mother that negatively affects the child's survival. If the mother works and resides in the same place as her children, the result may be different.

The impact of this variable on mortality depends on the type and place of work. The mother's work often conflicts with the care given to children in terms of time. By definition, a working mother has little time to dedicate to her children. However, if the mother's occupation allows her to generate financial resources and to obtain the services of a nanny, that may help improve survival.

The impact of a mother's job has been shown to be significant in Tanzania (1999), Togo (1988) and in rural areas in Cameroon (1998). In rural Cameroon, the fact that a mother works in the agricultural sector (in a low-risk job) decreases the risk of child mortality for her children by 39%, compared to mothers who do not work. However, in both Tanzania and Togo the fact that a woman works is associated with a higher risk of child mortality. In Tanzania it nearly doubles the likelihood that a child will die between 1 and 5 years of age. In Togo the fact that a mother works raises the risk of child mortality by nearly 45%, especially in rural areas. Here there is reason to believe that mothers who do not work spend more time taking care of their children than those who do have a job.

In countries like India working mothers experience a greater loss of children than non-working mothers, and this applies with respect to both male and female children. Moreover, a narrower gender difference on child mortality among working mothers was detected in most states (Krishna, 1995). The income of the household and the parents has a mechanical effect: the more the household income increases, the more the child mortality decreases. The more

the income increases, the more the household will have access to good living conditions, healthcare and services.

According to Kishor and Parasuraman (1998), the mother's employment has a negative effect on the child's survival in the case where the mother is working away from home for cash or staying in an urban area. This simply means it is not the employment status of the mother but rather the absence of the mother that affects the child.

2.2.3 Place of residence

According to Anna et al. (2009), the mother's place of residence usually affects the survival status and nutritional status of the living children in most developing countries. The mortality of children is usually higher in non-urban areas than in urban areas. In urban areas the infrastructure for health services is generally better than in non-urban areas.

In their study of 1996, Bradshaw et al. compared the infant mortality rate in the Western Cape according to the place of residence. The probability of children dying before the age of 1 in informal areas of urban zones was almost 2,5 times greater than in formal urban areas. The infant mortality rate was also higher in rural towns than in formal urban areas. A mother living in an urban area reduced the odds of infant death (Machado & Hill, 2005).

According to Amouzou and Hill (2004), the observed effect of urbanisation is mostly because of a rapid increase in urban poverty resulting in the urban poor losing health advantages compared to non-urban residents. This is mostly likely to happen in South Africa, where there has been a rapid increase in the rural-to-urban migration of the black population since the year 1994. This was because the apartheid laws that had restricted the movement of black people were eliminated, so that a large number of people moved to informal settlements next to big cities. However, an informal settlement does not enjoy the same structure as other

urban areas. Children living in a formal area have a better survival rate compared to the children living in an informal settlement (Sastry, 2004).

2.3 DEMOGRAPHIC DETERMINANTS OF CHILD SURVIVAL

The age of the mother at first birth, birth order and sex of the child are some of the factors influencing child survival that were identified by Mosley and Chen (1984). Some studies were also conducted by Rutstein (2000), Davanzo et al. (2004) and Hobcraft et al. (1985). Each of these factors are discussed below.

2.3.1 Mother's age at first birth

In Malawi, like in the rest of the world, babies born to young mothers under the age of 20, or to older mothers after 40 years of age have a greater risk of dying before the age of 5 than babies born from mothers aged 20 to 40 years. Some studies like that by Hobcraft et al. (1985) show that the mortality of children of teenage mothers is higher compared to matured mothers. Some studies suggest that there is an increased risk for children born to older mothers and those who are maintaining birth spacing. However, children of older women are exposed to significant infant mortality (Mahmood, 2002).

2.3.2 Birth order

Birth order and parity have been studied quite extensively and have been shown to exert strong influences on infant and child mortality, for example in studies by Mosley and Chen (1984). First-borns have a higher risk of dying because of the age of the mother or because of birth complications. This higher risk may also be due to the mother's inexperience in looking after the infant.

The total number of children in the family would also limit the attention given or granted to each child. When the children are sick, they can therefore even die before they receive much attention from the parents (Kibet, 2010).

2.3.3 Sex of the child

Like in the rest of the world, one finds a higher mortality in male children in Malawi than in female children. This is true at every age because of biological reasons, with baby boys being naturally more vulnerable to infections than baby girls. In most sub-Saharan African countries, like in East Asia, South Asia, the Middle East and North Africa, boys are preferred to girls.

The preference for boys is apparent through sex determination. Furthermore, boy preference in parental care, intra-family food distribution, feeding practices and utilisation of health services are some of the behavioural means by which sex-biased attitudes may have led to the observed mortality.

According to Bhuiya and Streatfeid (1991), the positive effect of a mother's education on child survival is not known for boys and girls in a country like Bangladesh. They postulate that for boys a change in the mother's education from no schooling to between 1 and 5 years of schooling results in a reduction of risk of death. However, empowered women increase the bargaining power of wives relative to their husbands and this therefore results in a decline in the rate of child mortality.

2.4 ENVIRONMENTAL HEALTH DETERMINANTS OF CHILD SURVIVAL

Environment is considered to have an impact on childhood mortality. The environment comprises access to sanitation, source of drinking water, source of energy and type of

residence. Certain studies contain additional data on environmental health factors, but they are not available consistently across countries or over time.

Environmental health indicators are usually strongly associated with socio-economic status and place of residence. The type of drinking water supply whether women live in households with a piped supply either inside the dwelling or inside the yard, and in households where drinking water is obtained from a surface source like a river, stream, pond, lake and dam has a significant effect on child survival (Anderson et al, 2002).

The South African Demographic and Health survey (SADHS) report of 1998 indicated that the under-five mortality differentials were caused by environmental factors. Environmental household factors such as source of drinking water, sanitation, housing materials and source of energy were investigated. Under-five mortality was more than doubled where the source of drinking water was other than piped water. The under-five mortality rate was higher where poor sanitation existed. The report also showed that there were associations between material used for the dwelling and the source of energy, and child mortality.

2.4.1 Access to safe drinking water

Under-five mortality rates are consistently lower among children residing in families who access drinking water from a safe source, compared to those who access drinking water from an unsafe source. Children living in households with access to an unsafe source of water are at higher risk of death. Increasing risk of diarrhoeal diseases is expected among households with unsafe drinking water. According to Mahmood (2002), a relationship exists between access to clean water and sanitation. Families living in households with access to piped water have significantly lower under-five mortality than families who depend on wells or boreholes for drinking water.

In his study Espo (2002) used indirect methods to estimate levels and trends of mortality in Malawi. The results indicated that the source of drinking water and sanitation facilities are strong predictors of child mortality. Also, in her study to determine the relative significance of environmental and maternal factors on childhood mortality in south-western Nigeria, Folasade (2000) found that the child mortality rate continued to be a function of an environmental factor, namely the source of drinking water, and a child-care behaviour factor, namely where the child was kept when the mother was at work.

2.4.2 Access to an improved toilet (flush or pit)

Access to an improved toilet, either flush or pit, is potentially an important determinant of child mortality. In households that lack access to proper toilets, children have higher exposure than other children to diseases such as diarrhoea and other gastrointestinal disorders (Puffer & Serrano, 1973). Childhood mortality is higher in households that do not have access to a flush or pit toilet, especially where the bush or field is used as a type of sanitation.

2.4.3 Access to energy

The type of energy used in the household can affect children in three different ways. Firstly, if children spend more time where cooking takes place, especially for those who do not have electricity, the smoke, which emits harmful substances, could elevate their risk of respiratory disease and therefore increase mortality. Secondly, children born to mothers who are exposed to smoke during pregnancy are likely to have a low birth weight and hence are at higher risk of death. Finally, the type of cooking fuel used may be an indicator of a household's economic status (Mishra & Rutherford, 1997). Cooking and heating with solid fuel on open fires or traditional stoves in an unventilated indoor environment leads to health hazards for children.

2.5 NUTRITIONAL VALUE AS DETERMINANT OF CHILDHOOD MORTALITY

Mosley and Chen (1984) pointed out that the survival of children is influenced by nutrients available not only to the child, but also to the mother. Nutritional deficiencies can be very significant to the overall health of infants and children because growth and development can be seriously hindered by shortages in essential vitamins or nutrients. The survival of children is influenced by the nutrients they receive from their diet as well as their mother's diet.

Nutritional availability is necessary for children's growth. Under-nutrition is generally characterised by comparing the weight or height of children at a specific age and sex with the distribution of observed weight or height. There are different indicators that explain the nutritional status of a child. Stunting results from chronic under-nutrition, whereas wasting results from inadequate nutrition over a shorter period, and underweight encompasses both stunting and wasting. Typically, growth faltering begins at about six months of age, as children progress to foods that are often inadequate in quantity and quality, and increased exposure to the environment increases their likelihood of illness (Allen & Gillespie, 2001).

Malnourished women tend to deliver premature or small babies, who are more likely to die or suffer from suboptimal growth and development. Poor early nutrition leads to poor school readiness and performance, resulting in fewer years of schooling, reduced productivity, and earlier childbearing.

