FACTORS INFLUENCING UNDER FIVE MORTALITY IN URBAN AND RURAL KENYA

By

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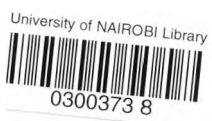
Q50/71137/07

A PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN POPULATION STUDIES, UNIVERSITY OF NAIROBI



OCTOBER, 2009

DECLARATION

This project proposal is my original work and has not been presented for a degree in any other University.

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This project proposal has been submitted for examination with our approval as the university supervisors:

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MR. ANDREW MUTUKU

DEDICATION

I dedicate this research project to my father Japheth Kilobi, an educationist, and my mother Rispah N. Kilobi, for all kinds of support rendered to me during the course of my studies.

ACKNOWLEDGEMENT

In the first place, I thank the Almighty God who has enabled me to successfully complete this research project.

I am grateful to the Government of Kenya in general and the department of Civil Registration in particular, for granting me study leave to undertake this master's degree course in Population Studies.

My heartfelt thanks also go to the entire teaching staff of the Population Studies and Research Institute (PSRI), and particularly to my supervisors: Dr. Anne Khasakhala and Mr. Andrew Mutuku who have supervised me and enabled me to complete this project. Not forgetting Dr. Lawrence Ikamari who assisted me in the study analysis.

My appreciation also goes to my parents especially my mother for her support and encouragement during the time of my studies and my sister Alice for taking care of my family during my studies. I am also indebted to my friends especially, Symon Muita for his immense support during my studies.

Finally, I would also wish to recognize the administrative staff as well as all my classmates who have been supportive in one way or another throughout my study period at PSRI. May God bless them abundantly.

ABSTRACT

Under five mortality in Kenya has continued to rise since 1989 from 90.9 deaths per 1000 live births to 115 per 1000 live births in 2003, making it improbable that the MDG target of reducing child mortality by two thirds by 2015 will be achieved. It is estimated that approximately, eight out of each 100 live births die before their first birth day, representing huge wastage of potential manpower (CBS, 2004). Differentials by place of residence from the 1989, 1993, 1998 and 2003 KDHS show that under five mortality rate has remained higher in rural areas than in urban areas. In 1989, urban and rural under five mortality was 89 and 91.2 respectively, 1993 was 75.4 urban and 95.6 rural, 1998 it was 88.3 for urban and 108.6 for rural, and in 2003 it was 93 for urban and 117 for rural areas.

The objective of this study was to examine the determinants of under five mortality in urban and rural Kenya. It specifically sought to establish the effects of some socio-economic, bio-demographic, socio-cultural and environmental factors on under five mortality in urban and rural areas.

The study utilized the 2003 Kenya Demographic and Health Survey (KDHS) data. Out of 8,717 eligible women, 8,195 women were successfully interviewed. The data was collected from women aged between 15 and 49 years in Kenya, on children born in the three or five years preceding the survey date either dead or surviving. The number of observations at this level was 5949 (1534 for urban and 4415 for rural) representing the number of live births born for the interviewed women in the period of five years preceding the survey. The main study variables were; maternal level of education, wealth index, maternal occupation, maternal age at first birth, birth order, preceding birth interval, source of drinking water and type of toilet facility while the dependent variable was under five mortality.

The study used a conceptual framework developed from Mosley and Chen framework for the analysis of infant and child mortality. To operationalise this conceptual framework, under five mortality was taken as the dependent variable and several socio-economic,

bio-demographic, socio-cultural and environmental variables were included as the independent variables.

The main methods of analysis were bivariate analysis, which was used to test the levels of correlation between under five mortality and the independent variables, and Cox's proportional hazard model used to measure the net effect of the independent variables on under five mortality. The results of the bivariate analysis revealed significant associations between maternal education, marital status and under five mortality in the urban areas while for the rural areas, maternal education, preceding birth interval and source of drinking water were statistically significant. However, occupation, wealth index, maternal age, birth order, religion and type of toilet were not statistically significant in this study in both the urban and rural areas. The results of the multivariate analysis revealed that maternal education and marital status were significantly associated with under five mortality in the urban areas while preceding birth interval, source of drinking water and maternal education were significantly associated with under five mortality in the rural areas.

The main policy recommendation for this study is the integration of under five survival programmes with family planning programmes especially in the rural areas to lengthen birth intervals in order to lower under five mortality associated with short birth intervals and promotion of education of the girl child.

Further studies need to be conducted to determine the mechanisms through which socio-economic and some bio-demographic factors influence under five mortality in urban and rural Kenya, since they were not clear in this study.

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CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

1.1 Introduction

Under five mortality (U5MR), the probability of dying between birth and age five expressed per 1000 live births, commonly on the agenda of public health and international development agencies, has received renewed attention as part of the United Nation's Millennium Development Goals. Infant mortality (a component of under five mortality) is an important indicator for describing the overall social and economic well being of a country and hence the health status of its people. This is because more than any other age-group of a population, infant's survival depends on the socioeconomic conditions of the environment (Madise et al., 2003). It is one of the components of United Nations Development Index (UN, 2007). Hence its description is very vital for evaluation and planning of the public health strategies (Park, 2005). Under five mortality is largely as a result of infectious diseases, and neonatal deaths in developing countries are related to the availability of health services. Approximately 10 million infants and children under five years of age die each year, with large variations in under five mortality rate, and trends, across regions and countries (Mahay, 2003).

The place of residence, usually in the urban-rural dichotomy has generally been regarded as an important area where meaningful differentials in under five mortality can be observed (Gubhaju, 1987). The differentials are largely attributed to such factors as the difference in the standards of living, accessibility of public health and medical care facilities and differences in the socio-economic status of the families.

Studies on urban-rural mortality differentials in Sub-Saharan Africa show that overall mortality, and under five mortality in particular, is generally lower in urban than in rural areas (Akoto and Tabutin, 1989). Various factors account for this, including the high concentration of salaried workers (who generally have higher incomes) in urban areas, better education in urban areas, the concentration of public infrastructure in urban areas that provides sanitation services, including water supply, with health conditions that are

more favorable in urban than rural areas. However when observed, excess mortality in urban areas is often attributed to natural conditions in the physical environment, to seasonal and climatic conditions in particular, and the precariousness of living conditions in urban areas, caused mainly by the economic crisis.

Rural-urban differentials in infant and child mortality have been documented in several studies in Kenya, where rural residence has been associated with slightly higher infant and child mortality than residence in urban areas (Muganzi, 1984; Mutunga, 2004).On the other hand, Fosto et al (2007) found that although child hood mortality was observed in both rural and urban areas, it was generally faster in slums than in rural areas. Slum children exhibit much higher mortality than those in rural areas of Kenya. However, in their studies, Ikamari (1996) and Venkatacharya (1991) observed that under five mortality in rural areas was higher than in large urban areas, even after controlling for maternal and paternal education, ethnicity and religion.

This study aimed at exploring the factors likely to explain the observed urban-rural differences in under five mortality in Kenya by using the 2003 KDHS. It considered some bio-demographic, socio-economic, socio-cultural and environmental factors as influencing under five mortality in urban and rural areas. The study further explored whether the factors that were said to influence under five mortality differentials between rural and urban areas in earlier studies still existed.

1.2 Problem Statement

Under five mortality in Kenya has continued to rise since 1989 from 90.9 deaths per 1000 live births to 115 per 1000 live births in 2003, making it improbable that the MDG target of reducing child mortality by two thirds by 2015 will be achieved. It is estimated that approximately, eight out of each 100 live births die before their first birth day, representing huge wastage of potential manpower (CBS, 2004). If the country had been on track to meeting the MDG on child mortality, U5MR would be around 105 in 2003. At current trends, mortality rate in children younger than five years will decline by less than15% by 2015 from the 1990 base year, compared to the expected goal of 66.7%. The increase is attributed to contributions of socio-economic, demographic and environmental

factors as well as the impact of HIV/AIDS epidemic, continuous economic crisis and widespread political instability.

Differentials by place of residence from the 1989, 1993, 1998 and 2003 KDHS show that under five mortality rate has remained higher in rural areas than in urban areas. In 1989, urban and rural under five mortality was 89 and 91.2 respectively, 1993 was 75.4 urban and 95.6 rural, 1998 it was 88.3 for urban and 108.6 for rural, and in 2003 it was 93 for urban and 117 for rural areas. However, no recent attempt has been made to study the rural-urban factors determining under five mortality in Kenya since many of the studies have concentrated on estimating mortality levels by different socio-economic, demographic and other factors by regions. This study seeks to contribute to a better understanding of why under five mortality is higher in rural areas than in urban areas in Kenya.

Although it is argued that there is not much difference between under five mortality in rural and urban areas, Fosto J. et al. (2007), a critical question would be whether the same determinants that explain under five mortality in rural areas are the same ones that explain under five mortality in urban areas. For example, to what extend do the socio-economic, demographic, environmental and socio-cultural characteristics of the populations in the different residential areas account for the observed difference in the levels of under five mortality in rural and urban Kenya.

1.3 Objectives of the Study

The general objective of the study was to establish the effects of some socio-economic, bio-demographic, socio-cultural and environmental factors on under five mortality in urban and rural areas of Kenya. The specific objectives of the study were:

i. To establish the socio-economic determinants of under five mortality in rural and urban areas
ii. To determine the bio-demographic determinants of under five mortality in rural and urban areas
iii. To examine the socio-cultural determinants of under five mortality in rural and urban areas.

iv. To determine the environmental determinants of under five mortality in rural and urban areas.

