

DETERMINANTS OF PERINATAL MORTALITY IN KENYA

BY

IKUA ANNE WANDIA

Q50/72468/08

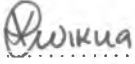


RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE AWARD OF A MASTERS OF
ARTS DEGREE IN POPULATION STUDIES AT THE UNIVERSITY
OF NAIROBI

NOVEMBER 2010

DECLARATION

I declare that all the material presented to the University of Nairobi, Population Studies Research institute is my own work, or fully and specifically acknowledged wherever adapted from other sources.

Signature.......... Date.....12/11/2010.....

Ikua Wandia Anne

Supervisors

This research project is submitted for award of a masters of Arts degree in population studies under our approval as university supervisors

Signature

.......... Date.....16/11/10.....

Professor John Oucho

Signature

.......... Date.....16-11-2010.....

Mr George Odipo

ACKNOWLEDGEMENT

Several people contributed to the completion of this project in various ways; first, I wish to thank God for His grace and strength during the entire period. I extend my deep gratitude to the Director, lecturers and staff of the Population Studies and Research Institute, University of Nairobi for the opportunity to study there.

I sincerely acknowledge the able research assistance, guidance and patience of Professor Oucho and Mr. Odipo through completion of my project. Special thanks go to my late mother Mrs. Ikua, my fiancé John and the entire family for encouraging me to push forth when it got tough. I am also indebted to my colleagues Rose Munene, Francis Kundu and Francis Njenga who offered enormous support during the entire period.

ABSTRACT

Background

This study seeks to highlight the determinants of perinatal mortality in Kenya using the Kenya Demographic and Health Survey 2003 data. The National Council for Population and Development (NCPD) and Central Bureau of Statistics were among the main implementers. The main objective of this study is to identify the determinants of perinatal mortality in Kenya in the country to inform policy makers and instigate appropriate programmes: the specific objectives are to explore the effect of the selected variables on perinatal mortality. Descriptive methods of analysis as well as multivariate logistic regression method of analysis will be used to determine the independent variables that are of more significance to perinatal mortality in each of the regions (provinces). The few studies that have been carried out on perinatal mortality, concentrate on one independent variable such as utilisation of health services or maternal education but studies that analyse various variables at once are yet to be identified.

Data from the survey shows that the perinatal mortality rate of the births in the five years preceding the survey was 40 deaths per 1000 pregnancies. It also indicates considerable differences in perinatal mortality by province with Coast province with the highest rate at 57 deaths per 1000 and Western with the lowest at 28 deaths per 1000 deaths. The variables used for this analysis in the study include: Maternal education, maternal occupation, maternal's age at first birth, Residence, region religion and ethnicity. The findings of analysis indicate that education is the most significantly associated to perinatal mortality in age at first birth, residence, employment status and religion.

TABLE OF CONTENTS

Chapter 1	Introduction.....	1
1.1	Background.....	1
1.2	Problem statement.....	2
1.3	Study Objectives.....	5
1.4	Significance of the study.....	6
1.5	Scope and limitations.....	7
Chapter 2	Literature review.....	9
2.1	Conceptual framework.....	15
2.2	Operational framework.....	16
2.3	Definition of concepts.....	16
2.4	Operational definition.....	17
Chapter 3	Data Methodology.....	18
3.1	Introduction.....	18
3.2	Sources and quality of data.....	18
Chapter 4	Determinants of perinatal mortality.....	21
4.1	Introduction.....	21
4.2	Descriptive statistics.....	21
4.3	Multivariate analysis.....	24
Chapter 5	Summary, conclusion and recommendations.....	29
5.1	Introduction.....	29
5.2	Summary.....	29
5.3	Conclusion.....	30
5.4	Recommendation.....	31
	REFERENCES.....	32
	APPENDICES.....	35

List of Tables

Table 1	Estimates of perinatal mortality in Kenya.....	4
Table 4.2	Descriptive analysis of perinatal mortality.....	23
Table 4.3.1	Multivariate analysis using model I and II.....	28

CHAPTER 1

INTRODUCTION

1.1 Background

Perinatal mortality has been defined by World health Organization as the number of stillbirths and deaths in the first week of life per 1000 live births. Stillbirths refer to deaths after 28 weeks gestation whereas early neonatal death refers to death of a live born baby within the first week of life. Perinatal Mortality rate (PMR) can be calculated as the sum of the number of stillbirths plus early neonatal deaths divided by live births plus still births multiplied by 1000.

Under-five mortality rates have decreased substantially over the past 20 years in developing countries, but perinatal mortality has not followed the same patterns and continues to present a huge burden. Perinatal mortality is a key health indicator of a country's socio-economic status and the quality of care especially to maternal health antenataly, during delivery and the early neonatal period. The perinatal mortality in Kenya, according Kenya Demographic Health Survey (2003) is at 40 deaths per 1000, with variations by provinces highest in coast province at 58 deaths per 1000 and western lowest with 28 deaths per 1000. It is therefore of importance to identify the determinants and the levels of perinatal mortality which contribute significantly to the Infant Mortality Rate (IMR).

A few population based studies of perinatal mortality have been done largely due to the fact that some of the early neonatal deaths occur after hospital discharge, and some of the deliveries occur at home. Most developing countries are lacking in registration systems for these deaths, therefore, studies concentrating on contributing factors of perinatal mortality

will be vital in prioritizing measures that will improve maternal health care antenatally, during delivery as well as early neonatal life so as to minimize Perinatal mortality and in turn reduce Infant Mortality Rate. Its description is also vital for evaluation of policies and planning purposes such as in the attainment of Millennium Development Goals.

One of Kenya's Millennium Development Goals (MDGs) is to reduce infant and childhood mortality rates by two thirds by the target date 2015. Of the Many studies that have been done to establish possible interventions to be implemented so as to achieve that goal, have concentrated on childhood mortality such as; Environmental determinants of childhood mortality in Urban Kenya Mutunga (2004), examination of trends and determinants of childhood mortality Hill et al (2001).

