INFANT MORTALITY DIFFERENTIALS IN KENYA AND TANZANIA

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DECLARATION

This project is my original work and to the best of my knowledge, has not been presented for a degree award in any other university.

Signed: .....**Date**....9/11/2007.....

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This project has been submitted for examination with our approval as university supervisors.

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DEDICATION

To the Lord God Almighty, whose love never fails; you are my all in all. To my parents, *Julius* and *Priscilla*; thanks for the firm grounding in education during those early years. My dear wife, *Mary*, and my daughter, *Favour Moseo*; thanks for your endless support and encouragement throughout the entire study period. *Kamos*, you also inspired me as I watched you grow; that life is a process, not a destination.

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This piece of work owes a lot to many, from a draft to the finished whole.

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Last but not the least; I sincerely appreciate the support of my close family members and friends, who bore the blunt of my incessant absence throughout the two-year period.

ABSTRACT

Infant mortality is an important indicator for describing the social and economic wellbeing of a country. In 2002, almost half of Sub-Saharan African countries had infant mortality rates greater than 100 per 1000 live births, with Sierra Leone, Liberia Niger and Angola having the highest. In Kenya infant mortality is very high and has continued to rise since 1989, that is, from 60 infant deaths per 1000 live births to 77 in 2003. Kenya Demographic and Health Survey (KDHS) 2003, records that infant mortality was 77 deaths per 1000 live births for the most recent five-year period preceding the survey (CBS et al 2004). Similarly, Tanzania Demographic and Health Survey (TDHS) 2004-5 recorded 68 infant deaths per 1000 live births (NBSD 2005). The above scenario was so despite more or less similar Gross Domestic Product (GDP). Kenya's GDP was estimated at 5.8 percent in 2006 while that of Tanzania was estimated at 6.0 percent, in the same period.

The main objective of this study was to establish the determinants and the differentials of infant mortality in Kenya and Tanzania, specifically the socio-economic determinants of infant mortality in Kenya while controlling for bio-demographic and socio-cultural factors, as well as to establish the bio-demographic determinants of infant mortality in Kenya and Tanzania while controlling for socio-economic and socio-cultural factors. The data used to inform this study finding was drawn from the 2003 KDHS and the 2004-5 TDHS.

Descriptive statistics reveal that most of the variables were highly associated with infant mortality in both countries. Mother's age at birth, birth order and preceding birth interval and mother's level of education had strong association with the dependent variable. Marital status, wealth index and religion were weakly associated with infant mortality, in both countries.

Multivariate analyses reveal that birth order and preceding birth interval, as well as mother's level of education, were highly significant predictors of infant mortality in both countries. Mother's level of education was significant at 95 and 99 percent confidence level in Kenya and Tanzania, respectively, at the secondary+ category, after controlling for bio-demographic and socio-cultural factors. Birth order and preceding birth interval, which were combined to form a composite variable due to their collinear relationship, had a strong effect on the dependent variables. In both countries, birth order 4+ and preceding birth interval less than 24 months were significant at 99 percent confidence level, after the controls. In Kenya, birth order 2 to3 and preceding birth interval <24 months were highly significant while in Tanzania, these category had no association with infant mortality, even after controlling for socio-economic and socio-cultural factors.

When bio-demographic and socio-cultural factors were controlled for, odds ratios for socio-economic factors did not show much difference in both countries. Type of place of residence, and particularly the rural category in Kenya, changed slightly from the previous results prior to the control. Those

variables that were significant at the multivariate level remained so, even after controlling for bio-demographic factors.

The study recommends that there is a need for mother's education to be revamped since it has an important link with infant mortality. This will not only bequeath mothers with sound methods of bringing up their infants but will also push up the mean at marriage, hence minimize adolescent fertility. Family planning programmes where mothers can be educated on the importance of family planning, and particularly spacing of births, are also recommended. The study also recommends further research to establish what factors account for the differentials in infant mortality between and within the two countries.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

CBS	Central Bureau of Statistics
DHS	Demographic and Health Survey
HDR	Human Development Report
IMR	Infant mortality rate
KDHS	Kenya Demographic and Health Survey
MOH	Ministry of Health
NBSD	National Bureau of statistics Dar es Salaam
TDHS	Tanzania Demographic and Health Survey

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.0 General introduction

Infant mortality rate is one of the most important indicators of human development. According to the Human Development Report (1999), a publication of the United Nations Development Program, the infant mortality rate is defined as the probability that an infant will die between birth and exactly one year of age times 1000. In other words, the infant mortality rate is the number of infants per 1000 live births that are expected to die before the end of the first year of life (HDR 1999, cf. Bajracharya and Gitter 2003). Infant mortality is commonly used as a measure of infant health and is a sensitive indicator of the socioeconomic conditions of a country. Under-five mortality is largely as a result of infectious diseases, and neonatal deaths in developing countries are related to the availability and accessibility of health services (Mahay, 2003).

Infant mortality is an important indicator of overall health and development in a country. These estimates assess population and health programs and policies, as well as contribute to population projections. Infant mortality measures also help identify specific populations that are at increased health risk. Infant mortality is the probability of dying before the first birthday.

The 2004-05 Tanzania DHS data indicate a recent, rapid decline in mortality. Infant mortality estimates show a decline from 100 in the 5-9 year period preceding the survey (approximately 1995-1999) to 68 during the 2004-05 TDHS estimate for the 5-9 year period preceding the survey is almost identical to the 1999 TDHS rate of 99 deaths per 1,000 births for the same period (i.e., 0-4 years preceding the survey) TDHS 2004-05). In 1999, infant mortality was 99 deaths per 1,000 live births. Other health indicators also improved. More infants are being exclusively breastfed now than in 1999. Vitamin A supplementation, which helps prevent blindness and infection, rose three-fold since the last survey with almost half of children under age 5 now receiving vitamin A supplements.

In Kenya infant mortality has been increasing over the years since 1998, that is, from 60 deaths per 1000 live births to 77 infant deaths in 2003. Infant and child mortality decreased markedly in the past five years. The infant mortality rate for the five-year period before the survey was 68 deaths per 1,000 live births.

1.1 Background information of the study countries

1.1.0 Kenya

The Republic of Kenya covers 582,000 square kilometers. Approximately 80 percent of Kenya is arid or semi arid. Only 20 percent total land mass is arable. Agriculture is the mainstay of Kenya's economy, accounting for 26

percent of the Gross Domestic Product (GDP); manufacturing accounts for about 14 percent.

Kenya is divided into 8 provinces and 75 districts, according to the 2003 DHS, although many more districts have recently been created from those already existent. The country is multi-ethnic with 43 ethno-linguistic groups. Major religions are Christianity and Islam. Kenya's population is mainly rural; according to 1999 census, only 20% of Kenya's population was urban. However, resurgence to major towns and cities, in search of employment and better social amenities, is on the increase.

Over the last few decades Kenya's population has increased from 5.4million in 1948 to 16.2 million in 1979, and then to 28.7 million in 1999. It is projected to reach 36.5 million by 2010 and 39.7 million by 2015. The annual growth rate has declined from 2.6 in 1999 to 2.2% in 2005(Population Reference Bureau, 2005). However, according to 2003 KDHS the documented fertility appears to have stalled. The total fertility rate of 4.9 children per woman for the three-year period preceding the survey (mid-2000 to mid –2003) is almost identical to the rate of 5.0 derived from the 1999 Population and Housing Census.