According to Fishman et al. (2004), under-nutrition raises the likelihood that a child will become sick and will then die from disease. Morbidity and mortality are the highest among those most severely malnourished, yet the high prevalence of mild to moderate underweight individuals means that they experience the greatest total burden of disease.Children who are underweight are also at increased risk of death, and under- nutrition is responsible for 44-

60% of the mortality caused by measles, malaria, pneumonia and diarrhoea. Overall, eliminating malnutrition would prevent 53% of deaths in young children, with most of those deaths occurring in South Asia and sub-Saharan Africa.

Interventions to prevent or decrease malnutrition or infectious diseases are expected to reduce child mortality, and interventions that accomplish both will have the greatest effect (Pelletier et al., 1993).

According to Caulfield et al. (2004), malaria is responsible for a large portion of childhood mortality in sub-Saharan Africa. The effect of under-nutrition on susceptibility to malaria has been discussed at length elsewhere, but the nutritional deficiencies resulting from malaria have been insufficiently explored. Insecticide-treated bed nets have been shown to prevent clinical episodes of malaria and decrease the prevalence of anaemia in children (Lengeler, 2003).

According to Checkley (2004), water, sanitation, and hygiene interventions decrease child malnutrition primarily by preventing diarrhoeal diseases. Hand-washing interventions can reduce the risk of diarrhoeal diseases by about 45%. Hand-washing interventions can be included in water and sanitation programmes or can exist as a single intervention, and they are both effective and cost-effective (Borghi et al., 2002). It seems that breastfeeding increases the chances for children's survival. In South Africa in 1998, only 7% of infants under six months of age were exclusively breastfed. However, with South Africa having one of the highest HIV infection rates of pregnant women in the world, breastfeeding of babies and the transmission of the HIV/AIDS virus is a debated issue.

2.5.1 Breastfeeding

Breastfeeding is universally accepted as the healthiest alimentation for the baby. The new-born has very poor immunity, but the active biological substances in the mother's milk are highly protective. It is also well known that the weaning period is a delicate phase, especially when hygienic conditions are poor, and alternative foods are low-protein or low-calorie food (Breschi et al., 2000).

UNICEF and WHO recommend that children be exclusively breastfed during the first six months of life, and that children be given solid or semisolid complementary foods in addition to breast milk from the age of six months to 24 months or more, when the child is fully weaned. Exclusive breastfeeding is recommended because breast milk is uncontaminated and contains all the nutrients necessary for children in the first few months of life.

In addition, the mother's antibodies in breast milk provide immunity to disease. Early supplementation is discouraged for several reasons. First, it exposes infants to the risk of infection. Second, it decreases infants' intake of breast milk and therefore the frequency of breastfeeding, which reduces breast-milk production. Third, in low-resource settings, supplementary food is often nutritionally inferior (MDHS, 2010).

Early initiation of breastfeeding is encouraged for a number of reasons. Mothers benefit from early suckling because it stimulates breast-milk production and facilitates the release of oxytocin, which helps the uterus to contract and reduces postpartum blood loss. The first breast milk contains colostrum, which is highly nutritious and has antibodies that protect the new-born from diseases.

Early initiation of breastfeeding also fosters bonding between mother and child. Although it is internationally recommended that infants should be breastfed for up to two years, some

infants are not breastfed and therefore do not receive the benefits of breastfeeding, while others stop breastfeeding before the age of two. Children may not be breastfed because of the mother's known HIV-positive status, or the mother having died, or for some other reason (WHO, 2005). It is recommended that the non-breastfed child be fed solid or semi-solid foods four to five times per day from the age of six to 23 months, with an additional snack being offered once or twice per day, as desired.

Vitamin A is an essential micronutrient for the immune system that plays an important role in maintaining the epithelial tissue in the body. Severe vitamin A deficiency (VAD) can cause eye damage. VAD can also increase the severity of infections such as measles and diarrhoeal diseases in children, and slow down recovery from illness (MDHS, 2010).

2.6 HEALTH-SEEKING BEHAVIOUR AS DETERMINANT OF CHILD MORTALITY

According to Hill (2003), health-seeking behaviour is not like other determinants that affect the rate at which children move from health to sickness. This group of factors influences this rate through the prevention and treatment of diseases. Preventative measures are commonly reported as the use of preventive services such as immunisation, malaria prophylaxis, place of delivery or antenatal care.

According to Govindsamy and Romesh (1997) in their comparison of DHS data in different countries, it is shown that there is an increase of 62% in health-seeking behaviour by the mother for child healthcare with each rising level of maternal education. In Pakistan, poor health-seeking behaviour was found to be common among uneducated mothers, and good health-seeking behaviour among educated mothers (Zahid, 1996). Educated mothers were

found to be more likely to use health facilities and fed their children better than uneducated mothers (Zahid, 1996).

Caldwell's (1979) explanation of this scenario is that educated mothers usually practise good health-seeking behaviour because education tends to change their behaviours and attitudes towards health. Educated mothers are more likely to be proactive mothers, willing to go against traditional norms that are harmful to the health of their children. They access modern healthcare, thereby increasing child survival chances (Caldwell, 1979). In agreement with this explanation, Mosley and Chen (1984) pointed out that education tends to increase the mother's skills in healthcare practices relating to contraception, nutrition, hygiene, preventative care and disease treatment, and these skills are essential for child survival (Mosley & Chen, 1984).

2.6.1 Place of delivery

Increasing the percentage of births delivered in health facilities is an important factor in reducing deaths arising from the complications of pregnancy. The expectation is that if a complication arises during delivery in a health facility, a skilled attendant can manage the complication or refer the mother to the next level of care (MDHS, 2010). In Malawi, 73% of births are delivered in a health facility; 57% of deliveries occur in public sector facilities, and 16% occur in private sector facilities, while 24% of births occur at home. Women aged 35–49 years are most likely to deliver at home.

Women having their first baby are more likely than women with a higher birth order to deliver in a health facility; the proportion of births occurring in a facility declines as birth order increases. Women in urban areas are more likely to deliver in a health facility than their rural counterparts. The Northern Region has the highest proportion of institutional deliveries,

followed by the Southern Region, while the Central Region has the lowest proportion. Women with higher levels of education are more likely to deliver in a health facility than women with less education or no education. For example, women with more than secondary-school education are more likely to deliver in a health facility than women with no education (MDHS, 2010).

2.6.2 Management of illness and prevention as health-seeking behaviour

The use of mosquito nets (bed nets) is one of the most effective strategies that can be used to prevent and manage infectious diseases like malaria. Malaria is endemic throughout Malawi and continues to be a major public health problem, with an estimated six million cases occurring annually (UNICEF, 2010). It is the leading cause of morbidity and mortality in children under the age of five and pregnant women (WHO, 2010).

Bed nets (mosquito nets) are an efficacious strategy of malaria control in selected areas. Insecticide-impregnated bed nets significantly reduce mortality and morbidity, as well as the incidence of severe malaria. They are also cost-effective, and if used widely, they may delay the spread of chloroquine resistance. The use of bed nets is therefore a priority for malaria control in sub-Saharan Africa.

Malaria transmission is largely determined by climatic factors, including temperature, humidity, and rainfall. Vector abundance follows seasonal rainfall patterns, and an increase in temperature raises the parasite's reproductive rate, thereby influencing the prevalence rate of malaria in the population. Transmission is higher in areas with high temperatures and during the rainy season (October through April), particularly along the lakeshore and lowland areas of the lower Shire Valley (MDHS, 2010).

Due to their reduced immunity, children under the age of five are most vulnerable to severe complications from malarial infection. Pregnant women are also particularly vulnerable to malaria because their immune systems are suppressed. The ownership and use of both treated and untreated mosquito nets are the primary prevention strategy for reducing malaria transmission in Malawi. Since 2007, Malawi has been shifting to the use of long-lasting insecticidal nets, which are heavy duty and pre-treated. In the past five years, over six million mosquito nets have been distributed country-wide in Malawi (MDHS, 2010).

2.6.3 Media knowledge on safe motherhood

Safe motherhood is fundamentally a matter of human rights, as all women are entitled to good health and high-quality health services. Maternal deaths are linked to women's low status in society, and their lack of decision-making ability and economic power. In order for women to be able to enjoy safe pregnancy outcomes, they need to be accorded the same opportunities for health, education, and employment as their male counterparts. Campaigns, rallies, workshops for all kinds of stakeholders, media coverage, production and distribution of literature and screening of relevant films will contribute immensely to this effort (UNICEF, 2010).

According to WHO (2000), health information can be communicated through many channels to increase awareness and assess the knowledge of different populations about various issues, products and behaviours. Channels may include interpersonal communication (such as individual discussions, counselling sessions or group discussions and community meetings and events) or mass media communication (such as radio, television and other forms of one-way communication, for example brochures, leaflets and posters, visual and audio-visual presentations and some forms of electronic communication).

2.7 SUMMARY

This chapter presented a review of literature and a conceptual framework concerning child mortality determinants. The framework illustrated how different factors contribute to child mortality, for example socio-economic, environmental, biological and maternal factors, nutrient deficiencies and health-seeking behaviour factors.

In the next chapter, which is the chapter on methodology, the data, sources and types of methods of analysis and limitations of the study are presented.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter presents the sources of data and methods that were used in the data collection, the research instruments, and sample design. The chapter also discusses operational definitions of the independent and dependent variables of the study and the strategies used in data-analysis methods.