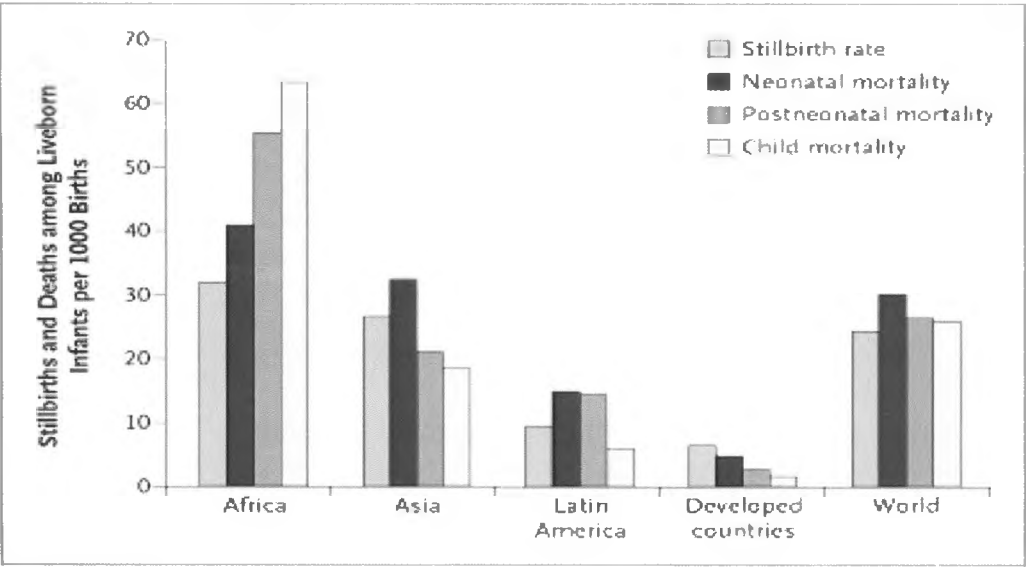
1.2 Problem statement

The under-5 Mortality rates have decreased substantially over the past 20 years in the developing countries, but perinatal mortality has not followed the same pattern and continues to present a huge burden. World Health Organization (2001) indicate that in 1995 the perinatal deaths world wide to be greater than 7.6 million, with 98 percent of these deaths occurring in developing countries.

According to KDHS 2003, the under-five mortality rate five years preceding the survey is 115 deaths per 1000 live births and perinatal mortality rate is 40 deaths per 1000 pregnancies in Kenya, these statistics also indicate the proportion of neonatal deaths that occur during the first week is 82 percent. These statistics show the magnitude of the burden perinatal mortality places on the under five mortality, with the intention of reducing childhood mortality by two thirds by 2015 it is of importance to study risk factors that are associated with perinatal mortality.

In 2004, there were 133 million live births globally; 3.7 million of these births died in the neonatal period, 3 million were still births and 90 percent of these deaths took place in the developing world where 90 percent of the babies were born. They also indicate that 76 percent or 3 millions of the deaths occurred in the early neonatal period and that there are 5.9 million perinatal deaths world wide. World Health organization (2005) estimates that mortality as a result of perinatal conditions constituted 4.4 percent of the deaths in the world

Figure 1: Still births and child mortality rates in the world.



Source: WHO (2005).

The figure above indicates that sub Saharan Africa has the highest rates of Child mortality, neonatal and stillbirths per 1000 live births; compared to Asia, Latin America and the developed countries. In relation to the world, Africa still has higher proportions of childhood mortality. UN 2000 indicates that less developed countries have the highest perinatal mortality and still births at rates at 50 and 26 per 1000 live births compared to the world rates and those in developed countries. Universally, there is huge literature which focuses on the determinants of infant and child mortality; however few studies have concentrated on the

perinatal mortality which is equally an important component of infant and childhood mortality

Table 1: Estimates of perinatal mortality rates in the world.

Country	Live births	Stillbirth rate	Early neonatal mortality rates	Perinatal mortality rate
World	132,882	47	24	23
More developed regions	13,160	10	6	4
Less developed regions	119,721	50	26	25

Source: Adapted from UN 2000.

Perinatal mortality studies done in Kenya and around Sub-saharan Africa, such as Antenatal care and perinatal outcomes in Kwale district by Mukhwana et al (2008), perinatal audit study in Western Tanzania Mbaruku et al (2009), incidence of stillbirths and perinatal mortality in Harare Zimbabwe Shingairai et al (2005) have used hospital or community based approaches however a few studies have used demographic health surveys for their analysis such as Khasakhala et al.

In these studies, cohort surveys which are either community or hospital based have been done; the findings in these studies cannot be used to generalize to the entire population as the sample is not representative and do not allow for the analysis of which variable (s) has significant contribution to the perinatal mortality. In addition, due to cost and time limitations, it is impractical to use similar methodologies for larger population sizes.

According to World Health organization (2006), perinatal mortality and still births are seen as normal occurrences in most societies and therefore go unreported. This poses a challenge in analysis on studies that would otherwise be used by policy makers and implementers to plan for public health interventions as well as other measures of significantly reducing perinatal mortality. Morbidity and mortality in the perinatal and neonatal periods are treatable and preventable conditions, therefore a study that focuses on the determinants of perinatal mortality and the regional variations will go a long way in advising the policy makers on the priority areas.

1.3 Objectives of the study

Overall Objective

To identify the determinants of perinatal mortality in Kenya to inform policy and instigate appropriate programmes.

Specific objectives

1. To determine the effect of maternal education and employment status on perinatal mortality in Kenya
2. To determine the effect of maternal age at first birth on perinatal mortality in Kenya.
3. To explore the effect of some background factors on perinatal mortality in Kenya.

1.4 Significance of the study

Perinatal mortality indicator plays an important role in providing the information needed to improve the health status of pregnant women, new mothers and newborns. In turn this information allows implementers and decision makers to identify problems, track temporal and geographical trends and disparities. Zupan et al (2005), point out that each year 10.7 million children under the age of five years die, of these four million during the first four weeks of life, another 3.3 million are stillbirths

World Health Organization (2006), estimates that 3.3 million stillbirths occur each year worldwide and this account for over half of all perinatal deaths. The majority of these deaths take place in developing countries, while countries in South-East Asia report the highest overall numbers of stillbirths, countries in Africa have the highest incidence rates per 1000 live births. In high-income countries stillbirth rates are as low as 6 per 1000 live births, whereas in less developed countries they can be as high as 26 per 1000 live births.

Countries with good perinatal care as in developed countries have rates that are below 10 whereas in Sub Saharan Africa Perinatal mortality rate is between 40 and 120. Studies done in African countries as well as in Kwale- Kenya, rural Tanzania and Northern Sudan indicate that a substantial proportion of perinatal and neonatal morbidity and mortality in developing countries could be prevented through appropriate adaptations and applications of inexpensive, relatively simple methods to improve antenatal, obstetric and neonatal care. Therefore, there is need for research to establish priority risk factors and determinants that are associated with perinatal mortality, so that they could be incorporated in the policy making processes with an intention of achieving the millennium development goal number four of reducing child mortality by two thirds by 2015.

Different demographic areas are unique in their climatic conditions, cultural practices as well as socio-economic characteristics which can significantly determine the variation in levels and trends of perinatal mortality, it is therefore of importance to look at the regional variations. Moreover, as successes with child survival programs reduce infant and child mortality rates, the proportion of infant and under-five deaths that occur in the neonatal period is rising. Thus, in order to sustain gains in child survival made in recent decades, attention must be focused on reduction of morbidity and mortality in the newborn period.