Infant mortality in Kenya has continued to rise since 1989, that is, from 60 infant deaths per 1000 live births to 77 in 2003. According to the 2003 KDHS infant mortality was 77 deaths per 1000 live births for the most recent five-year period preceding the survey. This rate of infant mortality is considered to be

still very high, and that something needs to be done to avert such a societal menace.

1.1.1 Tanzania

The united Republic of Tanzania is the largest country in East Africa, covering 940,000 square kilometers, of which 60,000 are inland water. Tanzania (then Tanganyika) became independent of British colonial rule in 1961 and, one year later, on Dec 9 1962, became a republic. The offshore island of Zanzibar became independent in Jan 12, 1964 after the overthrow rule of the Sultanate. Administratively the mainland of Tanzania is divided into twenty regions and Zanzibar is divided into four regions. Each region is divided into districts. The population size of Tanzania has trebled from 7.7 million in 1948 to 23.1 in 1988. Tanzania has mixed economy in which agriculture plays a key role. Agriculture which comprises crop, animal husbandry, forestry, fishery and hunting sub-sectors- contributes the largest share of any sector to the largest gross domestic product.

According to 2004-05 TDHS infant mortality decreased markedly in the past five years. The infant mortality rate for the five year period before the survey was 68 deaths per 1000 live births as compared to the 99 deaths in the 1999 TDHS. This is one of the lowest mortality rates in East Africa. Still, this means

that currently one in every nine children in Tanzania dies before his or her fifth birthday.

1.2 Problem Statement

Infant mortality is an important indicator for describing the social and economic wellbeing of a country. Deaths during infancy result in resource wastage on children who do not survive (Kanampiu, 2001). The increase in levels of infant mortality is followed by a rise in fertility in a bid to replace the dead infants. This in turn increases population growth, thus reversing the gains made in demographic transition (Kanampiu, 2001). Infant mortality accounts for about 60 percent of under-five deaths in Africa.

In 2002, almost half of Sub-Saharan African countries had infant mortality rates greater than 100 per 1000 live births, with Sierra Leone, Liberia Niger and Angola having the highest. In Kenya infant mortality is very high and has continued to rise since 1989, that is, from 60 infant deaths per 1000 live births to 77 in 2003. Kenya Demographic and Health Survey (KDHS) 2003, records that infant mortality was 77 deaths per 1000 live births for the most recent five-year period preceding the survey (CBS et al 2004). Similarly, Tanzania Demographic and Health Survey (TDHS) 2004-5 recorded 68 infant deaths per 1000 live births (NBSD 2005). The above scenario was so despite more or less similar Gross Domestic Product (GDP). Kenya's GDP was estimated at 5.8 percent in 2006 while that of Tanzania was estimated at 6.0 percent, in the

same period. A study on the determinants of infant mortality in both countries will inform policy formulation in a bid to subvert the high infant mortality in Kenya.

1.3 Research Questions

In this study I intent to answer the following questions:

1. What are the socio-economic determinants and differentials of infant mortality in Kenya and Tanzania?
2. What other factors determine the differentials of infant mortality in Kenya and Tanzania?

1.4 Research objectives

The **main objective** of this study is to establish the differentials and determinants of infant mortality in Kenya and Tanzania.

The **specific objectives** of the study are:-

1. To establish the socio-economic determinants and differentials of infant mortality in Kenya and Tanzania while controlling for bio-demographic and socio-cultural factors.
2. To establish the other factors that determine the differentials of infant mortality in Kenya and Tanzania.

1.5Justification of the study

Goal 4 of the Millennium Development Goals (MDGs) aims at reducing child mortality and the target is to reduce, by two thirds, the under-five mortality rate between 1990 and 2015. Infant and child mortality declined in Kenya between the 1970s and 1990s and has since been increasing while in Tanzania there has been a downward trend. The study on the determinants of infant mortality in both Kenya and Tanzania will assist in policy formulation in both countries, which will be of immense help towards realization of the MDG 4. This will be realized through the findings of the comparative study between the two countries now that Tanzania's infant mortality estimates have shown a downward trend as compared to those of Kenya which, on the contrary are rising. This scenario is so despite the fact that the two countries having more or less similar GDPs.

Research has shown that infant mortality rate is an excellent summary index of the level of living and the socio-economic development of a country (Kanampiu 2001; HDI cf. Bajracharya and Gitter 2003; CBS et al, 2004l; NSBD 2005). This recognition has inspired international and national governments to intensify their efforts to lower infant mortality and raise the level of child survival. Reduction and prevention of infant deaths has been a central preoccupation of health authorities and policy makers in both countries thus consuming colossal amounts of revenue which could have been put to alternative use. This comparative study will therefore be necessary in

providing the relevant information to formulate policies and intervention programmes for reducing infant mortality in Kenya.

1.6 Scope and limitation of the study

Kenya demographic and health survey 2003 and Tanzania demographic survey 2004-5 survey data was utilized in informing the study's findings. Data from women aged 15 and 45 in both countries was considered.

It is important to note that secondary data suffers a number of limitations; non coverage errors, underreporting and overreporting. Data quality may have been compromised since the recording was done retrospectively and hence could have led to underreporting of child deaths, especially those that occurred soon after birth. Due to this only the live births in the five years preceding the survey were considered to reduce the recall bias. Secondary data also restricts this study to the utilization of only those variables used in the survey. This, therefore, will not allow for certain control and/or independent variables to be tested against the dependent variable consequently limiting the frontiers to some crucial knowledge.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 Introduction

The fall in infant mortality rates has been one of the most astounding improvements of human wellness in history. Under primitive conditions, one in every five children born could have been expected to die before the first year of life. While this rate was prevalent, during the 19th Century in what is now the developed world, rates as high still exist in many countries in the Third World today. With the advent of scientific and medical innovation and the improvement in human living conditions, infant mortality gradually started to decrease and many countries have very low infant mortality rates (Bajracharya and Gitter 2003). Scholars have associated the decline in general mortality as mainly due to improvements in socioeconomic conditions which was later accelerated by public health and medical advances and measures (Omran, 1971:534).

Infant mortality has been discussed on three broad topics, which are bio-demographic factors, socio-economic factors and socio-cultural factors.

2.1 Bio-demographic factors

For the purposes of meeting the objective of this study, bio-demographic factors used include age of the mother at birth, birth order of the infant and

preceding birth interval. Both preceding birth interval and birth order were combined to form a composite variable since they are collinearly related.

2.1.0 Birth order

Usually the relationship between birth order and mortality at early ages takes a U-shaped form: Mortality is high for first-born children and births of very high orders and is low for births for births of order 2 or 3 (Pandey 1998). First born children have a likelihood of being raised by parents with limited skills and experience, possibly increasing the risk of infant and child mortality. Births of very high order may have mothers who are physically depleted at the time of conception and through out pregnancy. They are thus more likely than other children to suffer from conditions associated with high mortality risk such fetal growth retardation and low birth weight. High order births are also born into families that already have a number of younger children who compete for resources and parental care. The effects of first-order birth are likely to be strongest at older ages (Pandey 1998).