The current study involved a secondary data analysis of the 2010 Malawi Demographic and Health Survey (MDHS) dataset of the children under five years old and the women who had given birth in the last five years preceding the survey.

3.2 SOURCES OF DATA

3.2.1 Background of the data

The data for this study was derived from the 2010 Malawi Demographic and Health Survey (MDHS), which was implemented by the National Statistical Office (NSO) from June to November 2010, with national representation sample of more than 2 700 households.

The primary objectives of the 2010 MDHS project were to provide up-to-date information on fertility levels, nuptiality, sexual activity, fertility preferences, breastfeeding practice, the nutritional status of mothers and young children, early childhood mortality, maternal mortality, maternal and child health, malaria awareness, behaviour regarding HIV/AIDS, and HIV prevalence (MDHS, 2010).

3.2.2 Sample design

The sample for the 2010 MDHS was designed to provide population and health indicator estimates at national, regional and district level. The sampling frame used for the 2010 MDHS was the 2008 Malawi Population and Housing Census (PHC), which was provided by the National Statistical Office (MDHS, 2010).

A complete listing of households was done in each of the MDHS clusters from May to June 2009. The list of households served as a sampling frame for the selection of households. The households comprised the second stage of sampling. A minimum sample size of 950 households was required per district to provide an acceptable level of precision for the indicators measured in the survey. A representative sample of 27 345 households was selected for the 2010 MDHS. A subsample of one third of the households was selected to conduct HIV testing of eligible women aged 15–49, anaemia testing was conducted for eligible children aged 6–59 months, and anthropometric measurements were taken for eligible children aged 0–5 years (MDHS, 2010)

3.3 QUESTIONNAIRE DESIGN

Three questionnaires were used for the 2010 MDHS, namely household, men and women questionnaires. The current study focused only on the women's questionnaires. The questionnaires were adopted to reflect the population and health issues relevant to Malawi. Issues were identified at a series of meetings with various stakeholders from government ministries and agencies, nongovernmental organisations, and development partners. In addition to English the questionnaires were translated into two major languages of Malawi, namely Chichewa and Tumbuka (MDHS, 2010).

The women's questionnaires were used to collect information from all eligible women aged 15–49 years. These women were asked questions on the following main topics: background characteristics (education, residential history, media exposure, etc.); birth history and childhood mortality; knowledge and use of family planning methods; fertility preferences; antenatal, delivery and postnatal care; breastfeeding and infant feeding practices; women's and children's nutritional status; vaccinations and childhood illness; marriage and sexual activity; women's work and husband's background characteristics; malaria prevention and treatment; awareness and behaviour regarding AIDS and other sexually transmitted infections (STIs); adult mortality, including maternal mortality, and domestic violence.

3.4 RESPONSE RATE

The household and individual response rate for the 2010 MDHS showed that a total of 27 307 households had been selected, and 25 311 were involved in the survey. Of the 25 311 households found, 24 825 were successfully interviewed, yielding a response rate of 98%. In the interviewed households, a total of 23 748 women were identified to be eligible for the individual interview, of which 97% were successfully interviewed. Among the men, 7 783 were identified as eligible and 92% were successfully interviewed.

3.5 VARIABLES OF THE STUDY

3.5.1 Operational definition of the dependent and independent variables

Both the dependent and independent variables as presented in the framework were derived from the Mosley and Chen study (1984). Each variable was discussed, while some variables were recorded because some options had too few responses to acquire rational analysis.

3.5.2 Dependent variable

a) Under-five mortality is the dependent variable of this study. Under-five mortality refers to all deaths occurring before age five. The outcome variable (under-five mortality) has been categorised as alive or dead depending on whether or not the child survived the first five years of life. Alive is coded 1 and dead is coded 0. This means that those children who died within the period of 0-5 years were compared to those who survived the same period.

3.5.3 Independent variables

The predictor variables have been divided into socio-economic, environmental and biological determinants, as shown in Table 1. The table also show how the variables were recorded for the purposes of this study.

Table 3.1 Variables used and their definitions

Variables	Definition
Socio-economic Mother's education	No education Primary Secondary Higher
Place of residence	Urban Rural
Mother's employment status	Not working Formal Informal
Region	Northern Central Southern
Demographic Mother's age at first birth	10–24 25+
Birth order	1 2 3 4 5+
Sex of the child	Boy Girl
Environmental household Source of water	Piped/tap Borehole/tube well Open/protected well
Type of sanitation used	Flush toilet Pit toilet/latrine without slab/open pit Other
Source of energy used: Has electricity	Yes No Not de jure residents
Nutritional value Exclusive breastfeeding: 0–6 months	No Yes
Health-seeking behaviour Place of delivery	Home Government hospital Other
Listening to radio: Safe motherhood	No Yes

(Source of data, MDHS, 2010)

3.6 DATA ANALYSIS

3.6.1Categorization of study variables

The first stage of the data analysis was the recording of some variables into categories that made the analysis and interpretation of results meaningful. **Mother's education**, for example, initially had four categories: no education; primary education; secondary education, and higher education. This was regarded as the most important variable to determine the child's survival.

For **place of residence,** urban areas were taken as the reference category, while rural areas were referred to as the second category.

Three categories were recorded for **mother's employment status:** *not working*; clerk, sales, managers and agriculture employees were merged into one group, namely *formal*; and domestic, services, skilled or unskilled and agriculture self-employed were merged into one group, namely *informal*.

Sex of the child was dichotomous: female was the reference category and male the second category.

Mother's age at first birth was derived by actually using the current age of the mother at the time of giving birth, and the first child's year of birth. Two categories were formed, namely 10– 24 years old and 25+.

Birth order was re-categorised into five groups, namely first order, second order, third order, fourth order and fifth order or more

Source of energy used by the household: households with access to electricity from the mains switch were recorded in one group, and households without electricity were also recorded in another group and not de jure residents into a third group.

The same technique was applied to **source of water,** where piped and tap water were re-merged into one group, while borehole or tube well water were merged into another group, and open or protected well water into another group. For the **type of sanitation,** three categories were formed: flush toilets or pit latrine were re-merged into one group, pit latrine without slab or open pit were merged into one group and others into one group.

Exclusive breastfeeding from 0–6 months correlates with **nutritional factors,** which plays a role in child survival. It was re-categorised into two groups, namely yes and no.

Mothers reported their **place of delivery** for the children as having given birth at home, in a government hospital or other. This was used a as proxy for health-seeking behaviour by the mother. Three categories were merged for place of delivery. Those who gave birth at home were merged into one group, government hospital and health centres were merged into a single group, while other was merged into one group.

Listening to radio: safe motherhood was re-merged into two groups, namely yes into one group and no into another group.

3.6.1 Methods of data analysis

The data analysis for this study was done using the SPSS version 21 statistical software package. Data was analysed at three levels: univariate analysis, bivariate using Kaplan-Meier survival analysis, mortality rates for infants and child mortality, and multivariate Hazard analysis (Cox regression).

In the first stage of analysis, univariate analysis was used to examine the distribution of the study participants in relation to the variables selected for this study. For this analysis, frequency tables were used to summarise the study participants' characteristics and the proportion of children who had died across selected variable categories.

The second stage of the analysis was to calculate the under-five mortality rate: the probability of dying between birth and exactly five years of age expressed per 1 000 live births, and the infant mortality rate: the probability of dying between birth and exactly one year of age expressed per 1 000 live births.

The third stage of analysis was a survival analysis, which was carried out in terms of the probability of a child surviving beyond a specific interval of time (age in months) and the risk of instantaneous death. These two measures were respectively referred to as survival function and hazard rate. In order to analyse differentials in child mortality, the Kaplan-Meier method captures survival functions and survival curves that are stretched graphically to get a clear visual depiction of the differential.

To control confusing background factors in the investigation of determinants of child mortality, the Cox proportional hazard model (Cox, 1972) was adopted as the last stage of analysis for the study. Survival variables or time required for survival analysis was taken as the survival age of the children in months. It was uncensored in the event of the death of a child under 59 months, while it was censored for children surviving beyond five years. The dependent variable of the hazard model in the multivariate analysis measured mortality of an individual i, in the age interval t, which can be interpreted as the probability of dying between t and delta-t. Given that the child has survived at the beginning of the age interval, is assumed to have the following functional form:

$$\ln(t) = \alpha(t) + x(t)\beta(t)$$

The multivariate proportional hazard regression model was utilised in order to statistically determine the importance of various socio-economic, demographic, health-seeking behaviour and nutritional value and environmental variables to infant and child mortality in Malawi between 2005 and 2010.

3.7 LIMITATIONS OF THE STUDY

- The information on child survival was obtained from mothers who were alive and part of the survey when the data was collected. This technique has a potential selection bias, because in order for a child to be reported, the mother must be a member of the study population at the time of the survey. Thus, either death or emigration of the mother can affect the reporting coverage.
- Incorrect dating of the births can distort the data, particularly if the errors vary with the survival status of the child.
- Inclusion of stillbirths may lead to overestimation of childhood mortality.

3.8 SUMMARY

The chapter rationalised the selection of the sources of data that were used in the study and provided an overview of data sources and methods of analysis.