1.4 Justification of the Study

The study of under five mortality is useful in monitoring children mortality in the population which is useful in evaluating the performance of infant and child survival and family planning programmes. The government of Kenya launched the National Population Policy on Sustainable Development (NPPSD) in 2002, which among other goals, aims at improving the health and welfare of the people, health education especially among women and children so as to prevent premature deaths and illness in this group. The findings of this study aim to inspire the government to intensify their effort to lower under five mortality and raise the level of child survival thus contribute to the achievement of the MDG's goal 4.

Differentials of under five mortality in urban and rural areas justify a comparative analysis of the determinants causing this disparity. The significant economic and social inequality in the face of mortality has been an important unsolved problem as under five mortality continues to rise. This study seeks to contribute to the growing evidence base in understanding why under five mortality rate is higher in the rural areas than in the urban areas in Kenya.

The determinants of residential differentials in under five mortality need to be clearly understood since this is crucial in assessing the performance of child health care programs in the two areas over time and setting new goals in meeting the health needs of the society to reduce this disparity.

Improvement in under five mortality may be necessary for prompting a decline in fertility. A fall in fertility can also bring about a reduction in infant and child mortality by reducing high order births which are usually subject to higher risk of mortality.

1.5 Scope and Study Limitations

The study sought to examine the effect of some selected bio-demographic, socio-economic, socio-cultural and environmental factors on under five mortality, in rural and urban areas in Kenya.

The study utilized data from the KDHS 2003. The reliability of the DHS data depends on the completeness with which births and deaths are reported. The data was collected from women aged between 15 and 49 years in Kenya, on children born in the three or five years preceding the survey date, and on relevant socio-economic, socio-cultural and household characteristics covering both rural and urban areas. This study was limited to children, born to the interviewed women in the five years preceding the survey, either dead or surviving. The number of observations at this level was 5949 (1534 for urban and 4415 for rural) representing the number of live births born for the interviewed women in the period of five years preceding the survey.

Recording of child deaths was done retrospectively from birth histories obtained from the women interviewed, which could have led to under reporting especially those deaths that occurred soon after birth, non coverage errors and age heaping. One of the major errors in retrospective data on child survivorship is the omission of children who died, particularly along time ago. If this tendency is stronger among social and geographic groups of higher mortality, observed results will underestimate mortality differentials. Howeve r, these limitations do not affect the findings of the study as the data quality issues were addressed by the basic report of KDHS 2003 and found to be of good quality.

Also, the timing of events for example the index of child mortality for women is tabulated by characteristics of parents at the time of the survey, and observed relationships are often interpreted as reflecting the impact of those characteristics on children's survival chances. However, parental characteristics might have been different during the life and at the time of death of their children e.g. occupation and wealth. This could affect causal influence over time. The assumption in this study was that the covariates vary with time hence the study did not consider time-dependent covariates.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This section reviews literature which endeavors to point out the socioeconomic, bio-demographic, socio-cultural and environmental factors that determine under five mortality in rural and urban areas. The literature review first looks at studies undertaken on urban-rural under five mortality and then further discusses the selected socio-economic, bio-demographic, socio cultural and environmental factors that determine the under five mortality. This is followed by the presentation of the conceptual and operational frameworks which explain how these factors operate to influence under five mortality. Then the hypotheses and a definition of the key variables and their measurements follow.

2.2 Literature Review

2.2.1 Studies in Urban-Rural Under Five Mortality

Rural-urban differentials in under five mortality have been documented in several studies in Kenya, where rural residence has been associated with slightly higher under five mortality than residence in urban areas (Muganzi, 1984; Mutunga, 2004). NCPD (1989) indicated that although rural infant mortality was slightly higher than urban infant mortality, rural and urban child mortality rates were more or less equal. Fosto et al (2007) found that although childhood mortality was observed in both rural and urban areas, it was generally faster in slums than in rural areas. Slum children exhibit much higher mortality than those in rural areas of Kenya. However, the1977/78 Kenya Fertility Survey (KFS) data indicated significant under five mortality differentials by place of residence. Also, in their studies, Ikamari (1996) and Venkatacharya (1991), found that under five mortality in rural areas was higher than in large urban areas, even after controlling for maternal and paternal education, ethnicity and religion.

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 under five 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 evidence per se but on other factors e.g. poor sanitation and less well educated women which are correlated with rural areas (Da Varzo et al. 1983).

Although the place of residence had no significant effects on infant mortality in Indonesia (Hull and Gobhaju, 1986), it was significantly related to child mortality even in the presence of the controls of maternal education, father's education, women work status and ever-use of modern contraception (Pant, 1995). Also, according to the Multiple Indicator Cluster Survey (MICS, 2000), mortality differentials by rural-urban residence can be attributed to better health care services, higher levels of education and improved income in urban areas.

In studying trends in infant and child mortality in Mozambique during and after a period of conflict using the 1997 Mozambican DHS, Macassa G. et al. 2003 found that the levels of infant, child and under five mortality were considerably higher in rural than in urban areas. The possible causes of the different trends were impact of civil war, drought, migration, adjustment programmes and HIV/AIDS. The increase in mortality in urban areas during the last few years before the survey may have been related to the immigration to urban areas of women whose children had high levels of mortality.

Using data from the 1999-2000 Bangladesh Demographic and Health Survey, Islam and Azad 2008, in their study on rural-urban migration and child survival in urban Bangladesh found that although the indices of under five mortality are consistently better in urban areas, the urban-rural differentials in under five mortality have diminished in recent years. Under five mortality is higher among children born to urban migrants compared with children born to life-long urban natives (102 and 62 per 1000 live births, respectively). Within the urban areas, the child survival status is even worse among the migrant poor than among the average urban poor, especially recent migrants. This poor-non-poor differential in childhood mortality is higher in urban areas than in rural areas.

Most studies have shown significant association between socio-economic, demographic factors and under five mortality (Caldwell, 1979; Ikamari, 1996; Mustafa, 2008) or environmental factors (Mutunga, 2004; K'oyugi 1992) through use of survey data. Many under five mortality determinants all over the world are properties of the household within which the child is located which include levels of household income, adult literacy, health practices among household members, sanitary facilities and so on. Other determinants are organization of the health-care system, ecological characteristics such as climate rainfall, presence of disease vectors and distribution of land and resources (Caldwell, 1979; Preston, 1978). The socio-economic factors used in this study include maternal education, wealth index, and type of residence. Bio-demographic factors include age of mother at birth of child, birth order, preceding birth interval. The socio-cultural factors include marital status and religion while the environmental factors are source of drinking water and type of toilet.

2.2.2 Bio-demographic Factors

Changes in reproductive patterns can influence child health and survival through a number of different mechanisms especially through changes in maternal age at child birth, birth order and / or birth intervals. The bio-demographic factors used in this study include age of mother at birth of child, child's birth order, and preceding birth interval.

2.2.2.1 Maternal age at birth

Children born to women of under 20 or over 35 years are likely to have higher risks of mortality. Rutstein (1984) in a cross-national comparative study based on the world fertility Survey (WFS) data from developing countries found that the age of the mother, parity and child mortality relationship had a 'U'-shaped pattern. Mortality risks were highest among children born to very young women and those born to older women and at the first and highest parities. The higher risk of dying among children born to older women may be as a result of a decline in the efficacy in the reproductive system with age and economic pressure in the family while the excess risk at young maternal ages is partly due to their physical immaturity, limited knowledge and confidence in child care (Pandey et al. 1998).

2.2.2.2 Birth order

Mortality is high for first born children and births of very high order, and is low 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 under five mortality. Births of very high order may have women 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 as 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 births are likely to be stronger at older ages.

2.2.2.3 Birth interval

The 2003 KDHS report showed that under five mortality was 182 per 1000 for children born less than two years after the last child (NCPD, CBS & MII, 2003). Birth intervals have been found to be negatively associated with both infant and child mortality. The timing of births has pronounced consequences on infant, child and maternal mortality through sibling competition, maternal depletion and internal effect hypothesis (Hobcraft et al. 1985).

Palloni and Milman (1986) suggest that maternal and sibling competition for maternal attention and other household resources are the possible mechanisms that link short birth intervals and child mortality. Successive births may deplete the mother of energy and nutrition that may lead to pregnancy complications or premature births, increasing the risk of infant and maternal deaths. The early arrival of an infant necessitates premature weaning of the index child exposing the weaned child to malnutrition and increasing their probability of contracting infections and parasitic diseases. Invariably the longer duration of inter-birth interval has been found to increase profoundly the chances of infant survival (Bicego and Ahman, 1996). Disease transmission among closely spaced siblings has been suggested as another mechanism linking short birth interval and survival prospects of the index child (Palloni and Milman, 1986).

2.2.3 Socio-economic Factors

The socio-economic factors include maternal education, residence and wealth index. In his study on what explains rural-urban differentials in child mortality in Brazil, Narayan (1998) found that child mortality rates are substantially and significantly lower in urban areas of Brazil. Differences in socioeconomic characteristics were important in explaining rural-urban child mortality differentials whereby the effects of community characteristics are moderated by household socioeconomic factors, especially maternal education.