2.1.1 Mother's age at birth

Children born to mothers under 20 or over 35 years old are likely to have elevated risks of mortality. Very young mothers may experience difficult pregnancies and deliveries because of their physical immaturity. They are also likely to have limited knowledge and confidence in caring for their infants and young children (Pandey et al, 998). The 2003 KDHS found that the relationship between mother's age at birth and childhood mortality shows the

expected U-shaped pattern, with children of youngest and oldest mothers experiencing the highest risk of death (CBS et al 2004).

2.1.2 Birth spacing

Studying the dynamics of birth spacing defined as the interval between successive births is of interest for several reasons. First, several inferences are consistent with the notion that in much of the least developed countries, couples having large families tend to space births closer than couples with smaller families. This suggests that the timing of births may be inversely related to completed or cumulative fertility. Furthermore the timing of births has pronounced consequences on infant, child and maternal mortality through the dynamics of sibling competition, maternal depletion and interval effect hypotheses (Hobcraft et al., 1985; Palloni and Milman, 1986). The birth of each successive child creates competition for scarce resources among siblings in the household leading to a lower quality of care and attention to each child. The family resources might be overstretched, increasing the probability of each child in such household becoming malnourished (Gribble, 1993). Physiologically, successive births may deplete the mother of energy and nutrition that may lead to pregnancy complications or premature births compounding the risk of infant and maternal deaths, or impair the mother's ability to nurture her children. The early arrival of an infant necessitates the premature weaning of the index child, exposing the weaned child to malnutrition and increasing their probability of contracting infectious and parasitic diseases. Invariably, the longer duration of inter-birth interval has

been found to increase profoundly the chances of infant survival (Bicego and Ahmad, 1996). Children having short previous birth intervals are at a much greater risk than those with longer intervals (Luther, N.Y and Thapa, S. 1999). According to the 2003 KDHS, the length of the birth interval has a significant impact on an infant's chances of survival. As the birth interval gets longer the mortality risk is reduced considerably. Children born less than two years after a prior sibling were found to suffer substantially higher risks of death than children born after intervals of two more years (CBS, et al, 2004).

2.2 Socio-economic factors

2.2.0 Maternal education

Maternal education has been predicted to have an influential effect on infant mortality rates. Caldwell's (1979) study provides much evidence that the education of women (especially mothers) and infant mortality are intrinsically related. He found that educated women are more likely to be proactive, taking initiatives in providing the best care for their children and willing against traditional norms to access modern health care facilities for children, increasing their rate of survival. Bajracharya and Gitter (2003) predicted that, with reference to Caldwell's conclusion that the variable of maternal education is the single most important determinant of infant survival, that there is a negative relationship between infant mortality and their independent variable that represents literacy among adult women. According to Mosley and Chen's framework, income and maternal education are two commonly used correlates

or, in other words inferred causal determinants of child mortality in developing nations. Literate mothers usually give birth to healthier babies because they themselves tend to be healthier than mothers who are illiterate. Literate mothers are also more likely to provide their children with a healthy environment and nutritious food than illiterate mothers even when other conditions are similar (Pandey et al., 1998). Further still, literate mothers are likely to have more information about healthcare facilities and to have more influence within the family in deciding to take sick children for treatment. These traits are likely to result in lower mortality of children in all ages under five (Caldwell 1994; Cleland and Kaufman 1993; World Bank 1993 cf. Pandey et al 1998).

2.2.1 Wealth index

Wealth index is based on household ownership of material possessions such as radio, television, telephone, bicycle/scooter and car/track. It also includes the housing quality, whether the house has electricity, a finished floor and a permanent roof, that is, corrugated iron or tiles (Hill et. al 2001). This variable was constructed to act as a proxy for household wealth and disposable income. It was classified as poor, medium and high. Those in the high wealth index are expected to experience the lowest fatalities of their children (Hill et. al 2001).

Access to a flush or a pit toilet is potentially a very important determinant of infant in developing countries. Children in households that lack such access could have higher exposure than other children to diseases such as tetanus and digestive disorders (Puffer and Serrano 1978; UN 1985). Environmental factors such as source of water supply, type of sanitation facility available and quality of dwelling have been linked to morbidity and subsequent mortality (Victoria et al, 1986).

Faecham points out that, of the infectious diseases related to water supply and lavatory facilities, diarrheal diseases are of the greatest importance and that the reduction of these diseases would be the major benefit of programmes launched to improve dwelling units and the facilities therein. Rowland (1979) argues that the transmission of infectious diseases in Africa through a polluted water-supply or unsanitary lavatory facilities contributes to the contamination of traditional weaning foods.

2.2.2 Mother's type of place of residence

This is the place where the mother resides. It was grouped in terms of rural and urban. In developing countries living conditions are generally worse in rural areas than in urban areas, and healthcare facilities are less readily available and tend to be of poor quality. These differences usually result in higher infant and child mortality in rural areas than in urban areas (Pandey 1998). When no other variables are controlled, babies born in rural areas are

more likely to die. This evidence is not due to rural residence per se but on other factors e.g. poor sanitation and less well educated mothers, which are correlated with rural areas (Da Vanzo et al, 1983).

2.3 Socio-cultural factors

2.3.0 Marital status

According to Gyiamah (2005) in his paper on polygamous marital structure and child survivorship in Ghana and whether it was an age dependent effect, in the multivariate analysis, children in polygamous families were consistently found to be at a higher risk of death than those from monogamous families (Kiragu 2005).

Behm (1983) reports that in a study in Bangladesh, the mortality of widowed or divorced mothers was found to be higher than that of the currently married. Probable explanation for this is that widowhood and divorce are associated with substantial stress which may in turn affect child health (UN 1985).

Continuity and frequency of marriage has also been considered as a determinant of child mortality. Discontinuity in marriage is expected to reduce the resource available for raising children, particularly children from earlier marriages. Separation of the original spouse means that at least one of them is not physically living with the child to provide the resource normally expected (UN 1985).

2.3.1 Religion

A study conducted in India by (Pandey et al 1998), found that religion and membership in a scheduled caste or scheduled tribe is known to affect many aspects of life in India and is likely to affect levels of infant and child mortality as well. Some of the effects of religion and caste/tribe membership on mortality may be due to differences in lifestyle based on traditions and beliefs. Such differences may include customary practices related to child birth, infant feeding, and health care and these should have an effect on infant and child mortality independently of other variables. Part of the effect of religion and caste/tribe membership on mortality, however, may be due to other, related, socioeconomic conditions (Pandey et al., 1998).