CHAPTER 4

ANALYSIS OF RESULTS

4.1 INTRODUCTION

This chapter describes the analyses that were performed. The descriptive results are presented and discussed first, followed by the results of mortality rates by gender according to selected characteristics, then by a bivariate analysis using the Kaplan-Meier survival analysis and multivariate hazard analysis. There were 18 360 live births that occurred in the five years preceding the survey, of which 1 607 died before the age of five. This gave an under-five mortality rate of 88 deaths per 1 000 live births.

4.2 FREQUENCY DISTRIBUTION OF LIVE BIRTHS BY SELECTED EXPLANATORY VARIABLES

Table 4.1 below summarises the socio-economic, demographic, environmental household, health-seeking behaviour and nutritional value characteristics of the respondents (mothers of the children) and also demographic characteristics of the children born to these mothers. Table 4.1 shows that the proportion of mothers whose age at first birth was 10–24 years was 96,9%, and for 25+ the proportion was 3,2%. The results also show that for birth order 1 it was 19,7%, for birth order 2 it was 18,8%, while it was 16,8% for birth order 3. For birth order 4 it was 13,9%, and for birth order 5 or more 30,8%.

From Table 4.1 it is clear that 16,9% of mothers reported having no education, 69,4% had primary education, 13,1% had secondary and 5% had higher education. Table 4.1 also shows that 9,5% of the respondents resided in urban areas, while 90.5% of the respondents resided in rural areas. With regard to respondents' employment status, 23,0% reported not working, while 66,1% reported formal employment and 10,9% reported informal employment.

Table 4.1 also shows that the proportion of respondents who resided in the Northern Region of Malawi was 17.8%, 34.4% resided in the Central Region and 47.8% resided in the Southern Region. With regard to the demographic characteristics of children the results show male live births to be 50.0%, while female live births were also reported to be 50.0%.

With regard to environmental household factors, Table 4.1 shows that respondents who reported piped or tap water as a source of drinking water were 17.5%, 55.1% reported tube well or borehole, while 21.9% reported open or protected well. Only 5.4% reported other. About 9.2% of the respondents reported to have flush toilets, 76.2% reported pit latrines without slabs and open pit latrines, and 14.6% reported having no facility, with bush or field used as sanitation. The results showed that 92.9% of respondents reported having no electricity, 5.6% reported having electricity, while 1.4% reported not being de jure residents.

Table 4.1 Frequency distribution of live births according to selected explanatory variables

Variables	Frequency	Per cent
Age at first birth		
10–24	19 342	96,9
25+	625	3,2
Birth order		
1	3 925	19,7
2	3 763	18,8
3	3 354	16,8
4	2 779	13,9
5+	6 146	30,8
Mother's education		
No education	3 372	16,9
Primary	13 865	69,4
Secondary	2 623	13,1
Higher	107	0,5
Place of residence		
Urban	1 896	9,5
Rural	18 071	90,5
Mother's employment		
Not working	4 602	23,0
Formal	13 193	66,1
Informal	2 172	10,9
Region		
Northern	3 560	17,8
Central	6 866	34,4
Southern	9 541	47,8
Sex of the child		
Male	9 979	50,0
Female	9 988	50,0
Source of drinking water		
Piped or tap	3 486	17,5
Tube well or borehole	10 992	55,1
Open or protected well	4 378	21,9
Other	1 108	5,5
Total	**19 967**	**100,0**

Table 4.1 continued

	Frequency	Per cent
Type of toilet used		
Flush toilet	1 836	9,2
Pit latrine – without slab/open pit	15 217	76,2
No facility/bush/field	2 906	14,6
Source of energy		
No	18 528	92,8
Yes	1 119	5,6
Not de jure resident	287	1,4
Place of delivery		
Home	4 934	24,7
Government hospital	11 772	59,0
Other public	3 174	16,0
Listening to the radio: safe motherhood		
No	4 018	40,2
Yes	5 970	59,8
Exclusive breastfeeding: 0–6 months		
No	7 573	37,9
Yes	12 394	62,1
Total	**19 967**	**100,0**

(Source of data: MDHS, 2010)

Most of the respondents delivered at government hospitals (59,0%), 24,8% of the respondents delivered at home and 16,0% delivered at other public health facilities. The results in Table 4 also show that for exclusive breastfeeding for 0–6 months, 37, 9% reported to have not breastfed their children, while 62,1% reported to have breastfed their children. 40,2% of women reported to have not listened to the radio for safe motherhood, while 59,8% of women reported to have listened to the radio for safe motherhood.

4.3 MORTALITY RATE FOR INFANTS AND CHILDREN BY SEX ACCORDING TO SELECTED CHARACTERISTICS

Table 4.2 below summarises the infant mortality rate by sex according to selected characteristics. Table 4.2 shows that the infant mortality rate for males among mothers younger than 24 at first birth was 59 per 1 000 live births, and that it was lower for females at

56 per 1 000. For mothers of 25–34 years old, the infant mortality rate for males was 58 per 1 000, while it was higher for females at 66 per 1 000. For mothers of 35 years or older, the infant mortality rate was 56 per 1 000 for males, and for females it was also 56 per 1 000. Table 4.2 shows that for mothers younger than 24 at first birth the total infant mortality was 57 per 1 000 for male children, while for female children it was 60 per 1 000. For mothers older than 25 at first birth the total infant mortality was 69 per 1 000 for males, while for females it was 82 per 1 000.

According to Table 4.2, infant mortality first birth-order male children was at 55 per 1 000, compared to first birth-order female children at 57 per 1 000. For second birth-order male children mortality in infancy was 59 per 1 000, while for females it was 59 per 1 000. For third birth-order males infant mortality was 55 per 1 000, compared to the higher rate for third birth-order females at 67 per 1 000. For fourth birth-order males infant mortality was 59 per 1 000, while for females it was 64 per 1 000. For the fifth or more birth-order males infant mortality was 59 per 1 000, while for females it was 58 per 1 000. Table 4.2 also shows that for males whose mothers had no education infant mortality was 60 per 1 000, compared to the figure for females, namely 60 per 1 000.

Table 4.2 Mortality rate of infants by gender per 1 000 live births according to selected explanatory variables

Variables	Male deaths per 1 000	Female deaths per 1 000	Total deaths per 1 000
Age at first birth			
10-24	57	60	59
25+	69	82	75
Birth order			
1	55	57	56
2	59	59	59
3	55	67	61
4	59	64	61
5+	59	58	59
Mother's education			
No education	60	60	60
Primary	56	60	58
Secondary	64	63	64
Higher	20	18	19
Type or place of residence			
Urban	64	56	60
Rural	57	61	59
Mother's employment status			
Not working	60	65	63
Formal	58	57	58
Informal	53	68	61
Region			
Northern	55	55	55
Central	58	65	62
Southern	58	59	59
Source of drinking water			
Piped or tap	63	59	61
Tube well or borehole	58	61	59
Open or protected well	54	62	58
Other	54	54	54
Type of toilet facility			
Flush toilet	52	66	59
Pit latrine – without slab/open pit	58	61	59
No facility/bush/field	59	56	57
Has electricity			
No	57	61	59
Yes	60	58	59
Not de jure resident	68	32	53
Place of delivery			
Home	57	61	59
Government hospital	56	59	57
Other public	66	65	66
Exclusive breastfeeding: 0–6 months			
No	55	57	56
Yes	59	63	61

Table 4.2 continues

Listen to radio: Safe motherhood			
No	55	66	61
Yes	59	57	58

(Source of data: MDHS, 2010)

For male infants whose mothers had primary education infant mortality was 56 per 1 000, while for female infants it was 60 per 1 000. For males whose mothers had secondary education infant mortality was 64 per 1 000, compared to females at 63 per 1 000. For males whose mothers had higher education infant mortality was lower at 20 per 1 000, compared to females at 18 per 1 000.

For place of residence the results according to Table 4.2 show that for male children in urban areas the infant mortality rate was at 64 per 1 000, compared to females at 56 per 1 000. For males in rural areas infant mortality was 57 per 1 000, compared to females at 61 per 1 000. Table 4.2 also shows that the infant mortality rate for male children whose mothers were not working was 60 per 1 000, compared to female children at 65 per 1 000. For children whose mothers had formal employment the infant mortality rate was 58 per 1 000 for males, compared to females at 57 per 1 000. For infants whose mothers had informal employment the infant mortality rate was 53 per 1 000 for males, while for females it was 68 per 1 000.

Table 4.2 shows that for male infants in the Northern Region, the infant mortality rate was 55 per 1 000, and for the females it was the same at 55 per 1 000. For male children in the Central Region the infant mortality rate was 58 per 1 000, while for the females it was 65 per 1 000. In the Southern Region the male infant mortality rate was 58 per 1 000, compared to the females at 59 per 1 000.

The results in Table 4.2 also show that male children whose source of water was pipe or tap experienced an infant mortality rate of 63 per 1 000, compared to females at 59 per 1 000. The mortality rate of male infants whose source of water was tube well or borehole was 58 per 1 000, compared to females at 61 per 1 000. The infant mortality rate for males whose source of water was open or protected well was 54 per 1 000, compared to females at 62 per 1 000. For the category of other, the male infant mortality rate was 54 per 1 000, and the females was also at 54 per 1 000.