2.2.3.1 Maternal education

Female education in Kenya is an important determinant of under five survival. Women with education beyond secondary school had an under five mortality rate of 63 per 1000, while those with no education had an under-five mortality rate of 127 per 1000 live births (NCPD, CBS & MII, 2003). Advances in female education may represent a potent and cost effective means of reducing child mortality (Caldwell, 1979; Preston, 1978). Educated women are less likely to experience childhood deaths because they are thought to have better understanding and appreciation for health related matters. Also, they are less submissive to norms and practices that adversely affect the health and welfare of their children (Gyimah, 2002).

Maternal education may also affect under five survival through its influence on demographic factors such as age at first marriage and age at first birth, parity, and child spacing. Rutstein (1984) found a 'U' shaped pattern of association between child mortality and maternal age at birth in his study based on WFS. Educated women marry and start child bearing later thus avoiding the high risk to child death associated with early pregnancies (Hobcraft, 1993). They cease child bearing earlier, thus avoiding the elevated risks of infant and child mortality associated with advanced maternal age. Educated women also tend to make greater use of contraception, hence lengthening the intervals between births. They are also more likely to seek medical care services for their children including immunization (Caldwell, 1994; Pandey et al., 1998). As cited by Akwara (2000) in her study on socio-cultural factors and child health in Kenya, results of a study carried out in Chogoria (Goldberg et al., 1987) clarify why increased female

education is associated with lower mortality. Increased female education increases the percentage of fully immunized children, improves diarrhea management, increases use of modern family planning, increases use of health facilities and improves the nutritional status of the household.

2.2.3.2 Wealth index

The wealth index is a method developed by the ORC Macro and the World Bank to measure the socioeconomic level for a household in a ranked order. It uses principal-component analysis on the basis of respondent's household assets, amenities, and services. In the 2003 KDHS, this variable covered information on ownership of many ownerships ranging from a television to a bicycle or a car, as well as dwelling characteristics like source of water, sanitation facilities and type of material used in flooring (CBS 2004; Hill et al., 2001). In low-income countries, because of the difficulty in measuring the income of the households, the wealth index is believed to be a good proxy for measuring the economic status of the households (Mutunga, 2004). Those in the high wealth index are expected to experience the lowest fatalities of their children (Hill et al. 2001). Pena et. al, (2000) in their study on the effect of poverty, social inequity, and maternal education on infant mortality in Nicaragua, 1988-1993, found that absolute as well as relative levels of poverty were important determinants of infant survival in Nicaragua.

2.2.3.3 Women occupation

Mother's occupation is associated with nutritional status of their children. In their study on factors influencing infant and child mortality: A case study of Rajshahi District, Bangladesh, Mondal N et al., 2009, found that the incidence of under five mortality is higher among not working women than that of working women . Neonatal (94.6%), post-neonatal (95.2%) and child (97.7%) mortality level is high among not working women than self-employed (5.4%, 4.9% and 2.3%, respectively). Employed women take greater responsibility for deciding on matters such as expenditure on food and clothing, what to cook and how to treat a sick child (Kishor & Parasuraman, 1998).

2.2.4 Socio-cultural Factors

According to Akwara (2000), not only do economic and physical environments determine peoples well being but also the social and cultural environments that they inhabit. Similarly, the problem of child deaths and poor child health has both biomedical and socio-cultural causes. In fact, the social and cultural sphere holds the key to improved child health and childcare in general. Socio-cultural beliefs and practices affect infant and child feeding habits, weaning practices, beliefs around health, disease treatment and maternal attitudes and beliefs on child care, and knowledge and use of preventive and curative medicine. The socio-cultural factors in this study include marital status and religion.

2.2.4.1 Marital status

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 resources normally expected (UN, 1985).Traditionally, children were supposed to be born in a family consisting of a mother and father but this is rapidly changing with development, with girls getting pregnant earlier. In several countries in Sub Saharan Africa, adolescent fertility is sanctioned and valued within the adequate ritual framework (marriage), but strongly condemned when out of wedlock (Bledsue and Cohen, 1993). Hence, children borne outside marriage are most likely to be exposed to higher risk of death that accompanies the trauma from rejection and economic hardship that follows single motherhood. As explained by Akwara (2000), there is an increasing number of single, divorced or separated and widowed women in Kenya today. Many of these face economic hardships that have both traditional and contemporary origins. For example, land inheritance practices deprive such rural women off their primary means of livelihood. In addition, many lack the contacts, education or marketable skills that are needed to gain access to alternative sources of income in the formal or informal sectors.

2.2.4.2 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 infants and child mortality as well due to traditions and beliefs. Such differences may include customary practices related to child birth, infant feeding and healthcare and these should have an effect on infant and child mortality independently of other variables.

2.2.5 Environmental Factors

Environmental factors include source of drinking water and type of toilet. Environmental risk factors account for about one fifth of the total burden of disease in low income countries according to recent estimates (WB, 2001). The importance of water supply and sanitation as determinants of infant and child mortality has been underscored by several studies from developing countries. That among the ten identified leading mortality risks in high mortality developing countries, unsafe water, sanitation and hygiene ranked second, while in door smoke from solid fuels ranked fourth. About three percent of child deaths are ascribed to environmental risk factors and child death account for about 90 percent of the total (Mutunga, 2004).

2.2.5.1 Source of drinking water

Residence in a house with piped water according to Gyimah (2002) was associated with a thirty five percent reduction in the risk of infant deaths compared to that in a house whose source of drinking water was a river or stream.

2.2.5.2 Type of toilet

Children in households with flush toilets were 63 percent less likely too die compared to those in households with no toilet facility. A study by Omariba (2005) on changing childhood mortality conditions in Kenya found that there was a 20 percent increase in the risk of infant deaths in households with no toilet facility compared to those living in households with a pit latrine while risk of child deaths was 25 percent higher given the same circumstances. Also, according to K'oyugi (1992) in his study on the impact of environmental factors on infant and child mortality in Kenya, modern type of toilet facility and better quality of housing floor were statistically significant household

environmental factors associated with lower risk of death for children aged under five years together with less contaminated water. Also, children in households with flush toilets were 63 percent less likely too die compared to those in households with no toilet facility according to Gyimah (2002).

2.6 Summary of the Literature Review

From the various literature reviewed, there is significant association between socioeconomic, bio-demographic, socio-cultural and environmental factors and under five mortality. Increased socio-economic status specifically, mother's level of education is found to be closely associated with improved child survival. Higher levels of educational attainment are generally associated with lower under five mortality rates, since education exposes women to information about better nutrition, use of contraception to space births and knowledge about childhood illness and treatment. From the literature, larger differentials have been found to exist between the mortality of children of women who have attained secondary education and above and those with primary education and less. While primary education in many cases is beneficial relative to no education, there are a number of areas partially related to mortality and nutrition where primary education seems not to contribute to the welfare of family. While secondary education has a strong positive effect on quality of maternal and new born healthcare.

Also from the literature, demographic variables especially maternal age and birth order have typically a 'U' shaped relationship with under five mortality. Children born to old and young women have higher mortality rates than others. Also, first order and high order births have high mortality rates. The literature also indicates that a household's income, religion and mother's current marital status have significant effect on the survival prospects of under five children. Modern type of toilet facility and piped/ less contaminated water were statistically significant household environmental factors associated with lower risk of death for children aged under five years.

Although in some literature the place of residence had no significant effects on infant mortality like in Indonesia (Hull and Gobhaju, 1986), it was significantly related to child

mortality in most other studies. This is because urban areas have more advantages of better health care services and higher levels of maternal education, and therefore better child survival prospects.