1.5 Scope and Limitations

The study sought to establish the determinants of perinatal mortality in Kenya looking at the variations in regions and the contributing factors. The study covered all the seven regions in Kenya that are represented in the KDHS 2003, and since its intention was meant for other specific purpose outside this study there are various limitations.

One of the limitations is that the data collected from Kenya Demographic and Health survey 2003 is secondary data that is, it was retrospective as it collected information five years preceding the survey and the quality of mortality data depends on completeness of the deaths and births reported and recorded, however Sub Saharan Africa is said to have poor quality data or it does not exist at all due to cultural inhibitions. Just like any other secondary data, it is not free of errors such as non-coverage, under and over reporting due to poor recall. However an examination of the ratios from KDHS shows that no significant number of early infant deaths was omitted.

Secondly, the survey did not include a wide scope of socio-cultural factors that vary widely from region to region such as taboos, beliefs, religious and cultural factors which are thought to greatly affect maternal health. Finally, the Kenya Demographic and Health survey does not collect information on the specific cause of perinatal mortality which would greatly assist in guiding policy makers on which aspect to place great emphasis on.

CHAPTER 2

LITERATURE REVIEW

This section reviews literature which endeavours to point out the socio-economic, bio-demographic and environmental factors that determine the perinatal mortality in Kenya. According to Confidential Enquiry into Maternal and Child Health (CEMACH) 2007, it shows continued improvement in neonatal mortality with a rate of 3.3 per 1000 live births, a downward trend in the stillbirth rate from 5.7 per 1000 total births in 2002-2004 to 5.2 per 1000 total births in 2007. In England, Wales and Northern Ireland; CEMACH identified risk factors that are associated with perinatal mortality such as maternal age, maternal body mass index, antenatal care and birth weight.

Di Mario et. al (2007) did a systematic review of literature was done for studies carried out in developing countries. A total of 33 studies done in 31 developing countries were included in the review. 13 were cohort studies, 5 case-control studies analyzed as cohort studies, and 15 were case-control studies. Twenty-eight studies were hospital-based, while 5 had been conducted in the community. The findings can be categorized into 2 broad groups. The first group are context-dependent risk factors, such as maternal illiteracy, not receiving antenatal care, or socioeconomic disadvantage, i.e., risk factors for which a direct association to the outcome is not clear. The second group of risk factors relate to clinical conditions (maternal or fetal infections in particular) for which a causal pathway to the final outcome is already known or suspected, such as maternal syphilis or chorioamnionitis. Perinatal deaths are largely the result of maternal factors such as maternal age at first birth, interpregnancy intervals, maternal nutrition, socio-economic characteristics, and utilisation of maternal health care services during pregnancy (antenatal care), during delivery and post natal care.

The significance of young and old maternal ages at child birth as risk factors for adverse perinatal health outcome remains largely context dependent. A systematic review of studies of maternal age and risk of still birth by Huang et al (2008) indicates that older women have a higher risk of experiencing pregnancy-induced hypertension or gestational diabetes, between 50 percent and 70 percent of mothers of stillborn infants had medical or pregnancy complications during their pregnancies. The relative contributions of advanced maternal age and chronic conditions that may influence pregnancy outcomes remain to be fully elucidated.

The findings of a study in Bangladesh indicated that of the 465 births that were studied, 108 were low birth weights and 357 were normal births. Most of these low birth weights were born of mothers in the age group < 19 and > 30 whereas those of normal birth weight between 20-29 years. These findings recommend ages 20-29 as the ideal for child bearing Selina et al (2008). Babiker et. al 1994, in a study carried out in rural Sudan showed that, teenage mothers and those over 35 years and above ran nearly twice the risk of having an unfavourable pregnancy outcome compared with mothers between the ages 20-29 years. The results of this study are concurrent in a similar study carried out in Machakos Kenya, Muller et. al (1991). The impact of young and old maternal ages as risk factors for adverse perinatal health outcomes remain largely context dependent.

The bulk of epidemiologic evidence suggests that, depending on the setting, either teenage or old age pregnancies represent high risk categories. Children born to women of under 20 or over 35 years are likely to have higher risks of mortality. Rutstein (1985) in a cross-national comparative study based on the World Fertility Survey from developing countries found that the age of the mother, parity and child mortality perinatal mortality included had a U-shaped pattern.

Mortality patterns were higher among children born to very young women due to physical immaturity, limited knowledge on child care and those born to older women to a decline in the efficacy in the reproductive system with age.

Magadi et. al (2001), says that birth order is the most consistent predictor of poor birth outcomes in Kenya, where women having their first child are about twice as likely as others to deliver prematurely, have a baby who is smaller than average and or require a caesarean section. Both short < 18 months and long > 60 months birth interval (birth of the index child and the time of conception of the child) are associated with preterm births and low birth weights. Zhu et. al studied a 7 year birth cohort involving 173,205 from Utah US; women who became pregnant within 6 months after a live birth were at an increased risk of giving birth to a low birth weight or a preterm.

An analysis of Demographic Health Surveys from 18 countries, indicated that the risk of perinatal mortality was highest in women with very short and very long intervals between pregnancies. Women with less than 15 months between pregnancies, or more than 39 months, had a 43 percent greater chance of experiencing a perinatal death than women who spaced their pregnancies between 16 and 38 months. Women who waited 15–26 months between pregnancies had only an 11 percent risk of losing their child. Further, the risk of a perinatal death was highest in women with no previous children, and in women in the extremes of their reproductive years (<18 and >35 years of age).

Parental socio-economic and cultural characteristics such as wealth status, level of education, beliefs and practices have been shown to have an influence on perinatal mortality, as these factors tend to influence maternal decision on seeking healthcare, nutritional choices among

others. With respect to the mother's educational levels, the highest proportions of perinatal deaths are observed among those with no education and higher education, those with no education and primary education are observed to have higher proportions of perinatal deaths with regard to partner's education.

The relationship between maternal education and perinatal mortality is complex but several studies have demonstrated rates of infant and childhood mortality rates in association with increased levels of maternal education. This association is partly explained by the economic advantages and access to health care afforded by education. Potential links between maternal education and reduced perinatal and neonatal mortality also include appropriate birth spacing and health-seeking behaviour, particularly for prenatal care, as well as poor maternal nutrition before and during pregnancy impacts adversely on pregnancy outcome and can lead to spontaneous abortion, stillbirth, small for gestational age babies, preterm delivery, or increased risk of perinatal and neonatal death. Also, certain forms of maternal malnutrition limit neurologic development in the fetus. Furthermore, maternal malnutrition may increase the risk of maternal infection, and impair development of the fetal immune system World Health Organization (1996).