The results also show that for the category of flush toilets the infant mortality rate for males was 52 per 1 000, compared to females at 66 per 1 000. For pit latrine without slab or open pit used, the male infant mortality rate was 58 per 1 000, compared to females at 61 per 1 000. Where there was no facility or the bush or field was used, the male infant mortality rate was 59 per 1 000, compared to the rate for females at 56 per 1 000.

Table 4.2 also shows that for the source of energy used for households with no electricity the infant mortality rate for male infants was 57 per 1 000, compared to females at 61 per 1 000. For households with electricity the infant mortality rate among male infants was 60 per 1 000, compared to females at 58 per 1 000. For not de jure residents, the male infant mortality rate was 68 per 1 000, compared to females at 32 per 1 000.

The results also show that for male infants who had been born at home, the mortality rate was 57 per 1 000, while for female infants it was 61 per 1 000. For male children who had been delivered at government hospitals the infant mortality rate was 56 per 1 000, compared to females at 59 per 1 000. For males who had been delivered in other public health facilities the infant mortality rate was the highest at 66 per 1 000, compared to females at 65 per 1 000.

The results from Table 4.2 show that for male children who had been exclusively breastfed, the infant mortality rate was 59 per 1 000, compared to female infants at 63 per 1 000. For males who had not been breastfed, the infant mortality rate was 55 per 1 000, while for females it was 57 per 1 000. For male children whose mothers listened to the radio for safe motherhood, infant mortality was 59 per 1 000, compared to females at 57 per 1 000. Male children whose mothers did not listen to the radio for safe motherhood, the infant mortality rate was 55 per 1 000, while for females it was 66 per 1 000. The last column of Table 4.2 represents total deaths (infant mortality rates) for both male and female children according to selected characteristics.

Table 4.3 summarises the child mortality rate by gender according to selected characteristics. The table shows that for mothers who had been 10–24 years old at first birth, the child mortality rate was 79 per 1 000 for male children, while for female children the mortality rate was 80 per 1 000. For mothers who had been 25 or more years old, the child mortality rate was 109 per 1 000 for male children, while for females it was 112 per 1 000.

Table 4.3 also shows that the child mortality rate for first birth-order male children was 74 per 1 000, and 80 per 1 000 for females. For second birth-order male children the mortality rate increased to 85 per 1 000, while for female children it was 80 per 1 000. For third birth-order male children the mortality rate was 82 per 1 000, and for female children it was higher at 81 per 1 000. For fourth birth-order for male children the child mortality rate was 80 per 1 000, compared to females at 90 per 1 000. For the fifth or higher birth-order male children the mortality rate was 79 per 1 000, the same as for females (79 per 1 000).

According to Table 4.3, child mortality for male children whose mothers had no education was 86 per 1 000, compared to female children at 79 per 1 000. For male children whose mothers had primary education, the child mortality rate was 78 per while for female children

it was 82 per 1 000. For male children whose mothers had secondary education the child mortality rate was higher at 84 per 1 000, compared to female children at 85 per 1 000. For male children whose mothers had higher education, child mortality was lower at 40 per 1 000, compared to female children at 35 per 1 000.

For place of residence the results according to Table 4.3 show that for male children in urban areas the child mortality rate was 84 per 1 000, compared to female children at 72 per 1 000. For male children in rural areas it was 79 per 1 000, compared to female children at 82 per 1 000. Table 4.3 also shows that the child mortality rate for mothers who were not working was 79 per 1 000 for male children and 84 per 1 000 for female children. For children whose mothers had formal employment the rates were 82 per 1 000 for male children and 79 per 1 000 for female children. For children whose mothers had informal employment, child mortality was 68 per 1 000 for male children and 91 per 1 000 for females.

Table 4.3 also shows that for male children in the Northern Region, the child mortality rate was 75 per 1 000, and for female children it was 80 per 1 000. For male children in the Central Region it was 80 per 1 000, while for females it was 90 per 1 000. In the Southern Region the male mortality rate was 81 per 1 000, compared to females at 75 per 1 000.

Table 4.3 Mortality rate of children by gender per 1 000 live births according to selected explanatory variables

Variables	Males death per 1 000	Females death per 1 000	Total deaths per 1 000
Age at first birth			
10-24	79	80	80
25+	109	112	110
Birth order			
1	74	80	77
2	85	80	83
3	82	81	81
4	80	90	85
5+	79	79	79
Mother's education			
No education	86	79	82
Primary	78	82	80
Secondary	84	85	85
Higher	40	35	37
Type or place of residence			
Urban	84	72	78
Rural	79	82	81
Mother's employment status			
Not working	79	84	81
Formal	82	79	80
Informal	68	91	80
Region			
Northern	75	80	78
Central	80	90	85
Southern	81	75	78
Source of drinking water			
Piped or tap	80	77	78
Tube well or borehole	81	82	82
Open or protected well	79	83	81
Other	70	79	75
Type of toilet facility			
Flush toilet	80	81	81
Pit latrine – without slab/open pit	79	82	80
No facility/bush/field	83	79	81
Source of energy			
No	80	82	81
Yes	75	73	74
Not de jure resident	98	57	78

Table 4.3 continued

Place of delivery			
Home	83	80	82
Government hospital	77	79	78
Other public	86	91	88
Exclusive breastfeeding: 0–6 months			
No	80	78	79
Yes	80	83	81
Listen to radio: safe motherhood			
No	78	88	83
Yes	81	77	79

(Source of data: MDHS, 2010)

The results in Table 4.3 also show that for male children whose source of water was pipe or tap, the child mortality rate was 80 per 1 000, compared to females at 77 per 1 000. The child mortality rate of male children whose source of water was tube well or borehole was 81 per 1 000, compared to females at 82 per 1 000. For male children whose source of water was open or protected well the child mortality rate was 79 per 1 000, compared to female children at 83 per 1 000. For other male children the child mortality rate was 70 per 1 000, with to females also at 79 per 1 000.

The results also show that in the category for flush toilets the child mortality rate among male children was 80 per 1 000, compared to female children at 81 per 1 000. For pit latrine without slab or open pit used, the male child mortality rate was 79 per 1 000, compared to female children at 82 per 1 000. Where there was no facility or the bush or field was used, the male child mortality rate was 83 per 1 000, compared to females at 79 per 1 000.

Table 4.3 also shows that for the source of energy used, no electricity, the child mortality rate among male children was 80 per 1 000, compared to females at 82 per 1 000. For the category with electricity, the child mortality rate among male children was 75 per 1 000, compared to that for females at 73 per 1 000. For not de jure residents the male child

mortality rate was 98 per 1 000, compared to females at 57 per 1 000. The results also show that for male children who had been born at home, the child mortality rate was 83 per 1 000, while for female children it was 80 per 1 000. For male children who had been delivered at government hospitals, the mortality rate was 77 per 1 000, compared to females at 79 per 1 000. For male children who had been delivered in other public health facilities it was 86 per 1 000, compared to female children at 91 per 1 000.

The results from Table 4.3 show that for male children who had been exclusively breastfed the mortality rate was 80 per 1 000, compared to female children at 83 per 1 000. For male children had not been breastfed the child mortality rate was 80 per 1 000, while for female children it was 78 per 1 000. For male children whose mothers listened to the radio for safe motherhood the child mortality rate was 81 per 1 000, compared to the rate for females at 77 per 1 000. For male children whose mothers did not listen to the radio for safe motherhood the child mortality rate was 78 per 1 000, while the female child mortality rate here was 88 per 1 000. The last column of Table 4.3 represents the total deaths (child mortality rate for both male and female children according to selected characteristics).

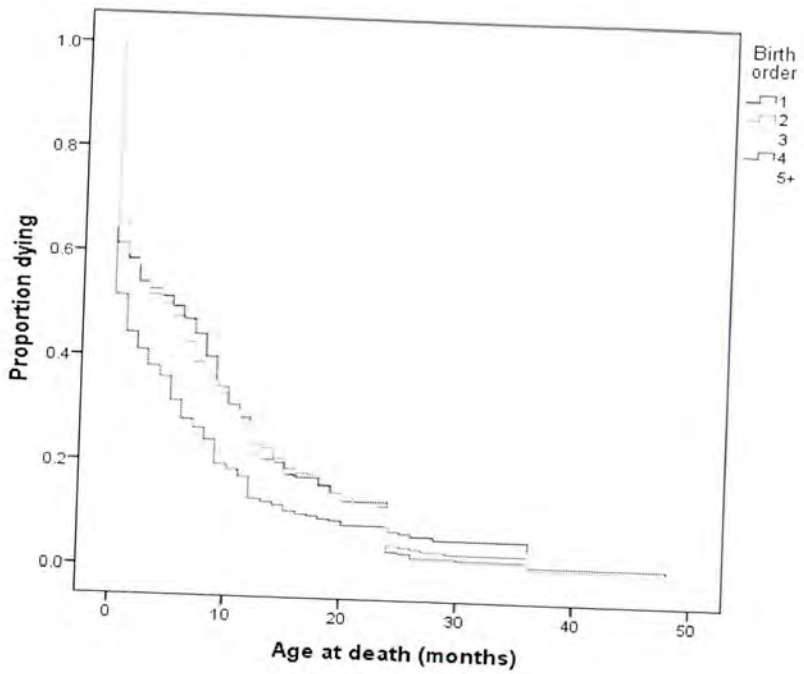
4.4 BIVARIATE ANALYSIS USING KAPLAN-MEIER SURVIVAL ANALYSIS

Correlates of under-five mortality differentials by age at first birth, birth order, sex of child, mother's educational level, and place of residence, region and exclusive breastfeeding are depicted by the Kaplan-Meier survival curves shown in the figures below.