2.7 Theoretical Framework

2.7.0 Conceptual Framework

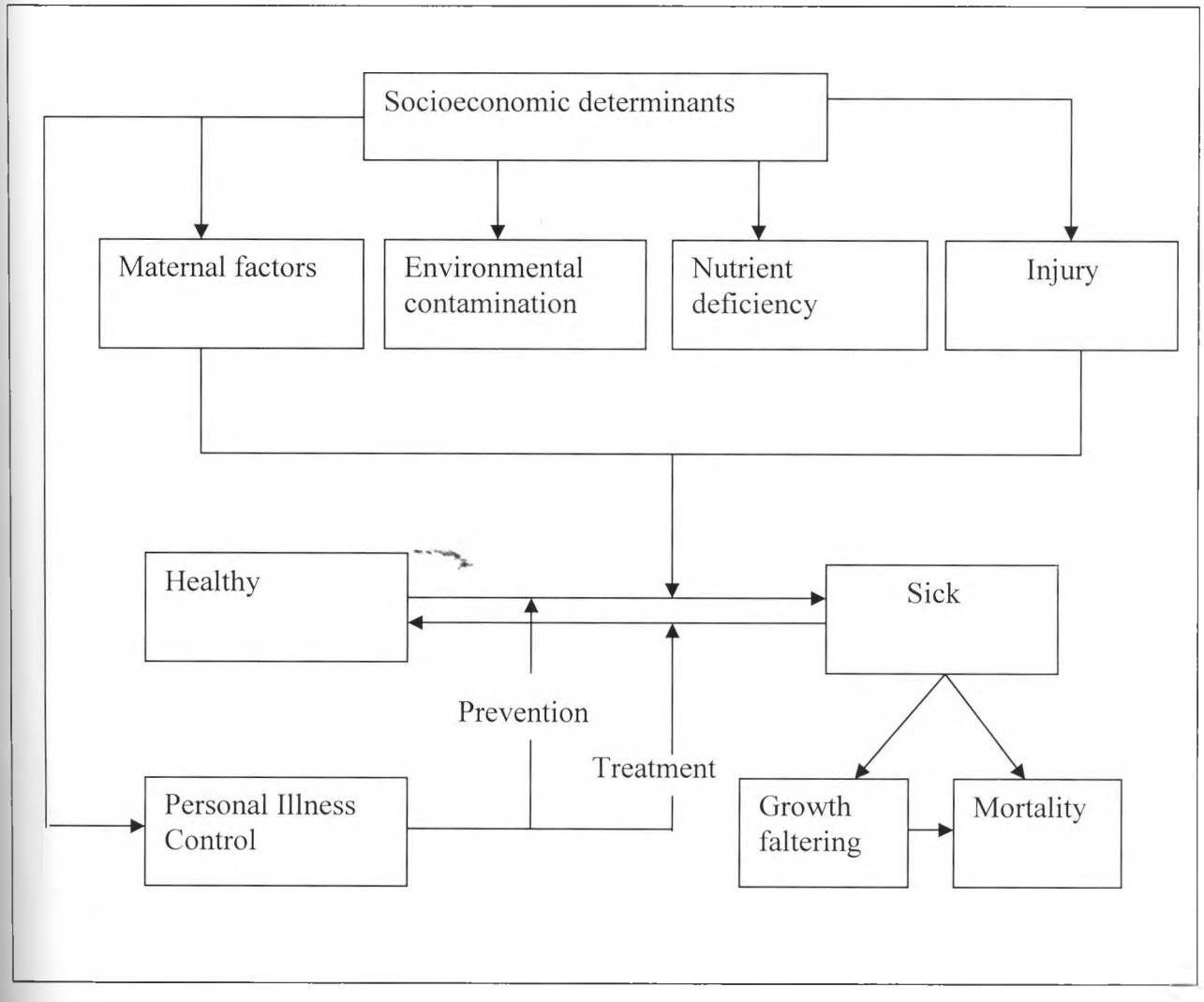
The study utilized Mosley and Chen framework for child survival. Mosley and Chen (1984) were among the first to study the intermediate biomedical factors affecting child mortality, labeled "proximate determinants". The framework (fig.1) is based on the premise that all socio-economic and socio-cultural determinants of child mortality operate through a common set of five proximate determinants; maternal, household environmental factors, nutrient deficiency, injury, and personal illness control to exert an impact on child mortality. These proximate determinants affect the state of health of the child and determine whether the child is sick or healthy and once the child is sick, they go on to establish whether the child gets well or dies.

Mosley and Chen distinguished between variables considered to be exogenous or socio-economic (social, economic, community, regional and cultural factors) and endogenous or biomedical factors (breastfeeding patterns, hygiene, sanitary measures and nutrition). Exogenous variables have indirect effects because they operate through the endogenous biomedical factors to affect child survival. The biomedical factors are also called intermediate variables or proximate determinants since they constitute the middle step between the exogenous variables and child mortality (Schultz, 1994; 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 as it encompasses a biosocial approach to child survival. It is a flexible model that is modified to suit particular situations.

In this study the framework has been modified such that the socio-economic determinants are the socio-economic and socio-cultural factors which include maternal education, wealth index, occupation, marital status and religion. Maternal factors in this study are the bio-demographic factors which include maternal age at birth, birth order and preceding birth interval. Environmental contamination in this study is the environmental factors which include type of toilet and source of drinking water. The nutrient deficiency, injury and personal illness control factors were omitted in this study.

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

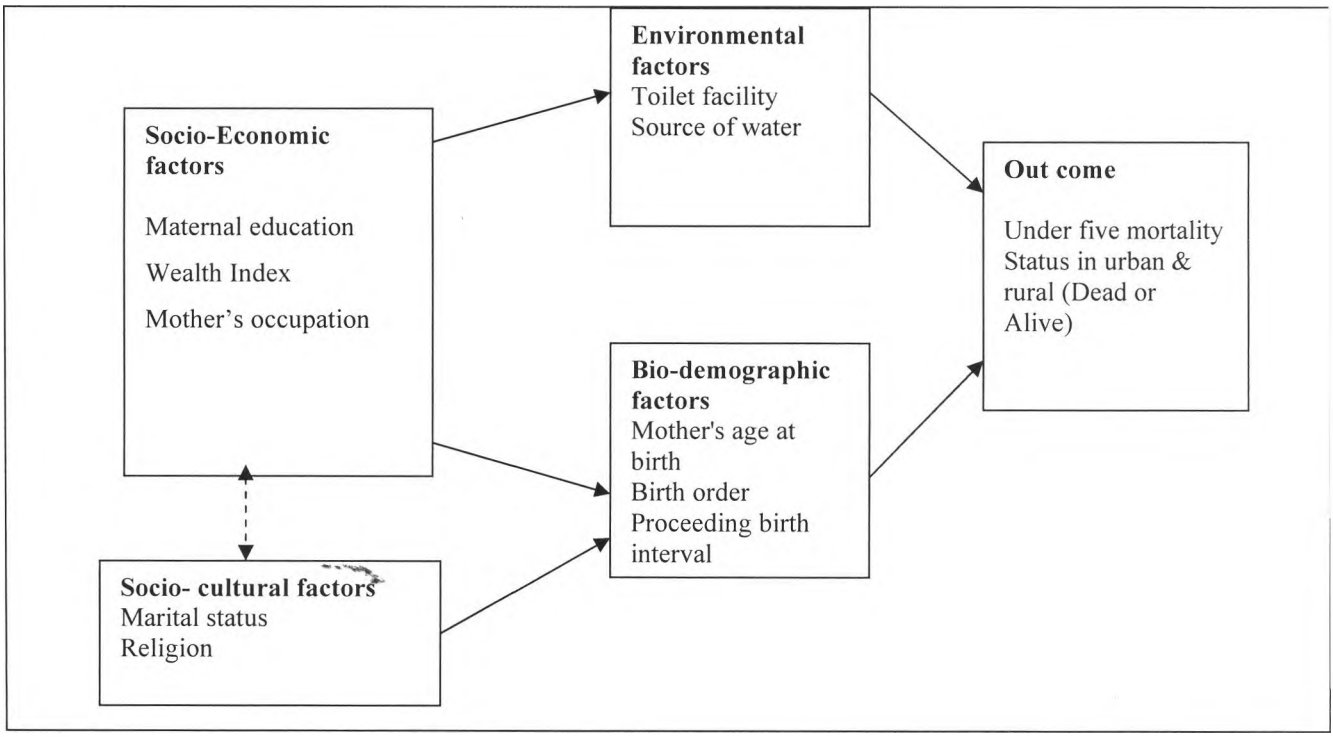


Source: Mosley W.H and Chen L.C (1984). Population and Development Review, a Supplement of Volume 10:29

2.7.1 Operational Framework

The operational framework (fig.2) is used to show how the conceptual framework is applied on the selected variables. In this study, socio-economic factors and socio-cultural factors are the background factors. These are maternal education, type of place of residence, marital status, religion and wealth index, are considered indirect. They operate through the bio-demographic (maternal) and environmental factors i.e. intermediate variables which are maternal age, birth order, preceding birth interval, source of drinking water and toilet to determine under five mortality in rural and urban areas.

Fig. 2: Operational Framework for the study of under five mortality.



Source: The Mosley and Chen Framework, 1984:25

2.7.2 Conceptual hypotheses

1. Socioeconomic determinants are likely to influence under five mortality.
2. Socio-cultural factors are likely to influence under five mortality
3. Maternal (bio-demographic) factors are likely to influence under five mortality
4. Environmental factors are likely to influence under five mortality

2.7.3 Operational Hypotheses

1. Womens' higher education is associated with lower chances of under five mortality in urban than in rural areas.
2. A womans' high wealth index is associated with decreased under five mortality in urban than in rural areas.
3. Stable marriage unions are associated with improved under five mortality.
4. Children born in an interval of less than two years are more likely to die in rural areas than in urban areas.
5. The age of the mother at the time of birth is associated with higher under five mortality in rural than urban areas.
6. Safe source of drinking water is associated with decreased under five mortality in urban than rural areas.
7. Using an appropriate toilet facility is likely to decrease under five mortality in urban than in rural areas.
8. Women's occupation in the urban area has a negative effect on under five mortality as compared to rural areas.

2.8 Definition of Variables and their Measurement

2.8.1 Dependent Variable

In this study, the dependent variable will be under five mortality; variable B7. It measures the survival status of the index child before the fifth birth day. It is categorized as dead or alive. This variable is derived from the information on child survival status at the time of the survey (in months). It is measured as; 1 for failure which are the under five deaths, the main focus of the study, and 0 for censured i.e. those still surviving.

2.8.2 Independent Variables

The independent variables include socioeconomic, bio-demographic, socio-cultural and environmental variables. The socioeconomic variables used in the study include maternal education level, wealth index and type of place of residence. The bio-demographic variables include age of the mother at birth, birth order, preceding birth interval. Socio-cultural factors include marital status and religion. Environmental factors are type of

toilet and source of drinking water. The link between independent (causal) factors and under five mortality has been summarized in Mosley and Chen frame work.