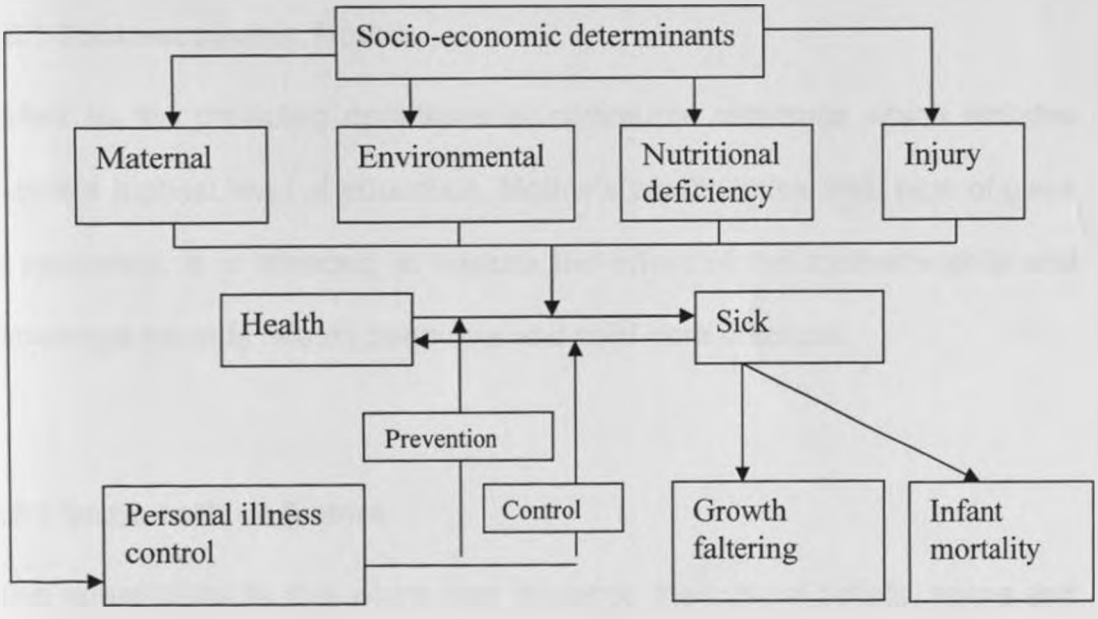
2.4 Theoretical framework

Since the purpose of this study was to asses the determinants and differentials of infant mortality in Kenya and Tanzania, Mosley and Chen framework for child survival has been used, but with modification to suit the study. The framework is based on the premise that all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms or proximate determinants to exert an impact on mortality.

Correlation between mortality and socio-economic characteristics are used to generate causal inferences about the mortality determinants (Mosley and

Chen 1984). The model has been chosen because it is the most popular and widely adopted model in child survival studies. It is considered to be the most crucial and most comprehensive in most systematic analytical frameworks for the study of child survival in developing countries. It encompasses a biosocial approach to child survival and by extension, infant survival. Furthermore it is a flexible model that can be modified to suit particular situations.

Fig. 1 Mosley & Chen Framework for the study of child survival



Source: Mosley W.H and Chen L.C (1984). Population and development review, a Supplement of volume 10:29

2.5 Definition of key concepts

Foregoing are the definitions of the concepts used in this study.

2.5.0 Infant mortality rate (IMR):

The number of deaths occurring to children under one year of age per 1000 live births. It is the probability of dying before the first birthday.

2.5.1 Socio-economic factors

Refers to the prevailing conditions of communal relevance which includes mother's highest level of education, Mother's wealth index and, type of place of residence. It is intended to capture the effect of the mother's skills and knowledge towards related behaviour and child care practices.

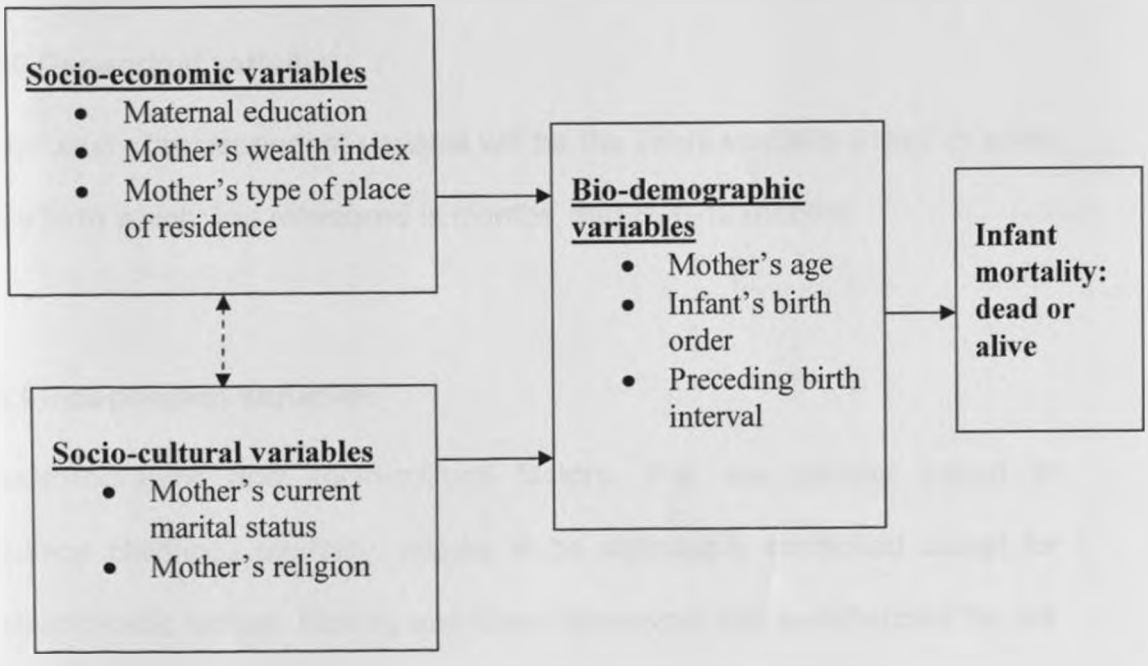
2.5.3 Socio-cultural factors

This refers to the factors which may influence the cultural beliefs, norms and practices that people adopt. They include religion, ethnicity and marriage type. Religion is postulated to influence people's attitudes, beliefs and practices, which may have implications on child weaning practice, use of health services and general childcare. Al these have implications on infant survival status. Marital status is a socio-cultural factor that has implications on availability of economic resources that impact on the standard of living hence affecting infant mortality.

2.5.4 Bio-demographic factors

This comprises age of the mother at birth, birth order of the infant, preceding and succeeding birth interval, size of the infant at birth, length of time the infant is breastfed and the survival status of the preceding sibling. Birth order and preceding birth interval have combined to form a composite variable to take care of confounding effects on each other.

Fig. 2 Operational framework for the study of infant mortality



Source: Adapted from the Mosley and Chen Framework, 1984:25.

2.6 Operational hypothesis

1. The higher the mother's education the lower the chances of infant mortality and vice versa.

2. A mother's type of place of residence has a relationship with an infant's survival status.
3. A mother's wealth index is associated with an infant's survival status.
4. The higher the age of the mother at the time of birth, the higher the chances of an infant's death.
5. A mother's marital status has a relation with an infant's chances of survival.
6. High birth orders and short preceding birth intervals are associated with infant deaths.

2.6.0 Dependent variable

In this study the dependent variable will be the infant mortality (dead or alive) since birth which was measured in months, that is, 0-12 months.

2.6.1 Independent variables

Bio-demographic and socio-cultural factors, that are usually known to influence childhood mortality, require to be statistically controlled except for socioeconomic factors. Mosley and Chen framework has summarized the link between causal factors and infant and child mortality. The demographic and health surveys have, however, not incorporated all of them but have included those that are of utmost interest for public policy and for which there are interventions known for reducing mortality (Rutstein, 2000).