Childhood mortality for birth orders in the survival curve shows that children with first birth order have more chances of dying in infancy, especially in the first few months, with the probability of dying stabilising during childhood. The results in Figure 4.1 show that for birth order 2 the chances of dying are lower in both infancy and childhood. Children with birth

order 3 are likely to die in both infancy and childhood, but the risk is shown to have reduced around 38 months. Children with birth order 4 are more likely to die in infancy compared to childhood. For children with birth order 5 the chances are also higher in infancy compared to those in childhood.

Figure 4.1 Kaplan-Meier survival analysis curves classified by birth order



According to Figure 4.2, children whose mothers had no education were more likely to die than children whose mothers had primary education. For children whose mothers had secondary education the chances of dying were higher in infancy than in childhood. For children whose mothers had higher education the chances of dying were lower compared to other educational levels. This shows that the higher the education the mother has, the better the survival chances of her children are.

Figure 4.2 Kaplan-Meier survival analysis curves classified by mother's education

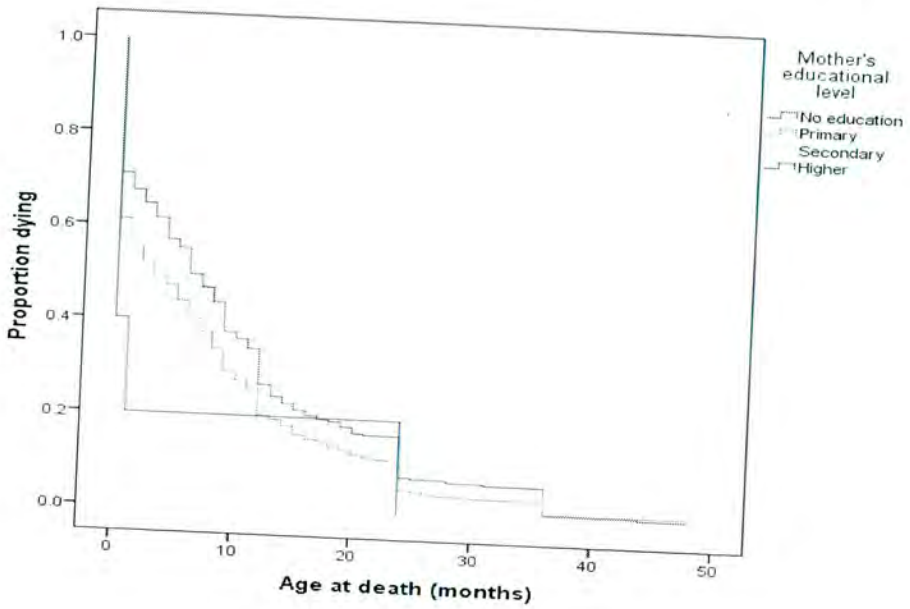


Figure 4.3 shows that the place of residence differentials in the survival chances during childhood were pronounced, showing that children in rural areas were more likely to die compared to children in urban areas at every age.

Figure 4.3 Kaplan-Meier survival analysis curves classified by type or place of residence

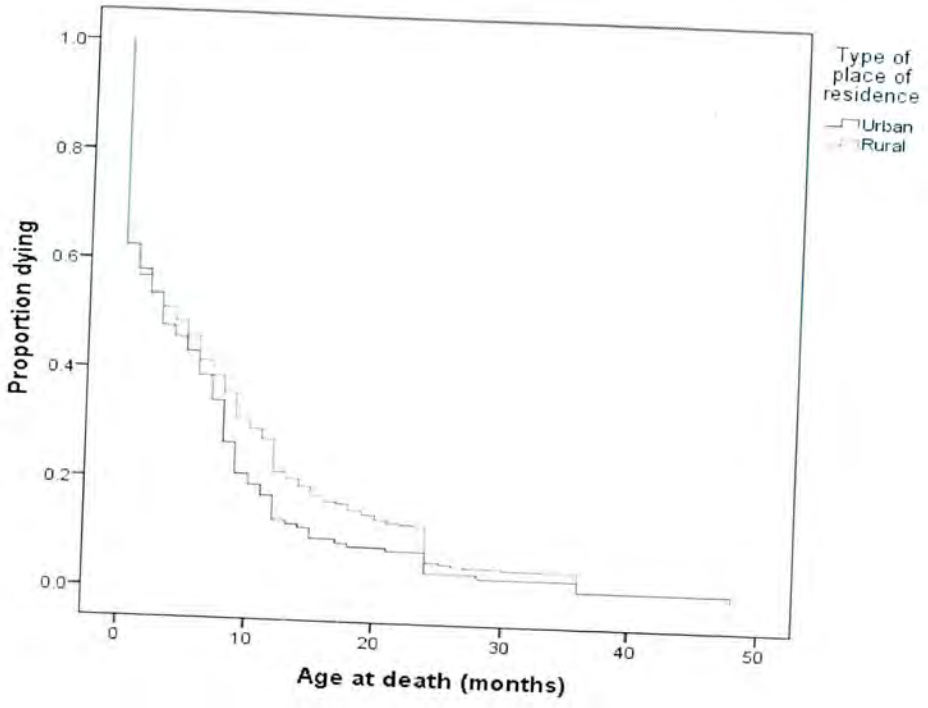
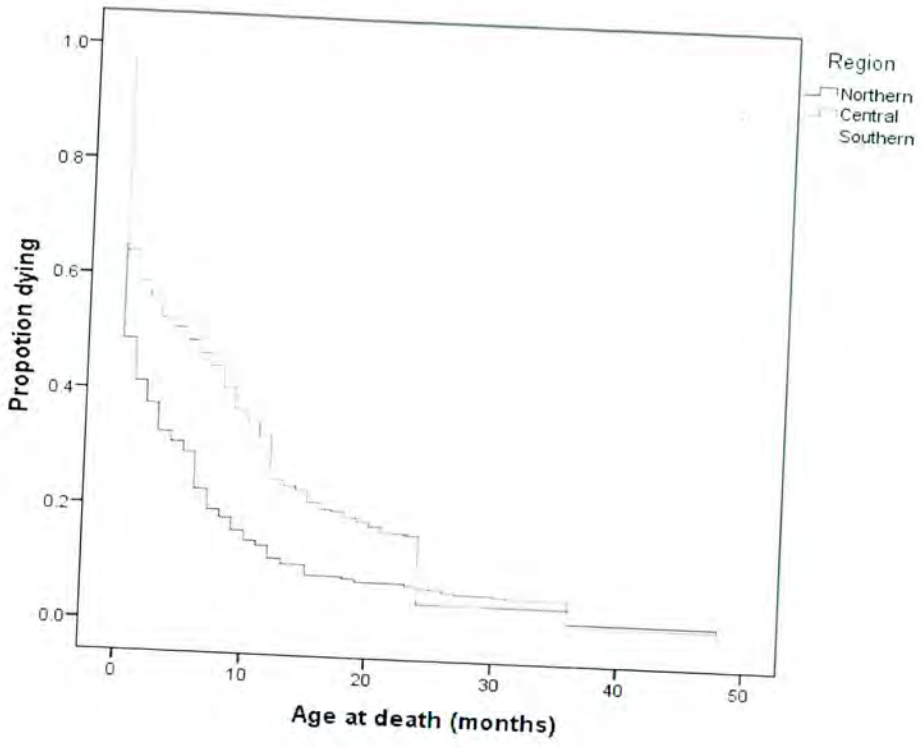


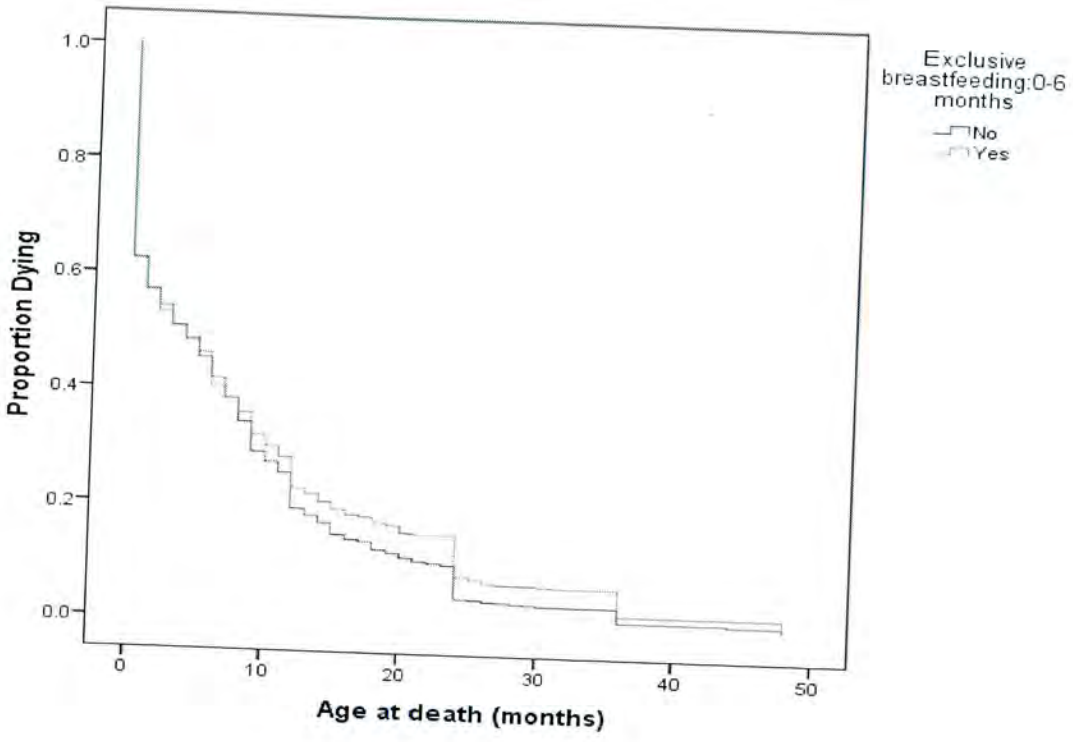
Figure 4.4 shows that children in the Central Part of Malawi were more likely to die at every stage, and at about 25 months the proportion dying was higher than at other stages. Children in the Northern Region were more likely to die in infancy than in childhood. Those in the Southern Region of Malawi also experienced a higher mortality rate in infancy than in childhood.