2.8.2.1 Mother's age

Mother's age will be used as a proxy for mother's physiological, mental and emotional maturity as well as the mother's experience with child care. This was recorded as mage and will be classified as; 1= under 20, 2= 20-29, 3= 30+. The breakpoints were selected because of the need to cover the different reproductive trajectories: adolescents, young adults and adults (Mustafa and Odimegwu, 2008). As usual, it is expected that under fives born to women aged 20 and below and over 30 years will have higher mortality compared to those from age between 20 and 29 years.

2.8.2.2 Highest level of education

Highest level of education 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 recorded as educ and categorized into; 1= no education, 2= primary education, and 3= secondary plus. The expected usual trend was that the risk of under five death would decrease with the increase in the level of mother's education.

2.8.2.3 Religion

Religion refers to the religious group to which the mother belongs. It was recorded as rel. and will be categorized as; 1= catholic, 2= protestant/ other Christian, and 3= Muslim / no religion/ other.

2.8.2.4 Marital status

Marital status refers to the mother's marital status. It was recorded as marital and three categories created; 1= never married, 2= currently married, and 3= formally married. Children born in stable family unions where their women are married were expected to have higher chances of survival compared to those with never / formally married women.

2.8.2.5 Birth order

This variable refers to the order in which children were born. It was recorded as border and three categories were created; first births, 2-3, and 4+. The risk of under five death was expected to be higher among first and higher order births.

2.8.2.6 Preceding birth interval

This variable refers to the time in months calculated as the difference between the current birth and the previous birth. It was recorded as precbint and has three categories which are; 1= < 24, 2= > 24 and 3= first birth. Under five mortality was expected to be higher when siblings were born at an interval of less than 24 months.

2.8.2.7 Occupation

Mother's occupation is associated with nutritional status of their children. It was recorded as occupant and had two categories; 1= working and 2= not working women. Those not working are expected to exhibit a higher under five mortality than the working women.

2.8.2.8 Wealth index

Wealth index is based on household ownership of material possessions such as radio, television, telephone, refrigerator, bicycle, motorbike, and car. 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). It serves as a proxy for household wealth and disposable income. It was recorded as windex and classified as 1= low (0-30 percent), 2= medium (31-70 percent), or 3= high (71-100 percent). Those in the high wealth index were expected to experience lower under five mortality.

2.8.2.9 Source of drinking

Environmental factors include source of drinking water and type of toilet facility. Disease exposure especially to diarrhea is associated with these two facilities. The source of drinking water was recorded as water and classified into; 1= piped and 2= unpiped water.

2.8.2.10 Type of toilet facility

Type of toilet facility was recorded as toilt and grouped into those who had toilet =1 and those with no toilet =2. It was expected that children born in households with piped water and toilet facilities would experience the lowest risk of death.

CHAPTER 3

DATA AND METHODOLOGY

3.1 Introduction

This chapter presents a description of the source of data used in the study and the analytical methods utilized to inform the study findings on the determinants of under five in rural and urban areas.

3.2 Data Source

This study utilized the 2003 KDHS data on child mortality and other socio-economic, socio-cultural, bio-demographic and environmental factors. Since children are the basic unit of the analysis, the data was transformed such that each child constitutes a unit of observation. The eligible women were all aged 15-49 years who were either usual residents or visitors present in the selected household on the night before the survey. Out of 8,717 eligible women, 8,195 women were successfully interviewed with a response rate of 94% (91.1% in urban and 95.5% in rural areas).

Each female respondent in the reproductive age of 15-49 was asked an individual interview to report on the number of sons and daughters who lived with her, lived elsewhere and the number who died. She also provided a detailed birth history of her child bearing experience including items like sex, date of birth, single or multiple birth, survival status, current age of each live birth, and age at death of each live birth if not alive. Information was also collected on child and maternal health and family planning. The number of observations at this level was 5,949 (1534 for urban and 4415 for rural) representing the number of live births born for the interviewed women in the period of five years preceding the survey.

The data for mortality estimates were collected in the birth history section of the female'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). The selective omission from the birth histories of births, who did not survive, is another potential data quality problem, which can lead to

underestimation of mortality rates. In the analysis of the KDHS, 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. Selective omission of child deaths is usually severe for early infancy deaths. Underreporting of early infancy deaths is most commonly observed for births that occurred long before the survey; thus it is useful to examine the ratios over time (CBS et al, 2004).

3.3 Methods of Data Analysis

3.3.1 Descriptive statistics

To interpret the association and test the levels of correlation between variables under study, both frequency distributions and cross-tabs were used. Frequency distributions were used to show the distribution of under five mortality by the selected background variables and the values of their women by giving the percentage distribution, while cross tabulation was used to establish relationships between under five mortality and the selected variables i.e. the nature of the relationship between or among the variables, and to determine if there was any association between under five mortality and the independent variables. However, it does not tell the relationship between the two variables i.e. the direct effect of the relationships.

3.3.2 Cox's Proportional Hazard Model

The focus of this study was under fives i.e. children 0-59 months whether alive or dead at the time of the survey and their mortality patterns were modeled from birth until the age of five. Since not all children had had the chance to survive to the oldest age under investigation by the time of the interview, Cox's proportional hazard model, developed initially by Cox (1972) was used to account for censoring in the estimation of exposure time. The Cox regression procedure is a technique for analysis of 'survival data' i.e. data that measure the time until a death occurs. It was useful for this study as it allowed for the possibility that the hazard rate of a death differ between individuals with different socio-economic, demographic, socio-cultural and environmental characteristics. Moreover, since the proportional hazards model is nonparametric in the sense that it involves an unspecified function in the form of an arbitrary baseline hazard function, this model is flexible.

Cox regression investigates the effect of several variables on the time a specified event takes to happen. In child mortality, this is known as Cox regression for survival analysis. It does not assume any survival model but it is not truly non-parametric because it assumes that the effects of the predictor variables upon survival are constant over time and are additive in one scale. The hazards ratio associated with the predictor variable is given by the exponent of its coefficient. The model is represented as:

$\lambda_i(t) = \lambda_o(t) * \exp(\beta_1 * Z_1 + ... + \beta_m * Z_m)$ Or

$\lambda_i(t) = \lambda_0(t)\exp(Z^1{}_i \beta_i)$

Where

- i are the index subjects i.e. children
- $\lambda(t)$ denotes the resultant hazard (probability of child dying), given the values of the m covariates (socio-economic, bio demographic, socio-cultural, environmental), for the respective cases $(Z_1, ..., Z_m)$ and the respective survival time, (t),
- $\lambda_0(t)$ is the baseline hazard, i.e. hazard for the respective individual (child) when all independent variable values are equal to zero,
- β_i represents the associated coefficients for the respective cases $(Z_1, ..., Z_m)$

The hazard function facilitates calculation of the relative risks of certain groups in relation to specific baseline groups by exponetiating the coefficients. That is if β is the hazard coefficient, just compute e^{β}. Exp (β) or e^{β} represents the risk of dying associated with each covariate, relative to the risk for the reference category. The regression coefficient indicates the relative effect of the covariate on the hazard function. These coefficients vary around zero. A positive coefficient increases the value of the hazard function and therefore indicates a negative effect on survival time. A negative coefficient decreases the value of the hazard function and therefore indicates a positive effect on survival time. Therefore in this study, a positive coefficient indicates a greater probability of hazards risk of under five mortality; and a negative coefficient indicates a smaller hazards risk of under five mortality.

In the proportional hazards model, the event of study is an under five death in the five years of life, and how the hazard risk of under five mortality depends on the covariates. All the covariates intended for the present survival analysis are time-constant independent variables i.e. they do not change in value over time. The dependent variable used in this hazards model analysis is under five survival time, which is measured as the duration in months from birth to death (if the event occurred) or from birth to the survey date (censored data). In this study, the hazard function, which is under five mortality is the response variable, while the covariates include the selected socio-economic, bio-demographic, socio-cultural and environmental factors.

While chi-square is used to test the goodness of fit model, the out put exponential beta (*ExpB*) was used as a regression coefficient to predict the hazard function. A variable was considered significantly associated with under five mortality when its P value was below 0.05. Also, in the analysis, a variable was only considered insignificant if none of its categories was significant.

The study used a full model to incorporate all the variables. The results were used for the comparative study of the effect of these variables on under five mortality in urban and rural areas.

CHAPTER 4

DETERMINANTS OF UNDER FIVE MORTALITY IN URBAN AND RURAL AREAS

4.1 Introduction

This chapter presents the results of the preliminary study findings and a discussion of the results of multivariate analysis on factors associated with under five mortality in urban and rural Kenya. Section 4.2 describes the characteristics of the population under study while section 4.3 examines the association between under five mortality with the selected bio-demographic, socio-economic, socio-cultural and environmental variables under study. Section 4.4 presents a discussion of the results of multivariate analysis on factors associated with under five mortality in urban and rural Kenya. And section 4.5 gives a summary that concludes this chapter. The results of the model are shown in Table 4.3.