2.7 Variable definition and measurement

2.7.0 Highest level of education

This refers to the highest formal schooling attained by the mother. It is intended to measure knowledge and the skills of the mother in infant care as well as acting as a proxy for household income. It was categorized into no education, primary education and secondary plus. The expected usual trend was that the risk of an infant's death would decrease with the increase in the level of mother's education.

2.7.1 Mother's age

This will be used as a proxy for mother's physiological, mental and emotional maturity as well as the mothers experience with childcare (Ikamari 1996) and for the purposes of the focus of this study, infant care. It will be classified as under 20, 20-34 and 35 years and above. As usual, it is expected that infants born to mothers aged 20 and below and over age 35 will have higher mortality compared to those from aged between 20 and 35 years.

2.7.2 Religion

Refers to the religious group to which the mother belongs. Three categories were created which comprise; Catholic, Protestant/other Christian, and Muslim/no religion/other.

2.7.3 Marital status

This variable refers to the mother's marital status. It has been given three categories, that is, never married, currently married and formally married.

2.7.4 Birth order

This variable refers to the order in which the children were born. The variable has four categories which are; first births, 2-3 and 4+. The risk of death was expected to be higher among first and higher order births. For the sake of taking care of confounding effects of birth order and preceding birth interval (since first births do not experience preceding interval) the birth order and preceding birth interval variables were combined to come up with a new variable. The new variable created, named birth order and preceding birth interval, has the following categories: First births; 2 to 3 and <24; 2 to 3 and >24; 4+ and <24; and 4+ and >24.

2.7.5 Preceding birth interval

This variable refers to time in months calculated as the different between the current birth and the previous birth. The variable has three categories which are <24 and >24 months and first interval. Infant mortality was expected to higher when siblings were born at an interval of less than 24 months. This variable was combined with birth order to form one composite variable known

preceding birth interval and birth order. The categories for the newly created variable are shown on the variable earlier on described, that is, birth order.

2.7.6 Type of place of residence

This refers to the place where the mother resides. It has two categories, which are rural and urban areas.

CHAPTER 3: DATA AND METHODOLOGY

3.0 Introduction

This chapter details the data source and the methodology used in this study. Data analytical methods, which informed the study findings, have also been discussed.

3.1 Data Source

This study will utilize the 2003 and the 2004-5 Kenya and Tanzania Demographic and Health Surveys' data, respectively, which are nationally representative surveys conducted in these countries. Child files from the two surveys, capturing information about a nationally representative sample of 5949 women in Kenya and 8564 women in Tanzania, on the last five years prior to the surveys have been utilized. The 2004-05 TDHS is the sixth in a series of national surveys conducted in Tanzania while the 2003 KDHS is the third of its kind. They are designed to measure levels, patterns, and trends in demographic and health indicators. Data sets for the countries (children's recode) were requested from Measure DHS, and h variables of interest to the study were extracted from the data sets.

In each of the two surveys each female respondent (15-49) was asked on an individual interview (using the women's questionnaire) to repot on the number of sons and daughters who lived with her, the number who lived elsewhere and the number who have died. The women where also asked to provide a detailed birth history of their childbearing experience covering details such as

sex, date of birth, whether a birth was single or multiple, survival status of the birth, current status of each birth and, if not alive, the age at death of each live birth.

3.2 Data quality

The data for mortality estimates were collected in the birth history section of the women's questionnaire. The quality of mortality estimates calculated from retrospective birth histories depends upon the completeness with which the births and deaths are reported and recorded (CBS et al, 2004; NBSD et al, 2006). Another potential data quality problem is the selective omission from the birth histories of births who did not survive, which can lead to underestimation of mortality rates. As recorded in the analysis of the Demographic and Health Surveys, other potential problems include displacement of birth dates, which may cause a distortion of mortality trends, and misreporting of the age at death, which may distort the age pattern of mortality. When selective omission of childhood death occurs, it is usually most severe for deaths in early infancy. Underreporting of early infant deaths is most commonly observed for births that occurred long before the survey; hence it is useful to examine the ratios over time (CBS et al, 2004; NBSD et al, 2005).

3.2.0 Sex ratios at birth

In many African societies, there is the tendency to prefer male children over female ones, probably due to patrilineal nature of African societies. Consequently, women tend to remember and report their male children better than there female ones (Singh, 1997). This consequently affects the quality of data due to omission of female births.

3.3 Methods of data analysis

Methods of data analysis include descriptive statistics and binary logistic regression since the dependent variable is dichotomous. Infant mortality will be the dependent variable while type of place of residence, religion, marital status, maternal age at birth, preceding birth interval, birth order, mother's highest level of education and wealth index, will be the independent variables. It is good to note that, birth order and preceding birth interval have been combined together, to avoid confounding effects they have on each other since they are closely related.

3.3.0 Bivariate Analysis

Descriptive analysis at a population level allows the comparison of distribution of suspected factors. The statistical measures used here to interpret the association and test the levels of correlation between variables under study include:

Frequency distributions were used to show the distribution of the infant mortality by the selected background variables and their values of their mothers. Cross tabulations were also used at the bivariate level of analysis to establish relationships between infant mortality and the selected variables. It was useful in the initial examination of the nature of relationship between or among the variables, and to determine if there was any association between dependent variable and independent variable. However, it gives the percentage distribution of various variables but it does not tell us anything about the relationship between the two variables other than the presence or absence of the association.

The bivariate analyses, based on an underlying normal distribution of data were used to test the goodness of the fit. It is a general test, testing whether or not frequencies, which have been empirically obtained, differ significantly from those, which would be expected under a certain set of theoretical assumptions. It determines the level of association between the variables under study for all cross tabulations and isolates the significant independent variables. The tests were used to test the significance of associations between infant mortality and each independent variable, without giving the direct effect of relationships. The calculated Chi- Square Test is designated by:

$$X^2 = \frac{(O_1 - E_1)^2}{E_1}$$

3.3.1 Logistic regression

Multivariate logistic regression was used to assess the net effect of socio-economic, and bio-demographic variables on the risk of infant death. It was also used to identify the mechanism through which the socio-economic and bio-demographic variables influence the risk of infant deaths in Kenya and Tanzania.

Logistic regression was used to determine the probability of an infant death occurring given certain existing conditions (covariates). This method has been chosen because the dependent variable is dichotomous.

Logistic model is also an extremely flexible and easily used function. It lends itself to a biological meaningful interpretation (permits multivariate analysis of risk perception for estimating infant mortality).

CHAPTER 4: CHARACTERISTICS OF THE STUDY POPULATION

4.0 Introduction

This chapter presents the characteristics of the study population. Frequencies have been shown in table 4.0. The total number of births was 5949 and 8564 in Kenya and Tanzania, respectively. Out of these births, 404 infants in Kenya and 527 in Tanzania died before celebrating their first birthday. Descriptive statistics have been used to test the association between infant mortality and the independent variables.

4.1 Characteristics of the Study Population

The table 4.0 below shows a summary of births by background characteristics of the women responsible for such births in the study countries. In Kenya, infants dead were 6.8 percent against 93.2 percent of the total births. Tanzania had 6.2 percent of dead infants against the 93.8 percent of the total births. Tanzania had a smaller percentage of infants dead versus the total births compared to Kenya, although the difference was minimal.