Murphy et. al (1992) did an analysis report of Kenya, Egypt and Mexico on the relationship between maternal body mass index and pregnancy outcome, whereby 100 women's food intake and non breast milk foods were measured for 2 days each month. Anthropometric measurements of both maternal and infant were measured monthly. The results showed that, as in many other studies, low maternal BMI in early pregnancy was associated with lower birth weight in all three projects.

It is probable that a combination of low maternal BMI and low weight gain presents the highest risk of low birth weight, and that both measures are needed to best predict this risk. BMI also predicted birth length in Egypt and Kenya. Maternal education also influences utilisation of health services.

A study carried out in Kwale by Mukhwana et. al (2008), shows an association between antenatal care and perinatal outcomes, one of the reasons Ante natal care may have a positive association with perinatal outcomes is the association between attending ante natal care and behavioural decisions, including Tetanus Toxoids and Sulfadoxide Pyrimethamine doses, use of an Insecticide Treated Mosquito Net and decisions regarding place of delivery and who assists the delivery. Ante natal clients are also routinely given iron, folic acid and vitamin supplements, which may impact perinatal outcomes. It cannot be claimed that Ante Natal Care is the solution to high maternal and perinatal mortality in the developing world, but ensuring the provision of quality Ante Natal Care may help progress to the Millennium Development Goals for child mortality and that of maternal mortality.

A report by Lancet (2006) indicates that the antenatal period presents opportunities for reaching pregnant women with a number of interventions that may be vital to their health and well-being and that of their infants. The putative benefits of antenatal care (ANC) to babies include increased growth, reduced risk of infection and increased survival. Some elements of the package (tetanus toxoids, screening for pre-eclampsia, screening and treatment of asymptomatic bacteraemia and syphilis) have been shown to be cost-effective in a Sub-Saharan African context. Previous research shows that women who have had Ante natal care are more likely to deliver in a formal health facility and/or in the presence of a doctor or nurse-midwife Bhutta et. al (2005).

Obwaka et. al (1998) in a study carried out in Nairobi indicate that there are many complications of labor that may lead to perinatal death. It showed that there was significant association between perinatal mortality, previous abortion and inadequate or complete lack of antenatal care, which can result to complications. These shortcomings involve the health delivery system, including lack of transportation and essential obstetric skills, while others are more specific to the woman herself. These complications include delayed admission to the delivery area, dystocia, fetal distress, multiple gestations, intrauterine growth retardation (IUGR), and preterm delivery. Preterm birth may be responsible for 10-15 percent of all perinatal deaths in the developing world. Nearly two-thirds of all births in developing countries occur at home, and in approximately half of deliveries, skilled care is not available. Skilled care at delivery has been associated historically with lower neonatal mortality rates, but provision for skilled attendance at delivery and management of obstetric emergencies is a first-order operational challenge.

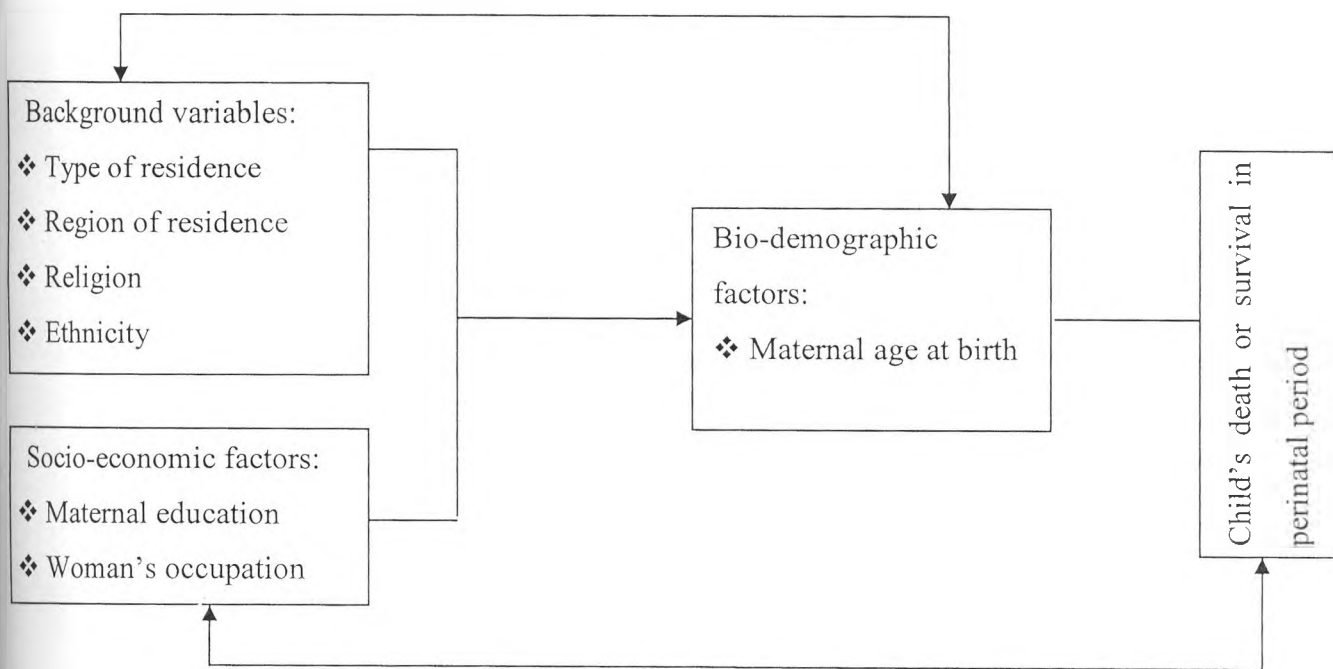
Reduction in perinatal and neonatal mortality as a consequence of improved detection and management of complicated labour requires a functioning referral system and the availability of a hierarchy of trained and supervised health care providers, including home or dispensary care provided by skilled community-based delivery attendants; trained midwives and/or nurses at first-line health facilities; and physicians trained in emergency obstetric care at district or regional hospitals. Most of the findings in Kenya are concurrent with other studies carried out in countries like Tanzania, Bangladesh, Malawi Mat lab and other areas which show significant relationship between determinants such as maternal factors and socio economic characteristics on perinatal mortality.

2.1 Conceptual framework

In the conceptualisation, this study seeks to use the framework developed by Nzita Kikhela (1986) who came up with an analytical framework that represents the events in life that can result to neonatal mortality or still birth. It is applicable in studying of perinatal mortality in developing countries compared to the commonly used Mosley and Chen because unlike the latter which is used in childhood mortality studies (0- 5years), Kikhela's framework includes the determinants that contribute to perinatal mortality during pregnancy . There were those determinants that exist before conception such as parents' socio-economic and cultural characteristics, mothers' demographic characteristics and environment. Those determinants that exist during pregnancy and are related to maternal health such as antenatal care, nutrition, delivery care, and finally those determinants that exist after child birth such as paediatric care, child's immunity status in the first week which all determine the survival of infant as depicted in Figure 3.