Figure 4.4 Kaplan-Meier survival analysis curves classified by region



According to Figure 4.5, the exclusive breastfeeding differential in the survival curve for the probability of dying during childhood was pronounced. Children who had not been exclusively breastfed during the first months were more likely to die than children who had been breastfed.

Figure 4.5 Kaplan-Meier survival analysis curves classified by exclusive breastfeeding



Kaplan-Meier survival curves do not give a clear depiction of the association of childhood mortality with age at first birth, sex of the child, mother's employment status, source of drinking water, type of toilet used, source of energy, place of delivery and listening to radio for safe motherhood.

Table 4.4 below shows the results of the Kaplan-Meier survival analysis of the mean ages at death and the association between each of the selected variables for the infants, children and under-fives according to selected explanatory variables. The results also indicate whether each variable was significantly associated with infant, child and under-five mortality on the basis of their levels.

Table 4.4 Kaplan-Meier survival analysis of mean age at death according to selected explanatory variables

Variables	Infant mortality		Child mortality		Under-five mortality	
	Mean age at death	p-value	Mean age at death	p-value	Mean age at death	p-value
Age at first birth						
10 –24 years	1,3	0,95	21,9	0,52	8,2	0,08
25+	2,1		21,3		7,3	
Total	**1,7**		**21,6**		**7,7**	
Birth order						
1	1,4	0,16	21,3	0,58	5,3	0,00
2	1,0		21,0		7,9	
3	2,0		22,9		10,2	
4	1,4		22,1		8,4	
5+	2,3		21,1		7,9	
Total	**1,7**		**21,6**		**7,7**	
Sex of the child						
Male	1,6	0,23	21,1	0,82	7,4	0,26
Female	1,9		21,5		8,0	
Total	**1,7**		**21,6**		**7,7**	
Mother's education						
No education	2,0	0,72	21,8	0,61	9,6	0,01
Primary	1,7		21,3		7,4	
Secondary	1,8		23,7		6,5	
Higher	0,0		24,0		5,0	
Total	**1,7**		**21,6**		**7,7**	
Place of residence						
Urban	1,5	0,60	21,7	0,88	6,3	0,05
Rural	1,7		21,8		7,8	
Total	**1,7**		**21,6**		**7,7**	
Mother's employment status						
Not working	1,8	0,51	23,5	0,02	8,0	0,70
Formal	1,8		21,4		7,6	
Informal	1,2		19,3		7,4	
Total	**1,7**		**21,6**		**7,7**	
Region						
Northern	1,0	0,30	25,2	0,44	5,0	0,00
Central	1,5		22,0		8,9	
Southern	2,1		20,8		7,7	
Total	**1,7**		**21,6**		**7,7**	
Source of drinking water						
Piped or tap	1,4	0,58	22,8	0,58	7,0	0,10
Tube well or borehole	1,7		21,3		7,6	
Open or protected well	1,9		22,6		8,8	
Other	1,8		18,0		6,8	
Total	**1,7**		**21,6**		**7,7**	

Table 4.4 Continued

Type of toilet used						
Flush toilet	2,3	0,46	20,8	0,87	7,0	0,66
Pit latrine – without slab/open pit	1,6		21,6		7,7	
No facility/bush/field	2,0		21,9		8,1	
Total	**1,7**		**21,6**		**7,7**	
Source of energy						
No	1,8	0,10	21,6	0,28	7,8	0,62
Yes	0,64		23,8		6,8	
Not de jure residents	0,80		18,2		6,9	
Total	**1,7**		**21,6**		**7,7**	
Place of delivery						
Home	1,4	2,77	21,8	0,87	7,8	0,54
Government hospital	1,9		21,4		7,5	
Other public	1,3		22,0		8,2	
Total	**1,7**		**21,6**		7,7	
Exclusive breastfeeding						
No	1,7	0,70	20,5	0,02	7,3	0,02
Yes	1,6		23,4		8,4	
Total	**1,7**		**21,6**		7,7	
Listening to radio: safe motherhood						
No	2,2	0,51	21,2	0,52	8,2	0,11
Yes	1,4		21,9		7,4	
Total	**1,7**		**21,6**		7,7	

(Source of data: MDHS, 2010)

The results presented below, based on Table 4.4, focus only on under-five mortality. For information on infants and children, refer to Table 4.4 above.

According to the results presented in Table 4.4, birth order was significantly associated with under-five mortality at 0,000. Mother's education was also significantly associated with under-five mortality at 0,01. The table also shows that the type or place of residence was significantly associated with under-five mortality at 0,05. The results in Table 4.4 show that region was significantly associated with under-five mortality at 0,000. Exclusive breastfeeding was also significantly associated with under-five mortality at 0,02.

Other factors such as age at first birth, sex of child, mother's employment status, source of drinking water, type of toilet used, source of energy and listening to radio for safe motherhood were not found to be significantly associated with under-five mortality according to the results in the Kaplan-Meier analysis in this study.

4.5 MULTIVARIATE HAZARD ANALYSIS

To control confusing background factors in the investigation of under-five mortality the Cox proportional model was utilised. The model was adopted for investigating the determinants in terms of hazard ratios or relative risks (RR). Table 4.5 shows the results of the multivariate hazard analysis that was fitted for under-five mortality in Malawi. The model included all the variables that were found to be significantly or not significantly associated with under-five mortality. The adjusted odds ratios, standard deviation and p-value for each factor fitted into the model are presented in Table 4.5 below.

According to the results in Table 4.5, the chances of infants who had been breastfed dying were 0,814 times smaller than those of infants who had not been breastfed. Children who had been breastfed were 1,286 times more likely to survive than children who had not been breastfed. Under-five children were 1,105 times more likely to survive than those who had not been breastfed. The results also show that infants whose mothers had no education were 1,212 times more likely to survive than children whose mothers had secondary education. Children whose mothers had primary education were 1,079 more times likely to survive than children whose mothers have higher education. Under-five children whose mothers had secondary education were 0,793 times less likely to die than children whose mothers had a higher education, which was a reference category.

Table 4.5 Multivariate hazard analysis according to selected explanatory variables

Variables	Infant mortality			Child mortality			Under-five mortality		
	Exp(B)	SE	Sig.	Exp(B)	SE	Sig.	Exp(B)	SE	Sig.
Breastfeeding									
Yes (Ref)	0,814	0,321	0,523	1,286	0,107	0,018	1,105	0,054	0,065
Mother's education									
Higher (Ref)			0,710			0,841			0,272
No education	1,212	1,133	0,865	1,141	1,087	0,903	0,659	0,472	0,378
Primary	1,042	1,112	0,970	1,174	1,079	0,882	0,741	0,468	0,523
Secondary	0,840	1,099	0,874	0,972	1,089	0,979	0,793	0,469	0,621
Place of residence									
Rural (Ref)	0,957	0,298	0,882	0,944	0,226	0,800	1,136	0,101	0,208
Region									
Southern (Ref)			0,144			0,208			0,000
Northern	1,481	0,200	0,049	0,711	0,207	0,100	1,292	0,078	0,001
Central	1,141	0,186	0,478	0,896	0,110	0,319	0,899	0,057	0,063
Age at first birth									
25+ (Ref)	1,180	0,156	0,288	0,993	0,103	0,949	0,934	0,051	0,183
Birth order									
Birth order 5 (Ref)			0,233			0,845			0,000
Birth order 1	1,561	0,222	0,045	0,985	0,160	0,925	1,233	0,072	0,004
Birth order 2	1,671	0,264	0,051	0,952	0,154	0,748	0,965	0,079	0,654
Birth order 3	1,355	0,247	0,219	0,870	0,160	0,387	0,783	0,084	0,004
Birth order 4	1,323	0,253	0,268	0,857	0,159	0,334	0,933	0,083	0,403
Mother's employment									
Informal (Ref)			0,643			0,093			0,560
Not working	0,768	0,282	0,348	0,676	0,181	0,031	0,918	0,090	0,340
Formal	0,834	0,260	0,485	0,801	0,158	0,160	0,972	0,079	0,723
Source of drinking water									
Other (Ref)			0,961			0,463			0,443
Piped or tap	1,091	0,440	0,843	0,629	0,305	0,128	0,869	0,151	0,353
Tube well or boreholes	1,123	0,385	0,763	0,682	0,267	0,151	0,921	0,136	0,543
Open or protected well	1,015	0,406	0,970	0,656	0,279	0,131	0,844	0,143	0,234
Type of toilet used									
No facility/bush /field (Ref)			0,649			0,643			0,983
Flush toilet	1,086	0,339	0,807	1,248	0,237	0,349	1,016	0,121	0,893
Pit latrine – without slab/open pit	1,215	0,224	0,385	1,092	0,151	0,562	0,998	0,077	0,975
Listening to radio: safe motherhood									
Yes (Ref)	0,854	0,163	0,334	1,063	0,106	0,567	0,945	0,053	0,285