Table 4.0: Percentage distribution of the study population by background characteristics

	KENYA		TANZANIA	
Characteristics	Number	Percentage	Number	Percentage
Infants mortality				
Other	5545	93.2	8037	93.8
Dead infants	404	6.8	527	6.2
Wealth Index				
Poor	2616	44.0	3634	42.4
Medium	1077	18.1	1717	20.0
Rich	2256	37.9	3213	37.5
Type of place of residence				
Urban	1534	25.8	1472	17.2
Rural	4415	74.2	7092	82.8
Religion				
Catholic	1252	22.5	3360	39.2
Protestant/other Christian	3555	59.8	2092	24.4
Muslim/No religion/other	1142	19.2	3112	36.3
Highest education level				
No education	1210	20.3	2404	28.1
Primary	3456	58.1	5440	63.5
Secondary+	1283	21.6	720	8.4
Mother's age at birth				
<20	872	14.7	1162	10.7
20-34	4311	72.5	6100	71.2
35+	766	12.9	1302	15.2
Birth order and prec. b interval				
First births	1488	25.0	1826	21.2
2-3 and <24	530	8.9	529	6.2
2-3 and>24	1565	26.3	2443	28.5
4+ and <24	521	8.8	591	
4+ and >24	1845	31.0	3175	37.1
Marital status				
Never married	355	6.0	328	3.8
Currently married	5113	85.9	7496	87.5
Formally married	481	8.1	740	8.6
	(n)=5949		**(n)**=8564	

Source: Analysis of 2003 KDHS and 2004-5 TDHS data.

Mothers of poor wealth index category were more than the total number of mothers of the other two wealth index categories, in both countries. In Kenya

mothers at the poor wealth index category were 44.0 percent of the total, while in Tanzania they were 42.4 percent. Births to mothers aged less than 20 years were 14.7 percent in Kenya, while in Tanzania they were 10.7 percent. As expected, births to mothers aged between 20 and 34 were the majority in both countries. This shows that most of the births were concentrated within this age bracket since this is the most fertile age and also because majority of women at this age are usually married consequently exposing them to higher fertility. About three quarters of births were to mothers who were living in rural areas and majority had primary education, in both countries. 58.1 percent of births were to mothers who had primary education while 63.5 had the same level of education in Kenya and Tanzania respectively. Births to mothers who were residing in the rural Kenya were 74.2 percent against Tanzania's 82.8 percent.

In terms of marital status, most of the births were to mothers who were married at the time of their births. Births to mothers currently married were 85.9 and 87.5 percent in Kenya and Tanzania respectively. Kenya had a higher percentage of births to mothers who were professing Christian faith, and particularly protestant/other Christian, that is, 59.8 percent, against Tanzania's 24.4 percent. Majority of women by religion in Tanzania were Catholics.

Most infants were concentrated to birth order 4 and above with preceding birth intervals greater than 24 months, in the two study countries. In both countries

some children were also concentrated at first births category as well as birth order two to three, with preceding birth interval greater than 24 months.

In conclusion, it was expected that in Tanzania there were more infant deaths compared to Kenya since there were more births, that is, 8564 births against Kenya's 5949.

4.2 Bivariate analysis

Table 4.1 presents chi-square tests in both Kenya and Tanzania, and the percentage of infants dead against the total number of births. It also gives the background characteristics of the mothers to the infants in the two countries.

Bivariate analyses reveal that, in both countries, mother's level of education, and birth order and preceding birth interval were highly associated with infant mortality. The p-values show that there is significant association between mother's education and infant mortality. In Tanzania, type of place of residence, mother's highest level of education and age at birth were also highly associated with infant mortality. Nevertheless, wealth index and religion had no association with infant mortality in both countries.

Table 4.1: Associations between infant mortality by selected covariates

	KENYA			TANZANIA		
Characteristics	Dead Infants (%)	Other (%)	Total	Dead Infants (%)	Other (%)	**Total**
Wealth Index						
Poor	47.3	43.7	2616	47.6	42.1	3634
Medium	17.8	18.1	1077	21.3	20.0	1717
Rich	34.9	38.1	2256	31.1	37.9	3213
X^2=2.138 df=2 sig=0.343				X^2= 6.061 df=2 sig=0.48		
Type of place of residence						
Urban	25.5	25.8	1534	14.4	17.4	1472
Rural	74.5	74.2	4415	85.4	82.2	7092
X^2 =0.019df=1 sig=0.890				X^2= 10.104 df=2 sig=0.006		
Religion						
Catholic	18.1	21.3	1252	38.7	39.3	3360
Protestant/other Christian	60.6	59.7	3555	25.2	22.9	2092
Muslim/No religion/other	21.3	19.0	1142	36.1	36.4	3112
X^2 =2.88 df=2 sig=0.238				X^2=0.202 df=2 sig=0.904		
Highest education level						
No education	25.0	20.0	1210	33.2	27.7	2404
Primary	59.2	58.0	3456	62.0	63.6	5440
Secondary+	15.8	22.0	1283	4.7	8.6	720
X^2=11.300 df=2 sig=0.004				X^2=14.433 df=2 sig=0.001		
Mother's age at birth						
<20	13.6	14.7	872	19.2	13.2	1162
20-34	69.6	72.7	4311	67.0	71.5	6100
35+	16.8	12.6	766	13.9	15.3	1302
X^2=6.096 df=2 sig=0.047				X^2=15.059 df=2 sig=0.001		
Birth order & prec birth interval						
First births	20.0	26.6	1488	26.2	21.0	1826
2-3 & <24	12.4	8.1	530	7.0	6.1	529
2-3 & >24	21.8	31.3	1565	24.5	28.8	2443
4+ & <24	18.1	8.1	521	13.3	6.5	591
4+ & >24	27.7	31.3	1845	29.0	37.6	3175
X^2=57.915 df=4 sig=0.000				X^2=53.041 df=4 sig=0.000		
Marital status						
Never married	5.4	6.0	355	5.1	3.7	328
Currently married	84.4	86.1	5113	83.7	87.8	7496
Formally married	10.1	7.9	481	11.2	8.5	740
X^2=2.599 df=21 sig=0.273				X^2= 7.644 df=2 sig=0.022		
	(n)dead=404	**(N)**=5949		**(n)dead**=527	**(N)**=8564	

Source: Analysis of 2003 KDHS and 2004-5 TDHS data.

Marital status was associated with infant mortality at 95 percent confidence level in Tanzania, while in Kenya there was no association at all. It is worth noting that mother's age at birth was associated with infant mortality at 95 and 99 percent confidence level in Kenya and Tanzania respectively.

CHAPTER 5: DETERMINANTS OF INFANT MORTALITY IN KENYA AND TANZANIA

5.0 Introduction

This chapter presents a discussion of the determinants and differentials of infant mortality in Kenya and Tanzania. Analysis was based on the information from women interviewed using the women's questionnaire, on their child bearing experience, from KDHS 2003 and TDHS 2004-5. The total number of infants dead was 404 and 527 in Kenya and Tanzania, respectively.

Multivariate logistic models are presented and discussed. The aim is to determine the effect of selected independent variables which are wealth index, type of place of residence, highest level education, marital status, mother's age at birth, religion, birth order and preceding birth interval. Table 5.1 present multivariate results of the relationship between infant mortality and the selected independent variables, in the study countries. The overall analysis model was fitted to establish then importance of key factors influencing infant mortality in the two study countries.