4.2 Study Population Characteristics

Table 4.1 presents the characteristics of the study population by background variables for both rural and urban Kenya. The results show that while a greater percent of women in urban areas had primary education and secondary education at 49% and 37% respectively, majority of those in rural areas had no education and primary education at 22% and 61% respectively. This indicates that urban areas have more women who are educated as compared to rural areas. However, on overall, the results show that majority of women in the two areas had primary level of education at 49% for urban areas and 61% for rural areas.

The results further show that both urban and rural areas recorded a majority of women who were involved in some type of occupation at over 50%. However, the rural areas had a slightly higher percent of women working at 61% as compared to urban areas at 51%. Concerning the wealth index, the results show that majority of the women in the urban areas were in the higher wealth index at 85%, as compared to those in the rural areas where majority of women were in the low wealth index at 56%.

The results further show that more children were born to the women in the 20-29 age bracket in both areas with urban at 79% and rural at 73%. Few women gave birth under

the age of 20 years at 7% in both areas. This is a reality since these women are in their prime productive years. The results also show that more women in the rural areas gave birth after age 35 at 20% as compared to the urban areas at 14%.

Fewer births occurred to women in urban areas where 34% of them had only first births as compared to a majority of women in rural areas who had a higher birth order of 4 and above at 44%, indicating that many women in rural areas give birth to many children. Also, majority of the women in urban areas had a birth order of 2-3 at 38% as compared to those in the rural areas at 36%.

From the results, rural areas also had the highest percent of the women with a preceding birth interval of 24 months and above at 57% as compared to the urban areas with 47 %. The results further show that 21% of women in rural areas had a preceding birth interval of less than 24 months as compared to 19% of women in urban areas who had a preceding birth interval of less than 24 months. Also, women with first births were more in urban areas at 34% as compared to those in the rural areas at 22%.

The results of the study also show that a higher percent of women gave birth while in marital unions in the rural areas at 87% as compared to women in urban areas at 82%. However, urban areas had a higher percent of formally married women who gave birth at 10% as compared to those in the rural areas at 7%. Also more single women in the urban areas gave birth at 8% as compared to the rural areas where the never married women who gave birth were at 5%.

Concerning religion, the results indicate that majority of children in both the urban and rural areas were born to women who belonged to the protestant and other Christian at 59% and 60% respectively. Fewer children were born to women with Muslim and no religion at 18% in the rural areas while in the urban areas; fewer children were born to women who were Catholics at 19%.

Looking at the source of drinking water, the results show a greater percent of women in rural areas living in households whose source of drinking water was not piped at 85% i.e. unsafe drinking water. This was different from the urban areas where majority of women were in households with piped water at 64%. The results also show that urban areas had majority of the women in households with a toilet at 88%, as compared to those in the rural areas at 68%. Those in households with no toilet in the urban areas were fewer at 12% as compared to the rural areas where those in households with no toilet were at 32%.

Table 4.1: Characteristics of study population by background variables disaggregated by rural/urban residence (KDHS 2003)

	Urban		Rural	
Independent variables	*Frequency*	*Percent*	*Frequency*	*Percent*
Socio-economic variables				
Maternal education				
No education	219	14.3	991	22.4
Primary	751	49.0	2705	61.3
Secondary plus	564	36.8	719	16.3
Maternal occupation				
Not working	749	48.8	1730	39.2
Working	785	51.2	2685	60.8
Wealth index				
Low	133	8.7	2483	56.2
Medium	94	6.1	983	22.3
High	1307	85.2	949	21.5
Bio-demographic variables				
Maternal age				
15-19 years	110	7.2	297	6.7
20-29	1212	79.0	3241	73.4
30 plus	212	13.8	877	19.9
Birth order				
First births	524	34.2	964	21.8
2-3	582	37.9	1523	34.5
4 plus	428	27.9	1928	43.7
Preceding birth interval				
< 24 months	292	19.0	926	21.0
24 plus	714	46.5	2519	57.1
First births	528	34.4	970	22.0
Socio-cultural variables				
Marital status				
Never married	120	7.8	235	5.3
Currently married	1258	82.0	3855	87.3
Formally married	156	10.2	325	7.4
Religion				
Catholic	293	19.1	959	21.7
Protestant & other religion	902	58.8	2653	60.1
Muslim, no religion & other	339	22.1	803	18.2
Environmental variables				
Source of drinking water				
Piped	983	64.1	644	14.6
Un-piped	551	35.9	3771	85.4
Type of toilet				
Have toilet	1349	87.9	3017	68.3
No toilet	185	12.1	1398	31.7
TOTAL	N=1534	100%	N=4415	100%

4.3 Differentials of Under five Mortality by Background Characteristics.

This section discusses the results of bivariate analysis on the level of association between under five mortality and the selected socio-economic, bio-demographic, socio-cultural and environmental variables used in the study. Cross tabulation with chi-square test was used to establish the association as shown in table 4.2.

The results of the study found that maternal education had a significant association with under five mortality both in the urban and rural areas. Higher under five mortality occurred to women with no education but with higher deaths being in the urban areas at 13% as compared to 9% for rural areas, while least under five deaths occurred to women with secondary education and above in both the urban and rural areas at 6% respectively. Also, there were more under five deaths for women with primary education in the rural areas at 9% as compared to the urban at 8%. It is worth noting here that under five deaths for women with secondary and above education was the same for urban and rural areas at 6%. Education in the urban was significant at $P<0.006$ while in the rural it was significant at $P<0.024$.

From the study findings, preceding birth interval had a highly significant association with under five mortality in the rural areas but did not show any significance in the urban areas. The highest risk of under five mortality was associated with a preceding birth interval of less than 24 months with 13% for rural areas. This was followed by women with first births who had an under five mortality of 8% while the lowest under five mortality occurred to women who had a preceding birth interval of 24 months and above at 7%. Preceding birth interval in the rural was significant at $P<0.000$.

Marital status from the study findings further shows a significant association with under five mortality in the urban areas but was found not to be significant in the rural areas. More under five deaths occurred to women who were divorced or separated at 12%. This was followed by births to the currently married at 8% while least under five mortality in the urban areas occurred to women who were never married at 3%. Marital status in the urban was significant at 0.014

The study findings also show that environmental variables especially the source of drinking water, was found to be a highly significant factor of under five mortality only in the rural areas but not in the urban areas. Households with un-piped water in rural areas were associated with higher under five deaths at 9% as compared to households with piped water where under five deaths were at 6%. Source of drinking water was significant at $P<0.004$.

4.2 Bivariate analysis for the association between selected independent variables and under five mortality disaggregated by urban/rural residency.

	Urban		Rural	
Variable name	*U5 Dead*	*U5 Alive*	*U5 Dead*	*U5 Alive*
Socio-economic variables				
Maternal education				
No education	12.8	87.2	9.4	90.6
Primary	8.4	91.6	8.9	91.1
Secondary plus	5.9	94.1	6.0	94.0
	X^2 =10.39	*P=0.006*	*X^2 =7.487*	*P=0.024*
Maternal occupation				
Not working	7.2	92.8	8.9	91.1
Working	8.9	91.1	8.3	91.7
	X^2 =1.504	*P=0.220*	*X^2 =0.420*	*P=0.517*
Wealth index				
Low	8.3	91.7	9.4	90.6
Medium	8.5	91.5	7.9	92.1
High	8.0	92.0	7.1	92.9
	X^2 =0.034	*P=0.983*	*X^2 =5.370*	*P=0.068*
Bio-demographic variables				
Maternal age				
15-19	7.3	92.7	8.1	91.9
20-29	7.2	92.8	8.3	91.7
30 plus	9.8	90.2	9.0	91.0
	X^2 =2.985	*P=0.225*	*X^2 =0.852*	*P=0.653*
Birth order				
First births	6.3	93.7	7.9	92.1
2-3	8.8	91.2	7.8	92.2
4 plus	9.3	90.7	9.5	90.5
	X^2 =3.528	*P=0.171*	*X^2 =3.785*	*P=0.151*
Preceding birth interval				
< 24 months	11.0	89.0	13.0	87.0
24 plus	8.3	91.7	7.2	92.8
First births	6.3	93.8	7.9	92.1
	X^2 =5.669	*P=0.059*	*X^2 =29.448*	*P=0.000*
Socio-cultural variables				
Marital status				
Never married	2.5	97.5	8.5	91.5
Currently married	8.1	91.9	8.4	91.6
Formerly married	12.2	87.8	10.5	89.5
	X^2 =8.559	*P=0.014*	*X^2 =1.621*	*P=0.445*
Religion				
Catholic	6.8	93.2	7.7	92.3
Protestant & other Christian	8.0	92.0	8.8	91.2
Muslim, no religion & other	9.4	90.6	8.7	91.3
	X^2 =1.475	*P=0.478*	*X^2 =1.127*	*P=0.569*
Environmental variables				
Source of drinking water				
Piped	7.7	92.3	5.6	94.4
Un-piped	8.7	91.3	9.1	90.9
	X^2 =0.456	*P=0.499*	*X^2 =8.505*	*P=0.004*
Type of toilet				
Have toilet	8.0	92.0	8.3	91.7
No toilet	8.6	91.4	9.1	90.9
	X^2 =0.090	*P=0.764*	*X^2 =0.714*	*P=0.398*
	N=124	*N=1410*	*N=378*	*N=4037*

The study did not establish any significant association between maternal occupation, wealth index, maternal age, birth order, religion and type of toilet and under five mortality in both urban and rural areas.