Table 4.5 continued

Place of delivery									
Other public (Ref)			0,456			0,761			0,831
Home	1,214	0,268	0,470	1,024	0,153	0,876	1,042	0,079	0,603
Government hospital	0,933	0,212	0,743	1,092	0,134	0,508	1,007	0,069	0,919
Sex of the child									
Female (Ref)	1,134	0,152	0,409	1,032	0,105	0,762	1,077	0,051	0,144
Source of energy									
Not de jure residents (Ref)			0,249			0,977			0,814
No	0,695	0,649	0,574	1,000	0,467	1,000	1,155	0,248	0,562
Yes	1,194	0,743	0,811	0,941	0,548	0,912	1,195	0,279	0,522

(Source of data: MDHS, 2010)

The results in Table 4.5 show that infants who lived in the rural areas were 0,952 less likely to die than those who were in urban areas. Under-five children in rural areas were 1,136 times more likely to survive than those in urban areas. The results also show that infants from the Northern Region of Malawi were 1,481 times more likely to survive than those in the Southern Region. Under-five children who resided in the Northern Region were 1,292 times more likely to survive than the ones in the Central Region of Malawi. For the Southern Region the results were significant at the p=0,000 level of significance. For the Northern Region the results were significant at the P=0,001 level of significance.

The results also show that children born to mothers whose age at first birth was more than 25 years were 1,180 times more likely to survive than children whose mothers' age at first birth was 10–24 years. The results also show that children born with birth order 2 were 1,671 times more likely to survive compared to those with birth order 1, 3 and 4. For birth order 5 the results were significant at the p=0,000 level of significance. For birth order 1 the results were significant at the p=0,004 level of significance, while for birth order 3 the results were significant at the p=0,004 level of significance.

Children who were under five whose mothers were not working were 0,918 times less likely to die than those whose mothers had formal employment. The results show that infants who drank water from tube wells or boreholes were 1,123 times more likely to survive than infants who drank other sources of water. The results in Table 4.5 also show that under-fives who used flush toilets were 1,016 times more likely to survive than those who used pit toilets or the bush as a toilet facility. The results show that infants whose mothers listened to the radio for safe motherhood were 0,854 times less likely to survive than under-fives and children whose mothers listened to the radio for safe motherhood. The results also show that infants who were born at home were 1,214 times more likely to survive than children and under-fives who had been born at home. The results also show that female children were 1,134 times more likely to survive than male children, and that under-fives who had electricity or whose mothers used electricity as a source of energy were 1,195 times more likely to survive than those who did not use electricity as a source of energy.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter revisits the results presented in the previous chapter and highlights the key findings of the study. The recommendations for the study are then identified, and suggestions for possible future research are provided.

5.2 DISCUSSION OF RESULTS

The findings from the study revealed that children whose mothers had higher education survived more than children whose mothers had no education. This agreed with what was in the literature according to Caldwell (1979). Educated mothers, when compared with the uneducated ones, were more likely to insist on something being done about their children's sickness. In most cases educated mothers were likely to persist with the prescribed treatment and were likely to report back if the treatment was not working, while illiterate mothers seemed to fail to report back if the child's health was not improving, mostly because they feared being accused of incompetence and somehow they thought the doctor had provided the best treatment for their babies (Caldwell, 1979).

According to the results, children whose mother's age at first birth was less than 24 years were more likely to die than children whose mother's age at first birth was 25 years or more. According to Hobcraft et al. (1985), in Malawi, like in the rest of the world, babies born from young mothers before the age of 20, or from old mothers after 40 years of age, have a greater risk of dying before the age of five than babies born from mothers aged 20 to 40 years. The results show that children who had not been breastfed were more likely to die than children who had been breastfed, and this agrees with what is in the literature by Breschi et al. (2000),

namely that breastfeeding is universally accepted as the healthiest alimentation for the baby. The new-born has very poor immunity, but the active biological substances in the mother's milk are highly protective. It is also well known that the weaning period is a delicate phase, especially when hygienic conditions are poor, and alternative foods are low in protein or calories.

The results show that children with a higher birth order survived more often than children with a low birth order. These findings agree with the literature, therefore first-borns have a high risk of dying because of the age of the mother or because of birth complications. This may also be due to the mother's inexperience in looking after the infant. The total number of children in the family would also limit the attention that would be given or granted to each child. Thus at times when the child is sick he can even die before he receives much attention from the parents (Kibet, 2010).

Female children were more likely to survive compared to male children, and this result agrees with what the literature says. In Malawi one can find a higher mortality in male children than in female children at every age because of biological reasons, with baby boys being naturally more vulnerable to infections than baby girls. These differentials were reversed in the post-neonatal period.

The results show that children from the rural areas were more likely to die than those in the urban areas. According to Anna et al, (2009), the mother's place of residence usually affects the survival status and nutritional status of the living children in most developing countries. The mortality of children is usually higher in non-urban areas than in urban areas. In most cases the infrastructures for health services in urban areas are generally better than in non-urban areas.

5.3 CONCLUSION

The main aim of the study was to examine the effects of socio-economic, demographic and household environmental determinants on under-five mortality in Malawi. To achieve this aim the following specific objectives were pursued, namely to estimate the rate or prevalence of under-five mortality in Malawi and to examine differentials in infant and child mortality according to socio-economic, demographic, environmental, health-seeking behaviour and nutritional factors.

The results from the Kaplan-Meier survival analysis show that of all the selected variables, education, region, birth order, place of residence and breastfeeding were the only factors that were found to be significantly associated with under-five mortality in Malawi.

In summary, socio-economic determinants, as reflected by mother's education, place of residence and region, were associated with under-five mortality according to this study. However, socio-economic factors such as mother's employment seemed not to be associated with under-five mortality in Malawi. Environmental determinants as reflected by access to drinking water, type of toilet used, and access to energy (electricity) seemed not to be associated with under-five mortality in Malawi.

Demographic determinants as reflected by the mother's age at first birth and the sex of the child were not associated with under-five mortality according to this study. Health-seeking behaviour determinants as reflected by place of delivery and listening to the radio for safe motherhood were not significantly associated with under-five mortality in Malawi. Nutritional factor determinants as reflected by exclusive breastfeeding or lack thereof were found to be significantly associated with under-five mortality according to this study.

The MDHS 2010 reported an under-five mortality rate of 88 deaths per 1 000 live births, which looks very high and also reflects that the state of development of the country is still very poor, and a lot has to be done in order to achieve Millennium Development Goal 4 (MDG4) by 2015.

5.4 RECOMMENDATIONS

- The study has brought to light key issues on which the Ministry of Health and other policy makers need to focus. The empowerment of women through education should be encouraged and supported financially where necessary because the mother's education continues to influence under-five mortality. The mother's education is an important factor of under-five mortality in Malawi.
- Increasing the number of people who live in the Northern and Central Region of Malawi will help reduce under-five mortality compared to that in the Southern Region of Malawi. This should also be integrated with the programme to alleviate rural poverty.
- Health services should be brought closer to the communities so that mothers have access to them during and after pregnancy.
- Mothers should be encouraged to give birth in health facilities in order to be safe and to prevent the unnecessary death of babies. This will help mothers to access medication, especially in a population with a high HIV/AIDS prevalence.
- Mothers and women who are pregnant should be encouraged and supported to use mosquito nets (bed nets), since the incidence of malaria in Malawi is very high, and children under the age of five and pregnant women were found to be at great risk of contracting malaria, which contributes to morbidity and mortality.

- Women should be encouraged to breastfeed their children up to the age of six months, and complementary food or formula milk should be encouraged for those who cannot breastfeed because of various factors in order to prevent diseases and unnecessary deaths in the under-fives.
- All policies developed should be integrated with empowerment programmes for women, especially through campaigns and education. This will help women to utilise the health services and also to obtain more knowledge on how to take care of themselves and their children in order to prevent unnecessary deaths.
- Finally, the government and relevant stakeholders should monitor and evaluate the existing programmes regularly in order to revise and re-design programmes to make them more relevant to the factors that are predominant in determining child survival.
- Further research is required in order to investigate the role of determinants on under-five mortality in Malawi. Considering the various limitations of this study, another study using data of higher quality, especially data with information on antenatal care and immunisation for both children who are alive and those who died, is essential when investigating the causes of under-five mortality.

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