Kikhela N. (1986) developed a sequence of events that can lead to neonatal mortality or still births, and these sequences were based on the 17 hypotheses in his conceptual framework, and how they are dependent on each other. For example early neonatal mortality is dependent on factors such as child's healthcare at first week and care given to new born, whereas perinatal mortality is dependent on factors such as medical supervision as delivery, complications at delivery, mothers health during pregnancy. Each of the factors in Kikhela's framework can be a dependent or independent variable which in turn will contribute directly or indirectly to perinatal mortality. Figure 5 is modified and adopted to suit the study, which illustrates the variables to be analysed in the study.

Figure 2.1: An operational framework for perinatal mortality determinants in Kenya



Source: Modified Analytical Framework, Nzita Kikhela (1986).

2.2 Definition of concepts

Still births: These are dead born foetus also referred to as intra-uterine deaths. They are foetal deaths occurring in pregnancies lasting seven months or more.

Early neonatal deaths: These are deaths that occur within the first week of birth that is at age 0-6 days among live born children. Perinatal period commences at 28 completed weeks and ends seven days completed after birth.

Perinatal deaths: These constitute pregnancy losses that occurred seven months of gestation plus the deaths within the first seven days of life. It is therefore the sum of number of still births and early neonatal deaths divided by pregnancies of seven or more months.

Socio-economic factors: These comprise of maternal education, maternal employment status that is either employed or unemployed, maternal education is intended to illustrate the effect

of mother's knowledge and decision making capacity in regard to healthcare and nutrition choices

Demographic factors: These include maternal's age at 1st birth, religion, ethnicity.

2.2. Operational definitions:

Variable name	Measurement
Mothers age at birth	1=11-19, 2 =20-35, Else =0
Type of place of residence	1= Urban, 2=Rural,
Region	1=Nairobi, 2=Central 3=Coast, 4=Eastern 5=Nyanza, 6=,Rift valley 7=Western, 8=North Eastern
Highest level of education	0=No education , 1=Primary, 2=Secondary 3=Tertiary
Maternal's employment status	1=Unemployed, 2=Employed
Religion	1=No religion, 2=Catholic, 3=Protestant 4=Muslim, 5=Other
Ethnicity	1=Embu, 2=Kalenjin, 3= Kamba, 4=Kikuyu, 5 =Kisii, 6 =Luhya, 7= Luo, 8=Maasai, 9=Meru,10=Mijikenda,11=Somali, 12=Taita, 13= Turkana, 14=Kuria, 15=other

Operational hypothesis

These are hypothesis that have been derived from the operational hypothesis and are formulated to give expected direction of the effect on the dependent variable.

- The higher the level of mother's education the less the likelihood of experiencing perinatal mortality.
- The younger the mother (<20 years) or the older the mother (>35+) the higher the likelihood of experiencing perinatal mortality.
- A woman living in rural areas is more likely to experience a perinatal death compared to one who lives in urban areas.
- There is no significant association between ethnicity and perinatal mortality.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Kenya is an African country situated in the eastern part of the continent with Tanzania bordering to the south, Uganda to the West, Ethiopia and Sudan to the North, Somalia to the Northeast and Indian Ocean to the west. Kenya lies between 5 degrees south latitude and between 24-31 degrees east longitude, is divided into 8 provinces north eastern, Eastern, Coast, Rift valley, central, western, Nyanza and Nairobi. Kenya's total population was projected by Central Bureau Statistics to be at 32.2 million with annual growth rate of 2.9% per annum during the 1989-1999. The National Council for Population and Development (NCPD) and the Central Bureau of Statistics carried out the KDHS jointly with significant technical and logistic assistance from the Ministry of Health. Macro International provided technical assistance throughout the course of the project.

The 2003 KDHS is a nationally representative survey with a probability sample of 10,000 households. The survey allows for separate estimates of the key indicators for each province. A two stage sample design which involves first selecting the clusters using the National Sample Survey and Evaluation Programme (NASSEP IV), and the sampling households is used. A total of 400 clusters; 129 urban and 271 rural were selected. All women aged 15 to 45 years who were either usual residents in the selected households or were present in the night of the survey were eligible for interviews. This study is an analytical cross sectional study through secondary data analysis of the 2003 Kenya Demographic and Health survey data set for women and the data examined in this paper was collected from the individual and household woman's questionnaire.

The household questionnaire was used to collect demographic characteristics of the usual members and visitors in the selected household, whereas the woman's questionnaire was more detailed to include information on topics such as; reproductive history, vaccinations and childhood illnesses, infant and childhood feeding practices and mortality among others.

Dependent variable

Perinatal mortality includes still born of more than 28 weeks (stillbirths) and deaths during the first week of life (early neonatal deaths). Perinatal mortality rate is defined by dividing the number of perinatal deaths (still births and early neonatal deaths) by either the number of live births or by the sum of live births and still births.

Independent variables

The independent variables that are associated with perinatal mortality in Kenya are maternal demographic characteristics such as maternal age at birth, nutrition, Interpregnancy interval, birth order. Socio-economic characteristics such as wealth index, education and residence.

3.4 Methods of data Analysis

Descriptive statistics

To interpret the association and to test the levels of correlation between variable under study both frequency distributions and cross tabulations were used. Frequency distributions were used to show the distribution of perinatal mortality by selected background variables while cross tabulations was used to establish relationships between perinatal mortality and the selected variables.

Multivariate logistic regression

The model to be used for the multivariate analysis is depicted in the formula below:

$$\text{Logit } P \ln (P/1-P) = a + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p + E$$

Where:

P is the probability than an event will occur

$\ln$: - is the natural logarithm

1-P. - is the probability that an event will not occur

A:-Is the constant or intercept of the model

Bs: - are the logistic co-efficients

E: - is the error term

The statistical package for social sciences is used to run logistic regression. The logistic coefficients will be obtained. The outcome variable is perinatal mortality which binary had experienced a perinatal death or did. This variable is derived from information on birth histories and age at death month imputed.

Interpreting the results of logistic regression, Wald estimates, Nagelkerke R square, Beta (B), significance (Sign.), and Exponentiated B (Exp B) otherwise known as Odds ratio were used. A negative and a positive sign of beta indicate a reducing and an increasing effect of the variable in question on the outcome variable. The multiple logistic regression is carried out in two models whereby model I is not controlled for any variables while model II is controlled for region and ethnicity which showed least importance based on the findings of Model I. The benefit of using logistic regression model is that it can be used to create a predictor model.

CHAPTER 4

DETERMINANTS OF PERINATAL MORTALITY

4.1 Introduction

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

4.2 Descriptive analysis

Out of the 8195 women who were interviewed in the KDHS 2003, 5865 of them had experienced a birth and has ever been pregnant which is of interest so as to determine if they had experienced a perinatal death. Women who had ever had a terminated pregnancy after 7 months (stillbirths) were selected as well as those who had had a early mortality so as to get total number of perinatal deaths (stillbirths of 7 months and above + early neonatal deaths-deaths occurring 7 days after delivery).