In this section, bivariate analysis was only used to test the levels of association between maternal education, occupation, wealth index, maternal age at birth, birth order, preceding birth interval, marital status, religion, source of drinking water and type of toilet with under five mortality. However, associations do not measure the net effect or the magnitude of these predictor variables on under five mortality. Therefore, the net effect of these selected factors on under five mortality is explored in the next section using Cox regression hazard model.

4.4 Determinants of under five mortality in rural and urban areas of Kenya

This section discusses the results of multivariate analysis on factors associated with under five mortality in urban and rural Kenya. Cox regression hazard model was used to determine the net effect of some selected bio-demographic, socio-economic, socio-cultural and environmental variables on under five mortality. the results of the multivariate analysis.

4.4.1 Socio-economic Factors

Differences in socioeconomic characteristics were important in explaining rural-urban under five mortality differentials whereby the effects of community characteristics were moderated by household socioeconomic factors. The socio-economic factors considered in the study were maternal education, occupation and wealth index. From the results in Table 4.3, only maternal education was significantly associated with under five mortality in both urban and rural areas. The others (wealth index and maternal occupation) were not significant.

Maternal education was found to be an important determinant of under five survival in both the urban and rural areas at $p< 0.003$ and $P<0.05$ respectively. However, considering the magnitude of association, education was highly significant in the urban areas than the rural areas. Children born to women with secondary education and above in urban areas

were 63% less likely to die than children born to women who had no education; while in the rural areas children born to women with secondary plus education were 36% less likely to die than those born to women with no education. The results further show that children born to women with primary education in the urban areas were 43% less likely to experience an under five mortality compared to those with no education, while children born to women with primary education in the rural areas were 5% less likely to experience an under five death as compared to those with no education. Various factors account for this difference in significance of education, including the high concentration of salaried workers (who generally have higher incomes) in urban areas, better education in urban areas, the concentration of public infrastructure in urban areas that provides sanitation services, including water supply, with health conditions that are more favorable in urban than rural areas.

This is in line with previous studies which have found that higher levels of maternal education enhance better under five survival chances. Various scholars among them Pandey (1998), Akwara (2000) found that educated women are less likely than uneducated women to experience childhood deaths because they are thought to have a better understanding and appreciation for health related matters. Also, they are less submissive to norms and practices that adversely affect the health and welfare of their children (Gyimah, 2002).

Table 4.3: Effect of selected Socio-economic, Bio-demographic, Socio-cultural and Environmental Variables on under five mortality in urban/rural.

	URBAN			RURAL		
Variable	***B***	**S.E**	***Exp (β)***	***β***	**S.E**	***Exp (β)***
Socio-economic Factors						
Maternal Education						
No education (RC)			1.000			1.000
Primary	- 0.571	0.279	0.565**	- 0.055	0.162	0.946
Secondary plus	- 0.988	0.329	0.372***	- 0.442	0.228	0.643*
Wealth Index						
Low (RC)			1.000			1.000
Medium	0.172	0.481	1.188	- 0.082	0.138	0.921
High	0.255	0.382	1.290	- 0.072	0.156	0.931
Maternal Occupation						
Not working (RC)			1.000			1.000
Working	0.230	0.201	1.259	- 0.078	0.112	0.925
Bio-demographic Factors						
Maternal Age at Birth						
15-19 (RC)			1.000			1.000
20-29	- 0.050	0.395	0.951	0.103	0.234	1.109
30+	0.254	0.458	1.289	0.193	0.272	1.213
Birth order						
1 child (RC)			1.000			
2-3 children	- 5.455	36.851	0.004	0.855	1.008	2.351
4 plus	- 5.749	36.852	0.003	0.991	1.019	2.695
Preceding Birth Interval						
< 24 months (RC)			1.000			1.000
24 Months plus	- 0.264	0.227	0.768	- 0.643	0.119	0.526***
First births	- 5.795	36.851	0.003	0.469	1.009	1.599
Socio-cultural factors						
Marital Status						
Never married (RC)			1.000			1.000
Currently married	1.011	0.598	2.749	- 0.200	0.250	0.819
Formally married	1.346	0.634	3.841**	0.108	0.296	1.115
Religion						
Catholic(RC)			1.000			1.000
Protestant & other Christian	0.099	0.256	1.105	0.138	0.135	1.148
Muslim, no religion& other	- 0.042	0.320	0.959	- 0.018	0.192	0.982
Environmental Factors						
Source of Drinking Water						
Piped (RC)			1.000			1.000
Unpiped	0.043	0.209	1.044	0.415	0.184	1.514**
Type of Toilet						
Have toilet (RC)			1.000			1.000
No toilet	- 0.178	0.319	0.837	- 0.051	0.135	0.950

Urban censored=1410, dead=124. Rural censored=4037, dead=378

***P< 0.001, ** P < 0.01, *P<0.05; RC= Reference Category

4.4.2 Bio-demographic Factors

The results of the study show that the only bio-demographic variable significant in the study was preceding birth interval in the rural areas. Maternal age at birth and birth order were not significant in both the urban and rural areas.

Birth intervals have been found to be negatively associated with under five mortality. The study findings show that preceding birth interval in rural areas is a highly significant factor in under five mortality at $P<0.000$. Children born to women with a preceding birth interval of 24 months and above were 47% less likely to experience an under five death as compared to those with a preceding birth interval of less than 24 months. The longer duration of inter-birth interval has been found to increase profoundly the chances of under five survival.

This is in line with most studies in the developing countries which show that the length of preceding birth interval is the prime factor that influences mortality during infancy as well as other childhood ages of life. Palloni and Milman (1986) suggest that maternal and sibling competition for maternal attention and other household resources are the possible mechanisms that link short birth intervals and child mortality. Successive births may deplete the mother off energy and nutrition that may lead to pregnancy complications or premature births, increasing the risk of infant and maternal deaths. The early arrival of an infant necessitates premature weaning of the index child exposing the weaned child to malnutrition and increasing their probability of contracting infections and parasitic diseases. Invariably the longer duration of inter-birth interval has been found to increase profoundly the chances of infant survival (Bicego and Ahman, 1996). Disease transmission among closely spaced siblings has been suggested as another mechanism linking short birth interval and survival prospects of the index child (Palloni and Milman, 1986).

4.4.3 Socio-cultural Factors

Not only do economic and physical environments determine peoples well being but also the social and cultural environments that they inhabit. Similarly, the problem of child deaths and poor child health has both biomedical and socio-cultural causes. The socio-

cultural factors considered in the study were marital status and religion. From the study findings, only marital status was found to be an important determinant of under five mortality in the urban areas significant at P< 0.03 but not in the rural areas. Children born to formally married women in urban areas were 284% more likely to experience an under five death as compared to those born to the never married women. Continuity and frequency of marriage has been considered a determinant of under five 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 resources normally expected (UN, 1985).

4.4.4 Environmental Factors

Environmental risk factors account for about one fifth of the total burden of disease in low income countries (World Bank, 2001). The environmental factors considered in the study included source of drinking water and type of toilet. In this study, only source of drinking water was found to be a significant factor of under five deaths in the rural areas at P< 0.025 but not in urban areas.

The study findings show that residence in a household with piped water has an association with reduction in the risk of under five deaths in rural areas as compared to residence in a household whose source of drinking water was unpiped. Children born to women residing in households with unpiped water were 51% more likely to experience under five deaths than those born to those residing in households with piped water. This could point to pollution and contamination of water surface areas due to farming and congestion. This is in line with other studies like Gyimah (2002) where residence in a house with piped water was associated with a thirty five percent reduction in the risk of infant deaths compared to that of a house whose source of drinking water was not piped.

4.5 Summary

The chapter set out to examine the relationship between maternal education, occupation, wealth index, maternal age at birth, birth order, preceding birth interval, marital status, religion, source of drinking water and type of toilet on under five mortality. The results of

the multivariate analysis showed that maternal education and marital status were significant factors associated with under five mortality in the urban areas, as compared to the rural areas where preceding birth intervals, source of drinking water and maternal education were the significant factors associated with under five mortality. Although maternal education was significantly associated with under five mortality in both the urban and rural areas, the magnitude of association was higher in the urban areas as compared to the rural areas. Various factors account for this difference in magnitude, including the high concentration of salaried workers (who generally have higher incomes) in urban areas, better education in urban areas, the concentration of public infrastructure in urban areas that provides sanitation services, including water supply, with health conditions that are more favorable in urban than rural areas.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECCOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study findings and conclusions, as well as recommendations for policy and research drawn from the findings.

5.2 Summary

Improvements in under five mortality in Kenya has continued to decline in the past decade such that gains observed in the 1970's and 1980's have not been sustained in the 90's. The purpose of the study was to establish factors affecting under five mortality in the urban and rural areas of Kenya. The study utilized the 2003 KDHS a nationally representative sample of 8,195 women who were successfully interviewed with a response rate of 94% (91.1% in urban and 95.5% in rural areas). A child file was created for this study which comprised a sample of 5949 under five children whereby 1534 were from the urban and 4415 from the rural areas.