Three models have been shown in table 5.1 below. *Model I* and *II* present the socio-economic factors and their effects on infant mortality. Table *III* shows the odds ratios, when either bio-demographic and socio-cultural factors, or socio-economic and socio-cultural factors are controlled for to establish their net effects on either socio-economic or bio-demographic factors.

Table 5.0: Multivariate logistic regression of infant mortality against selected variables

	Model I		*Model* II		*Model* III	
Variables	Kenya	Tanzania	Kenya	Tanzania	Kenya	Tanzania
	Exp(B)	**Exp(B)**	**Exp(B)**	**Exp(B)**	**Exp(B)**	**Exp(B)**
Type of residence						
Urban(RC)	---	---			---	---
Rural	.894(.146)	1.027(.142)			.904(.148)	1.089(.143)
Wealth index						
Poor (RC)	---	---			---	---
Medium	.978(.147)	.972(.118)			.991(.148)	.979(.119)
Rich	.924 (.148)	.822(.119)*			.964(.150)	.837(.121)
Education level						
No education (RC)	---	---			---	---
Primary	.828(.129)	.851(.100)			.844(.154)	.841(.103)*
Secondary+	.584(1.79)***	.525(.230)***			.603(.205)**	.515(.233)***
Bord/prec.Interval						
First births (RC)			---	---	---	---
2 to 3 and <24			1.879(.195)***	1.050(.200)	1.861(202)***	1.007(.202)
2 to 3 and >24			1.080(.174)	.816(.148)	1.067(.180)	.779(.150)*
4+ and <24			2.772(.195)***	1.989(.179)***	2.607(.208)***	1.824(.183)***
4+ and >24			1.069(.182)	.743(.158)*	.991(.1914)	.686(.162)**
Mage at birth						
<20 (RC)			---	---	---	---
20 to 34			.882(.177)	1.063(.147)	.968(.181)	.768(.150)*
35+			1.195(.235)	1.451(.148)**	1.295(.240)	.806(.209)
Religion						
Catholic(RC)					---	---
Protestant/other Ch					1.180(.139)	.973(.119)
MuslimNoreligion					1.005(.186)	.894(.108)
Marital status						
Never married (RC)					---	---
Currently married					.818(.243)	.774(.217)
Formally married					1.151(.286)	1.101(.251)
Constant	.061	.067	.101	.080	.083(.329)***	.139(.265)***

Parenthesis (standard error); * * * P< 0.01; * * P< 0.05; * P< 0.10;
blank space=reference category(RC)
Source: Analysis of 2003 KDHS and 2004-5 TDHS data.

5.1 Kenya

5.1.0 socio-economic factors

In Kenya, mother's level of education and particularly secondary+ category was found to be a significant predictor of infant mortality at 99 percent

confidence interval. Infants born to mothers with Secondary+ level of education were 41.6 percent less likely to experience deaths compared to infants born to mothers with no education. This finding is in conformity with the findings of Pandey et al, that literate mothers usually give birth to healthier babies because they themselves tend to be healthier than mothers who are illiterate. Literate mothers are also more likely to provide their children with a healthy environment and nutritious food than illiterate mothers even when other conditions are similar (Pandey et al., 1998).

Infants born to mothers with primary education were found to be 25.6 percent less likely to die compared to the reference category. This is consistent with what is already documented in theory by accredited scholars. Caldwell (1979) found that educated women are more likely to be proactive, taking initiatives in providing the best care for their children and willing against traditional norms to access modern health care facilities for children, increasing their rate of survival.

Type of place of residence and wealth index had weak relationships with infant deaths, even after controlling for bio-demographic and socio-cultural factors .

5.1.1 Bio-demographic Factors

Birth order and preceding birth interval were found to be highly significant predictors of an infant's death. Infants of birth order 4 and above and born within a preceding birth interval less than 24 months were 177.2 percent likely

to die compared to those of first births category. Similarly, those of birth order 2 to 3 and born less than 24 months preceding birth interval showed a high risk of death, 87.9 percent compared to the reference category, first births. This confirms theoretical findings by other esteemed scholars that Children having short previous birth intervals are at a much greater risk of death than those with longer intervals (Luther, N.Y and Thapa, S. 1999).

Maternal age at birth was not significant therefore it had weak relationship with infant mortality.

5.1.2 Socio-cultural factors.

Socio-cultural factors had a weak relationship with infants' deaths. Neither of the two variables were significant.

5.2 Tanzania

5.2.0 socio-economic factors

Mothers of the rich wealth index category were 17.8 percent less likely to experience deaths compared to those born to poor mothers, the reference category. Mother's level of education was highly significant at secondary+ category. Infants born to mothers with secondary+ education were 47.5 percent less likely to die compared to infants born to mothers with no education. This is also expected since education of the mother has been established as a predictor of infant mortality. This is also in accordance to

what other scholars have found out, that education of women (especially mothers) and infant mortality are intrinsically related (Caldwell 1979) .

5.2.1 Bio-demographic Factors

Preceding birth interval and birth order as well as mother's age at birth were found to be significant predictors of infant mortality. Infants birth order 4 and above and born less than 24 months preceding birth interval were 98.9 percent likely to experience deaths compared to those of first births. However, infants of birth order 4 and above with 24 months preceding birth interval had relatively less than chances of dying. They were 25.7 less likely to die compared to first births.

After controlling for socio-economic and socio-cultural variables, infants born to mothers between ages 20 and 34 were 0.768 times less likely to die compared to those born to mothers below 20 years. This is in conformity to general expectation that, infants born to young and older mothers have higher chances of dying compared to those born to mothers between ages 20 and 34. Infants born to mothers below 20 years had the highest risk of death.

5.2.2 Socio-cultural factors.

Socio-cultural factors were weakly related with infant mortality. However, marital status, particularly currently married mothers exhibited some

significance at 90 percent confidence level. Infants born to mothers who were currently married stood 30.1 percent chance of dying.

5.3 Comparative discussion

Education of the mother seems to be a very important determinant of infant mortality in both Kenya and Tanzania. Education of the mother, for example, was highly significant especially at secondary+ category at 99 confidence level in both countries. Infants born to mothers with secondary plus level of education were 0.584 and 0.525 times less like to experience deaths in Kenya and Tanzania respectively. After controlling for bio-demographic and socio-cultural factors, the odds ratios for education in the two countries were affected by a small margin. In Kenya the odds ratios increased from 0.584 to 0.603 and so was the significance at 99 and 95 percent confidence levels. Tanzania's odds ratios on the contrary decreased from 0.525 to 0.515 but the level of significance remained the same, at 99 percent confidence level. This implies that secondary+ education was more significant in Tanzania than in Kenya even after the controls.

Wealth index and type of place of residence remained weak determinants of infant mortality in both countries. However, in Kenya the rich category was significant at 90 percent confidence level, but after controlling for socio-cultural and bio-demographic factors, the same category became insignificant.