Of the women who had experienced a birth and a pregnancy, 88.8 percent had experienced no death, whereas 11.2 percent had experienced an early neonatal mortality and 2.9 percent had experienced a stillbirth compared to 97.1 percent who had not. Women who had experienced one perinatal death were the majority at 81.3percent compared to those who had six and above deaths at 0.2 percent. A total of 603 perinatal deaths were experienced.

4.2. Distribution of deaths among women who experienced a perinatal death.

Independent Variable (s)	Perinatal death status	
	No Perinatal deaths (%)	Experienced perinatal deaths
Region		
Nairobi	92 (658)	8 (57)
Central	91.6 (879)	8.4 (81)
Coast	84.7 (580)	15.3 (105)
Eastern	89.5 (625)	10.5 (73)
Nyanza	88.4 (662)	11.6 (87)
Rift Valley	87 (893)	13.0 (134)
Western	90.2 (626)	9.8 (62)
North-Eastern	85.2 (287)	14.8 (50)
Type of place of residence		
Urban	90.4 (1645)	9.6 (175)
Rural	88.1 (3565)	8.4 (480)
Maternal's Level of education		
No education/preschool	82.1 (910)	17.9 (199)
Primary	89.2 (2783)	10.8 (336)
Secondary	92.8 (1178)	7.2 (91)
Higher	92.1 (339)	7.9 (29)
Respondents age at first birth		
11-19 years	87.1 (2991)	12.9 (442)
35-49 years	75.0 (6)	25.0 (2)
Maternal employment status		
Employed	89.0 (1643)	11.0 (204)
Unemployed	88.8 (3567)	11.2 (451)

Source: Generated from analysis of findings

This section also sought to explore how the perinatal deaths were distributed among the selected variables; the highest number of perinatal deaths was experienced in Rift valley (134), Coast (105) and Central (81) provinces respectively while Nairobi (57) and North-Eastern (50) had the least number of perinatal deaths.

Urban residence was associated with lower perinatal mortality compared to rural areas, majority of the perinatal deaths occurred in the rural areas (480) as compared to 175 in the urban areas. Education has been cited in many childhood mortality studies as a significant variable. higher the levels of education attainment are generally associated with lower mortality rates, since education exposes mothers to a lot of information that influences the choice of decision made in regard to health care, nutrition choices, use of contraceptives to space births (K'Oyugi 1992). These decisions made by the mother based on her knowledge and understanding directly influence the child health status, hence influencing that child's survival.

This has further been backed up by Caldwell's theory which found that education of women controlling for all other factors has an inverse relationship with infant and childhood mortality Caldwell and Macdonald (1981). The highest number of perinatal deaths was experienced by mothers who had primary education (336), contrary to expectation that the highest mortality would occur to those women who had no education. However, as justified by relevant literature, women who had higher education experienced least number of perinatal deaths (29) compared to other groups.

Women who are employed are said to be economically empowered and therefore have more purchasing freedom compared to those who are unemployed as compared to those who are not employed. This purchasing freedom is inclusive of health care; they are likely to frequently seek healthcare and are likely to have better feeding habits which are significant to maternal's nutrition and consequently to that of the newborn. In addition women who are employed are likely to stay in places that have improved sanitation, with water and a toilet which is important in reduction of diseases that are likely to contribute to perinatal mortality.

The highest proportion of perinatal deaths was experienced by the women who were unemployed (451) compares to those who were employed (204).The highest proportion of perinatal deaths occurred amongst women who were between the ages of 11-19 years; these findings concur with other studies discussed in the literature review which indicate that the recommended age for having a child is between the ages 20-35 years beyond this range there is a higher likelihood of perinatal mortality occurring.

4.3 Multivariate analysis

This chapter also presents the multivariate results using multiple logistic regression whereby the aim is to determine the net effect of selected independent variables which are mother's education, age at first birth, maternal's employment's status, maternal's region, residence, religion and ethnicity. The logistic regression model was adopted for this particular study mainly because the dependent variable is dichotomous and also it allows for prediction of the probability of an event occurring. Multivariate analysis for this study has been done in two models, model I fits in all the independent variable without controlling for any independent variables. Model II controls for region and ethnicity because they were of least significance to perinatal mortality. The importance of logistic regression in this case multivariate is that it enables us to predict the probability of an event occurring using the formula:

Predictor model

$$P= 1/1+e^{-z}$$

Where P- is the probability of an event occurring

e- Denotes the exponential function

4.3.1 Multivariate analysis using model I

This model controls for region and ethnicity independent variables, this is because literature has not yet shown any association between the two and perinatal mortality. The findings from multivariate analysis using Model I indicate that of the selected variables while controlling for region and ethnicity, show that education was the most important factor using the Wald's estimates, followed by age of the mother at first birth, then religion, maternal's employment status and finally residence.

Nagelkerke R square indicates that 3.1 percent of the variation in perinatal mortality was explained in this model as compares to 4.6 percent in model II. This model shows that a woman who has primary education is 4.9 times less likely to experience perinatal death compared to a woman with no education, which is in line with the set hypothesis with an underlying assumption that education decreases the likelihood of a mother experiencing a perinatal death because she has information which is necessary when making decisions in concerning healthcare, nutrition and child care.

Model I findings indicate that a woman is affiliated to catholic religion is 1.2 times likely to experience a perinatal death compared to a woman who is not affiliated to any religion. It also shows that a woman who is employed is 1.1 times more likely to experience a perinatal death compared to one who is unemployed, these findings contradict the report by literature review which associate employment with power to purchase including healthcare, better nutrition choices as well as living in areas with better sanitation, hence better chances of child survival. An increase in one year to the age of the mother at first birth decreases the chance of a woman to experience perinatal death by 3.6 percent.

4.3.2. Multivariate analysis using Model II

The relationship between perinatal mortality and the selected independent variables is provided in table 4.3. The results from the model summary the Nagelkerke R square shows that about 4.6% of the variation in the outcome variable (experienced perinatal death) is explained by this logistic model. Going by Wald estimates from the analysis, the most important of the independent variables is education since the higher the estimates the more the importance followed by ethnicity whereas region seemed to be the least important.

In terms of significance religion, maternal's level of education, employment status were significant to perinatal mortality at 0.05 confidence levels, so was respondents age at 1st birth, however region was not of much significance to the dependent variable. A woman who is employed is 1.2 times (95 percent CI 9.7to 14.3 percent) more likely to have a perinatal death compared to a woman who is not employed, a woman who is a catholic is 1.6 times (95 percent CI 8.3 percent to 19.2 percent) more likely to have a perinatal death compared to one who is not affiliated to religion, while that one who is a protestant is 1.9 times more likely to have a perinatal death compared to a woman who is not affiliated to any religion (95 percent CI).