The study specifically sought to establish the effects of some socio-economic, bio-demographic, socio-cultural and environmental factors on under five mortality in rural and urban areas in Kenya. To achieve the above stated objectives, several hypotheses to determine the magnitude of these effects were tested using Cox regression hazard model. The hypotheses were tested by a conceptual framework developed from the Mosley and Chen framework (1984) for the analysis of infant and child mortality. To operationalise the frame work, under five mortality was taken as the dependent variable while ten variables were selected to cover the socio-economic, bio-demographic, socio-cultural and environmental factors. The socio-economic variables used in the study were maternal education, wealth index and maternal occupation. The bio-demographic variables included maternal age at birth, birth order and preceding birth interval. The socio-cultural variables were marital status and religion, while the environmental factors were source of drinking water and type of toilet.

The results of the bivariate analysis showed that maternal education and marital status were significantly associated with under five mortality in urban areas while maternal education, preceding birth interval and source of drinking water were significantly associated with under five mortality in rural areas. The results of the multivariate analysis established that maternal education and marital status were significant factors associated with under five mortality in urban areas while preceding birth interval, water and maternal education were significant factors of under five mortality in the rural areas.

5.3 Conclusions

From the findings of the analysis, a few study hypotheses turned out as hypothetically expected while others did not. From the socio-economic factors, the hypothesis was that the higher the level of maternal education, the better the chances of under five survival in the urban than in the rural areas. Only maternal education was significantly associated with under five mortality at $P < 0.001$ in the urban areas. This is in line with previous studies which have found that higher levels of maternal education enhance better under five survival chances among them Pandey (1998), and Akwara (2000). Educated women are less likely than uneducated women to experience childhood deaths because they are thought to have a better understanding and appreciation for health related matters

From the bio-demographic factors used in the study, the results confirm the hypothesis that children born in an interval of less than two years are more likely to die in rural areas than those born in an interval of more than 24 months. The length of preceding birth interval was highly significant as a factor in under five mortality in the rural areas at $P < 0.000$ but not significant in the urban areas. Palloni and Milman (1986) suggest that maternal and sibling competition for maternal attention and other household resources are the possible mechanisms that link short birth intervals and child mortality. Successive births may deplete the mother off energy and nutrition that may lead to pregnancy complications or premature births, increasing the risk of infant and maternal deaths.

The findings also indicated higher under five deaths occurring to women below 20 and above 30 years in the rural areas than urban areas, hence the results were as hypothesized. The higher risk of dying among children born to older women may be as a result of a

decline in the efficacy in the reproductive system with age and economic pressure in the family while the excess risk at young maternal ages is partly due to their physical immaturity, limited knowledge and confidence in child care (Pandey et al. 1998).

For marital status the findings were as hypothesized where stable marriage unions are associated with improved under five mortality. Higher under five mortality occurred to formally married women in the urban than in the rural. Discontinuity in marriage is expected to reduce the resource available for raising children, particularly children from earlier marriages (UN, 1985). Source of drinking water in the rural areas was found to be significant and in line with the hypothesis that children born in households without piped water in rural areas were more likely to die than those born to households with piped water. This is in line with other studies like Gyimah (2002) where residence in a house with piped water was associated with a thirty five percent reduction in the risk of infant deaths compared to that of a house whose source of drinking water was not piped

Although variables like wealth index, maternal occupation, birth order, religion and type of toilet were hypothesized to be significantly associated with under five mortality, the study findings did not find any meaningful levels of significance with under five mortality in both the rural and urban areas. There is a possibility that these factors have indirect effects because they operate through other mechanisms to affect child survival and the study therefore recommends further research to establish the mechanism through which they operate to influence under five mortality.

From the findings of the study, factors affecting under five mortality were different for the urban and rural areas. For urban areas, the major determinants of under five mortality were maternal education and marital status, while for rural areas the major determinants were preceding birth interval, source of drinking water and maternal education. Although maternal education was significantly associated with under five mortality in both the urban and rural areas, the magnitude was higher in the urban areas where women with secondary and above level of education were 63% less likely to experience an under five

death while in the rural areas they were 36% less likely as compared to those with no education.

5.4 Recommendations

This section discusses recommendations for policy and further research drawn from the study findings and conclusions.

5.4.1 Recommendations for Policy

Improvements in under five mortality in Kenya has continued to decline in the past decade such that gains observed in the 1970's and 1980's have not been sustained in the 90's. Interventions geared towards improvement of under five survival depends on the programmes put in place by the government to reduce the risks. From the study findings, longer preceding birth intervals were significantly associated with under five survival especially in rural areas. In this regard, spacing of births in the rural areas should be encouraged by the government, the NGO's and CBO's through intensified family planning programmes so that contraceptives are made accessible and affordable to the women and also advocacy for smaller families.

The study results also established a significant association between maternal education especially secondary and above level of education with under five mortality. This is because the more years spent in school implies higher age at marriage and birth, and fewer number of children. To reduce higher under five deaths associated with no education, access to education especially secondary and above for girls should be improved. Although the government has made primary education free, in some places it is not accessible to young females due retrogressive cultural practices like early marriages. The government needs to have a specific policy geared towards the attainment of higher education by the girl child. Concerted efforts need to be put in place by the government and other stakeholders to enforce the Children's Act of 2001 so as to stamp out such practices. The government should also subsidize the cost of secondary education to ensure transition from primary to secondary level of education for women.

The study findings further showed that unpiped water was associated with increased risk of under five mortality in rural areas. Deliberate efforts to provide clean and safe water especially in the rural areas need to be prioritized by the government. Also, intensified public health awareness campaigns encouraging use of safe drinking water could well alleviate the higher risks of under five deaths associated with use of unsafe drinking water.

5.4.2 Recommendations for Research

From the study most factors were not significant and the results were contrary to the expected relationship. The study did not establish any significant association between maternal occupation, wealth index, birth order, religion and type of toilet and under five mortality. Future studies on determinants of under five mortality in rural and urban areas especially for variables like wealth index, maternal age at birth and occupation, should use other sources of data like census data in order to gain a deeper understanding of the differentials in these areas.

APPENDICES

APPENDIX 1: RESULTS OF COX REGRESSION MODEL OF SELECTED FACTORS ON UNDER FIVE MORTALITY IN URBAN AREAS.

Variables in the Equation: Urban areas

	B	SE	Wald	df	Sig.	Exp(B)
Educ			9.064	2	.011	
Educ(1)	-.571	.279	4.182	1	.041	.565
Educ(2)	-.988	.329	9.036	1	.003	.372
windex			.453	2	.798	
windex(1)	.172	.481	.128	1	.721	1.188
windex(2)	.255	.382	.446	1	.504	1.290
occupat	.230	.201	1.313	1	.252	1.259
Mage			1.580	2	.454	
Mage(1)	-.050	.395	.016	1	.899	.951
Mage(2)	.254	.458	.307	1	.579	1.289
border			1.296	2	.523	
border(1)	-5.455	36.851	.022	1	.882	.004
border(2)	-5.749	36.852	.024	1	.876	.003
precbint			1.376	2	.502	
precbint(1)	-.264	.227	1.353	1	.245	.768
precbint(2)	-5.795	36.851	.025	1	.875	.003
marital			4.894	2	.087	
marital(1)	1.011	.598	2.855	1	.091	2.749
marital(2)	1.346	.634	4.510	1	.034	3.841
REL			.375	2	.829	
REL(1)	.099	.256	.151	1	.698	1.105
REL(2)	-.042	.320	.017	1	.895	.959
water	.043	.209	.042	1	.839	1.044
TOILT	-.178	.319	.311	1	.577	.837

APPENDIX 2: RESULTS OF COX REGRESSION MODEL OF SELECTED FACTORS ON UNDER FIVE MORTALITY IN RURAL AREAS.

Variables in the Equation: Rural areas

	B	SE	Wald	df	Sig.	Exp(B)
Educ			5.324	2	.070	
Educ(1)	-.055	.162	.116	1	.734	.946
Educ(2)	-.442	.228	3.768	1	.052	.643
windex			.432	2	.806	
windex(1)	-.082	.138	.356	1	.551	.921
windex(2)	-.072	.156	.211	1	.646	.931
occupat	-.078	.112	.485	1	.486	.925
Mage			.597	2	.742	
Mage(1)	.103	.234	.195	1	.659	1.109
Mage(2)	.193	.272	.503	1	.478	1.213
border			1.573	2	.455	
border(1)	.855	1.008	.719	1	.397	2.351
border(2)	.991	1.019	.947	1	.331	2.695
precbint			29.669	2	.000	
precbint(1)	-.643	.119	29.000	1	.000	.526
precbint(2)	.469	1.009	.216	1	.642	1.599
marital			3.299	2	.192	
marital(1)	-.200	.250	.636	1	.425	.819
marital(2)	.108	.296	.134	1	.714	1.115
REL			1.517	2	.468	
REL(1)	.138	.135	1.048	1	.306	1.148
REL(2)	-.018	.192	.008	1	.927	.982
water	.415	.184	5.055	1	.025	1.514
TOILT	-.051	.135	.144	1	.704	.950

APPENDIX 3: UNDER FIVE SURVIVAL STATUS IN RURAL AND URBAN AREAS.

RURAL

		Frequency	Percent
Valid	.00	4037	91.4
	1.00	378	8.6
	Total	4415	100.0

URBAN

		Frequency	Percent
Valid	.00	1410	91.9
	1.00	124	8.1
	Total	1534	100.0

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