Birth order and preceding birth interval were found to be major predictors of infant deaths in both countries, with Kenya exhibiting higher significance at birth order 2 to 3 and preceding birth interval less than 24 months at 99 confidence level. Infants born to Tanzanian mothers were likely to experience

death at birth order 4 and above and preceding birth interval either less than or greater than 24 months, as opposed to Kenya were birth order 2 to 3 and preceding birth interval less than 24 months was quite significant. Infants of birth order 2 to 3 and preceding birth interval less than 24 months in Kenya were 87.9 percent likely to experience death compared to first birth infants. After controlling for socio-economic and socio-cultural factors the level of significance remained the same but the odds ratios dropped slightly from 1.879 to 1.861. It was interesting to note that, in Tanzania the same category wasn't weakly associated with infant mortality even after controlling for socio-economic and socio-cultural factors. However, birth order 4+ and preceding birth interval less than 24 was highly significant. Infants born less than 24 months and of birth order 4+ in Kenya were 177.2 percent likely to experience death but after controlling for socio-economic and socio-cultural factors the percentage dropped to 160.7. In Tanzania, the same category, infants were 98.9 percent likely to experience deaths compared to the reference category. After the controls, the percentage dropped to 82.4 percent.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSION

6.0 Introduction.

This chapter presents recommendations and conclusions of the study findings. The recommendations are based on the differentials which are existent between the two countries.

6.1 Recommendations to policy makers

Infant mortality in Kenya has been on the increase for quite a stretch of time. Nevertheless, there seems to be some light at the end of the tunnel since education, which was found in this analysis to be a significant determinant of infant mortality, has in the recent past been a major area of concern.

Family planning programmes are highly recommended by the findings of this study since birth order 4+ and preceding birth interval <24 months were found to be highly significant determinant of infant mortality. According to the 2003 KDHS, the length of birth interval has a significant impact on an infant's chances of survival, with short birth intervals considerably reducing the chances of survival. As the birth interval gets longer the mortality risk is reduced considerably (CBS et al, 2004). If mothers were educated on family planning methods, there would be lesser chances of infant mortality due to the short birth intervals and high birth orders. Although contraceptive knowledge and use have increased since the 1998 KDHS, there is still need to increase

more family planning programmes to help salvage the increasing infant mortality rates in Kenya.

6.2 Recommendations for further research

This study recommends that further research needs to be done to establish what really accounts for the differentials in infant mortality in Kenya and Tanzania. It seems like there are other factors which are responsible for the differentials, which probably were beyond the scope of this study.

Further research is also recommended on the socio-economic and bio-demographic determinants of infant mortality in the two countries since there has been changes in the actual IMR and, therefore, the trend in Kenya might have changed since there seems to be increasing literacy levels as a result of the introduced Free Primary Education. This has implications on the IMR since there is a strong relationship between mother's education and infant mortality. Such a research will also be useful in evaluating the extent to which we, as a country, have been able to meet the set goals before 2015, the MDGs' target year for the realization of the set goals.

6.3 Conclusion

This study concludes that more or less the same factors are responsible for infant mortality in Kenya and Tanzania. There were, however, differentials in the determinants of infant mortality between and within the two countries. The socio-economic factors that have been found accountable for infant mortality

are mother's education in both countries. In Tanzania, wealth index was also found to have a weak relationship with infant mortality after controlling for bio-demographic and socio-cultural factors. There was no relationship between wealth index and infant mortality in Kenya even after the controlling for both socio-cultural and bio-demographic factors.

Bio-demographic factors responsible for infant mortality in the two countries were birth order and preceding birth interval, with maternal age at birth in Tanzania exhibiting significance at $p<0.05$ after controlling for socioeconomic and socio-cultural factors. In Kenya maternal education had no relationship with infant mortality even after controlling for bio-demographic and socio-cultural factors.

Mother's education is however, still below par and, if we are to achieve the MDGs within the remaining time period, concerted efforts to improve on girl-child education are highly recommended by this study findings. Several scholars have confirmed that educated women have children with increased chances of survival (Rutestein, 2000; Gyimah, 2002; Ikamari, 1996; Omariba, 2005 e.t.c). Education has been given a weighty consideration in the Millennium Development Goals (MDGs), especially that of the girl child.

Birth order and preceding birth interval had a strong association with infant mortality and has been found to be very significant, at 1 percent level at for infants of birth order 4 and above and with preceding birth interval less than 24

months. The two Demographic and Health Surveys established that children born less than two years after a prior sibling suffer substantially higher risks of death than children born after intervals of two or more years.

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APPENDIX

Appendix 1a: Multivariate logistic regression of infant mortality against selected variables: Kenya

Variables	B	S.E	df	Sig	Exp(B)
Type of place of residence					
Urban (RC)	---	---	---	---	---
Rural	-.101	.148	1	.495	.904
Wealth index					
Poor (RC)	---	---	2	.970	---
Medium	-.009	.148	1	.949	.991
Rich	-.037	.150	1	.807	.964
Highest education level					
No education (RC)	---	---	2	.036	
Primary	-.169	.154	1	.271	.844)
Secondary+	-.505	.205	1	.014	.603
Religion					
Catholic (RC)	---	---	2	.372	---
Protestant/other Christian	.165	.139	1	.234	1.180
Muslim/no religion/other	.005	.186	1	.978	1.005
Marital status					
Never married (RC)	---	---	2	.123	---
Currently married	-.200	.243	1	.410	.818
Formally married	.140	.286	1	.624	1.151
Birth order & preceding birth interval					
First births(RC)	---	---	4	.000	---
2 to 3 and <24	.621	.202	1	.002	1.861
2 to 3 and >24	.064	.180	1	.720	1.067
4+ and <24	.958	.208	1	.000	2.607
4+ and >24	-.009	.194	1	.962	.991
Mother's age at birth					
<20 (RC)	---	---	2	.185	---
20 to 34	-.033	.181	1	.856	.968)
35+	.258	.240	1	.281	1.295
Constant	-2.489	.329	1	.000	.083

Source: Analysis of 2003 KDHS and 2004-5 TDHS data.

Appendix 1b: Multivariate logistic regression of infant mortality against selected variables: Tanzania

Variables	B	S.E	df	Sig	Exp(B)
Type of place of residence					
Urban (RC)	---	---	---	---	---
Rural	.085	.143	1	.554	1.089
Wealth index					
Poor (RC)	---	---	2	.315	---
Medium	-.021	.119	1	.858	.979
Rich	-.178	.121	1	.140	.837
Highest education level					
No education (RC)	---	---	2	.013	---
Primary	-.174	.103	1	.091	.841
Secondary+	-.663	.233	1	.005	.515
Religion					
Catholic (RC)	---	---	2	.565	---
Protestant/other Christian	-027	.119	1	.819	.973
No religion/no religion/other	-.112	.108	1	.301	.894
Marital status					
Never married (RC)	---	---	2	.238	---
Currently married	-.256	.217	1	.238	.774
Formally married	.096	.251	1	.701	1.101
Birth order & preceding birth interval					
First births (RC)	---	---	4	.000	---
2 to 3 and <24	.007	.202	1	.972	1.007
2 to 3 and >24	-.250	.150	1	.095	.779
4+ and <24	.601	.183	1	.001	1.824
4+ and >24	-.377	.162	1	.020	.686
Mother's age at birth					
<20 (RC)	---	---	2	.205	---
20 to 34	-.264	.150	1	.079	.768
35+	-.216	.209	1	.303	.806
Constant	-1.970	.265	1	.000	.139

Source: Analysis of 2003 KDHS and 2004-5 TDHS data.