These two models are similar in such that they both show education to be significant to perinatal mortality at 0.05 levels. A woman with primary education is 6.1 times less likely to experience a perinatal death compared to a woman who has no education at 0.05 level. In respect to region a woman who lives in central is 1.3 times more likely to experience a perinatal death compared to a woman who lives in Nairobi, whereas one who lives in Western and North eastern is 0.1 times and 0.2 less likely to experience a perinatal death compared to that who lives in Nairobi respectively.

4.3.1 Multivariate analysis findings using Models 1 and II

Variables	Model 1			Model II		
	S.E	SIG	EXP (B)	S.E	SIG	EXP (B)
Region						
Nairobi R.C					0.269	
Central				0.224	0.180	1.387
Coast				0.286	0.917	1.030
Eastern				0.274	0.354	1.289
Nyanza				0.262	0.272	1.334
Rift Valley				0.228	0.120	1.427
Western				0.252	0.649	0.891
North-Eastern				0.332	0.370	0.743
Type of place of residence						
Urban R. C						
Rural	0.099	0.380	1.091	0.119	0.843	1.026
Maternal's Level of education						
No education/preschool R.C		0.000			0.000	
Primary	0.127	0.000*	0.498	0.127	0.000	0.498
Secondary	0.168	0.000	0.360	0.168	0.000	0.360
Higher	0.224	0.001	0.451	0.224	0.001	0.451
Respondents age at first birth	0.013	0.007*	0.964	0.014	0.014*	0.967
Maternal employment status						
Unemployed R.C						
Employed	0.0906	0.062*	1.196	0.101	0.098*	1.182
Religion						
No religion R.C		0.208			0.041*	
Roman catholic	0.287	0.180	1.387	0.305	0.120	1.606
Protestant	0.279	0.917	1.030	0.295	0.026	1.930
Muslim	0.288	0.354	1.289	0.324	0.545	1.217
Other	1.069	0.272	1.334	1.109	0.646	0.601
Ethnicity						
Embu (R.C)					0.006*	
Kalenjin				0.770	0.064*	4.164
Kamba				0.736	0.070	3.786
Kikuyu				0.757	0.236	2.454
Kisii				0.793	0.223	2.629
Luhya				0.765	0.068	4.036
Luo				0.775	0.113	3.411

Masai	0.818	0.539	1.652
Meru	0.756	0.215	2.553
Mijikenda/Swahili	0.798	0.016	6.831
Somali	0.809	0.020	6.617
Taita	0.830	0.029	6.102
Turkana	0.818	0.336	2.197
Kuria	0.905	0.086	4.723
Other	0.823	0.026	6.272
*Significant at 0.05			

Source: Generated from analysis findings

The likely explanation is that in Nairobi there is a large population that inhabits the slum areas which is characterized by poor hygienic and sanitation which could result to less chances of child survival.

In regard to residence a woman who lives in rural areas is 0.03 times less likely to experience a perinatal death compared to a woman who lives in the urban areas at 0.05 level this can be due to the fact that healthcare in urban areas is expensive in addition to the fact that urban areas are overwhelmed by slums, there is pollution and poor sanitation which could expose both mother and new born to diseases that could reduces chances of survival.

A Kamba woman is 4.1 times likely to experience perinatal death compared to her Embu counterpart while a Turkana and Kuria woman is 5.5 and 0.98 times less likely to experience a perinatal death compared to an Embu woman at 0.05 level. One year addition to a woman's age at first birth decreases the chance of perinatal mortality by 3.6 percent. Table 4.3.1 illustrates the findings from multivariate analysis for models i and ii

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This chapter represents a summary of the study findings and conclusions, as well as recommendations for policy and research drawn from the findings. The study set out to analyse the determinants of perinatal mortality in Kenya, and the association of the selected variables namely region, type of residence, maternal's education status, age at 1st birth, maternal's employment status, ethnicity, and religion.

Descriptive analysis was done to show the distribution of perinatal deaths among the selected variables. In addition, to find out the effect of predictor variables on perinatal mortality, multivariate logistic regression was done. Multivariate analysis was done into Model I and II in which model I controlled for ethnicity and region, while model II did not control for any variables. The dependent variable was defined as perinatal mortality which was extracted from KDHS as follows; women who ever had a pregnancy and a birth were selected from the sample, from the birth histories the women who ever had a death were selected and those whose children died during the first seven days of life (early neonatal mortality) were selected. Women who ever had a terminated pregnancy after seven months (stillbirths) were also selected and the components added to comprise perinatal mortality.

Multivariate analysis indicates that of the selected independent variables namely region, type of residence, maternal's level of education, maternal's employment status, age at 1st birth, religion and ethnicity, education had a strong association with perinatal mortality, while region and ethnicity were not strongly significant to perinatal mortality.

5.3 Conclusion

The international public health and development community development has had much success but has many remaining challenges; over there is still unfinished agenda with child survival. 12million children under the age of five, 5 million die within 28 days, two thirds die within the 1st week of life, when 4.3 million fetal deaths are added to this number, then the importance of combating neonatal and perinatal mortality becomes self evident.

Based on the findings an indicated in chapter 4, the following conclusions can be made: education was strongly associated with perinatal mortality, followed by age of the respondent at 1st birth then maternal's employment status. Region and ethnicity did not show any significance and hence they were controlled for in model I. However comparing the two models; Model II had a higher percentage of variation explained (at 4.6%) compared to Model I. The specific objectives of this study were to establish the effect of maternal education and maternal employment status was selected, the findings indicate that of these two determinants both of these determinants were significant at 0.05 levels. They further indicated that a woman with education was less likely to experience a perinatal death compared to one who is not educated, in regard to employment the findings indicate that a woman who is employed is likely to experience a perinatal death compared to one who is unemployed, a possible explanation is that she is likely to leave the newborn in care of someone who is not conversant with child care and hence be at a higher risk of experiencing perinatal death.

The second objective sought to show the effect of demographic variables, for this study maternal age at 1st birth was selected, the findings indicate that it is significantly associated to perinatal mortality at 0.05 level. The third objective sought to explore the effect of some

background variables such as ethnicity, religion and region, among these, only religion was found to be significantly associated to perinatal mortality.

5.4 Recommendation

5.4.1 Recommendations for policy

In line with the findings of this study, the following recommendations can be made, education is an important variable which is of significant association to perinatal mortality, and therefore, the government of Kenya should lay further emphasis on girl child education so as to reduce perinatal mortality with an aim of reducing child hood mortality.

In addition implementers of health policy and programs should also heighten the emphasis on reproductive health so as to advice women on the recommended age for child birth (>20 and <35 years), since studies currently indicate that women of the 21st century are concentrating on furthering their careers, then starting families late.

5.4.2 Recommendations for Research

This study has used just but a few independent variables and the going by the Nagelkerke R Square, this study has only 4.6% variation using model I and 3.1% using model II. This shows there are still more variables that contribute to perinatal mortality that has not been addressed by this study, there is therefore need for further research to be done to identify more determinants that are of significance to perinatal mortality.

REFERENCES

Atalah E, Castro R. [Maternal obesity and reproductive risk.] *Rev Med Chil* 2004; 132:923-930 (in Spanish).

Agarwal DK, Agarwal A, Singh M, et al. Pregnancy wastage in rural Varanasi: Relationship with maternal nutrition and socio-demographic characteristics. *Indian Pediatr* 1998; 35:1071-1079.

Adam T, Lim SS, Mehta S, Bhutta ZA, Fogstad H, Mathai M, Zupan J, Darmstadt GL. 2005; Achieving the millennium development goals for health - Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. *British Medical Journal* 331:1107-1110. doi: 10.1136/bmj.331.7525.1107

Celia A Brown, Salim B Sohani, Khalid Khan, Richard Lilford, and Walter Mukhwana. Antenatal care and perinatal outcomes in Kwale district, Kenya.

Campbell OMR, Graham WJ., The Lancet Maternal Survival Series steering group Strategies for reducing maternal mortality: getting on with what works. *Lancet*. 2006; 368:1284-1299. doi: 10.1016/S0140-6736(06)69381-1

Conde-Agudelo A, Belizan JM, Diaz-Rossello JL. Epidemiology of fetal death in Latin America. *Acta Obstet Gynecol Scand* 2000; 79:371-378.

Calloway DH, Murphy S, Balderston J, Receveur O, Lein D & Hudes M (1992): *Village nutrition in Egypt, Kenya and Mexico: looking across the CRSP projects*. Berkeley, CA: Department of Nutritional Sciences, University of California

Chen CL, Cheng Y, Wang PH, et al. Review of pre-eclampsia in Taiwan: A multi-institutional study. *Zhonghua Yi Xue Za Zhi (Taipei)* 2000; 63:869-875.

Chalumeau M, Bouvier-Colle MH, Breart G. Can clinical risk factors for late stillbirth in West Africa be detected during antenatal care or only during labour? *Int J Epidemiol* 2002; 31:661-668.

Goldenberg RL, Kirby R, Culhane JF. Stillbirth: a review. *J Matern Fetal Neonatal Med* 2004;16:79-94

Harrison KA. The importance of the educated healthy woman in Africa. *Lancet* 1997; 349: 644-7.

Magadi M, Madise N and Diamond (2001). Factors associated with unfavourable birth outcomes in

Kenya, *Journal of Biosocial Science*, 33(2):199-225

Ibrahim SA, Babiker AG, Amin Ik, Omar MI, Rushwan H. Factors associated with high risk of perinatal and neonatal mortality: an interim report on a prospective community based study in rural Sudan. *Paediatr perinat epidemiol* 1994;8 193-20

Lawn JE, Cousens S, Bhutta ZA, Darmstadt GL, Martines J, Paul V et al. Why are 4 million babies dying every year? *Lancet* 2004; 364(9432): 399-401

Obwaka WL and Ruminjo JK (1995). Factors associated with stillbirths and 24 hour neonatal deaths in Nairobi Kenya. In *East Africa medical journal*.

Ondimu KN (2001). Determinants of perinatal health problems in kisumu district, Kenya. *International journal of health care quality assurance*. Volume 14 issue: 5 page 200-211.

Salakhov E, Tikhonova L, Southwick K, et al. Congenital syphilis in Russia: The value of counting epidemiologic cases and clinical cases. *Sex Transm Dis* 2004; 31:127-132.

Lumbiganon P, Piaggio G, Villar J, et al. The epidemiology of syphilis in pregnancy. *Int J STD AIDS* 2002; 13:486-494.

Newman RD, Hailemariam A, Jimma D, et al. Burden of malaria during pregnancy in areas of stable and unstable transmission in Ethiopia during a non epidemic year. *J Infect Dis* 2003; 187:1765-1772.

Rush D. Nutrition and maternal mortality in the developing world. *Am J Clin Nutr* 2000; 72:Perinatal mortality: a listing of available information. Geneva, World Health Organization. 1996 (unpublished document WHO/ FRH/MSM/96.7).

Schmidt MI, Duncan BB, Reichelt AJ, et al. Gestational diabetes mellitus diagnosed with a 2-h 75-g oral glucose tolerance test and adverse pregnancy outcomes. *Diabetes Care* 2001; 24:1151-1155.

Sepou A, Yanza MC, Nguembi E, et al. [Prenatal care in a semi-urban area of Central African Republic: Frequency, influential factors, maternal and neonatal prognosis]. *Med Trop (Mars)* 2000; 60:257-261 (in French).

Selina K. and Mahmudur R. Socio-economic determinants of low birth weight in Bangladesh: A multivariate approach.

Southwick KL, Blanco S, Santander A, et al. Maternal and congenital syphilis in Bolivia, 1996: Prevalence and risk factors. *Bull World Health Organ* 2001; 79:33-42.

Stanton C, Lawn JE, Rahman H, et al. Stillbirth rates: Delivering estimates in 190 countries. *Lancet* 2006; 367:1487-1494.

The world health report 2005: make every mother and child count. Geneva: World Health Organization, 2005.

Tikhonova L, Salakhov E, Southwick K, et al. Congenital syphilis in the Russian Federation: Magnitude, determinants, and consequences. *Sex Transm Infect* 2003; 79:106-110

Villar J, Gulmezoglu AM, and De Onis M. Nutritional and antimicrobial interventions to prevent preterm birth: an overview of randomized controlled trials. *Obstet Gynecol Surv* 1998; 53: 575-85.

World Health Organization: *Perinatal mortality: A listing of available information*. Geneva Switzerland. World Health Organization, 1996. FRH/MSM 96.7

World Health Organization. World health report 2001. Geneva: World Health Organization, 2001:144.

Watson-Jones D, Changalucha J, Gumodoka B, et al. Syphilis in pregnancy in Tanzania. I. Impact of maternal syphilis on outcome of pregnancy. *J Infect Dis* 2002; 186:940-947.

World Health Organization. *Neonatal and perinatal mortality. Country, regional and global estimates*. Geneva, Switzerland: World Health Organization; 2006.

Zhu BP, Haines KM, Le T, McGrath-Miller K, Bolton ML. Effect of the interval between pregnancy intervals on perinatal outcomes among white and black women. *Am J Obstet Gynecol* 2001; 185:1403-10.

Appendix: Analytical framework by Nzita Kikhela (1986)

