CORRELATES OF NEONATAL MORTALITY IN KENYA: A LOOK AT THE KENYA DHS (1989) AT NATIONAL LEVEL.

BY

JOSEPH LODIONG KENYI

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DECLARATION

This is to certify that this thesis is my own work and has not been submitted for a degree to any other university.

Kenyi

Joseph Lodiong Kenyi

This thesis has been approved for submission for examination with our authority as supervisors of the university.

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1. Professor M Rafiq

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2. Professor J.A.M Otieno

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ABSTRACT

Despite the acknowledged importance of neonatal mortality in terms of its critical contribution to one year deaths, very little attention has been paid to this in terms of the number of researches carried out at the Population Studies and Research Institute, University of Nairobi. This is not surprising at all because neonatal deaths are believed to be mainly biologically caused for which social scientists have no remedial solutions to offer. Yet evidence emerging from other developing countries indicates the overwhelming importance of socio-economic factors in reducing endogenous causes of mortality. Hence, there is a lot for social scientists to offer in terms of community based studies, using several sources of data.

The general objective of this study is to explore the associations of socio-economic, socio-cultural, demographic, environmental and health factors with neonatal mortality. These associations are explored using information on birth histories of 7150 women in the reproductive age group 15-49. In total the study includes 198 neonates who are born and died during the five year preceding the survey.

A number of statistical techniques of analysis including descriptive statistics, multiple and logistic regression models and relative risk method were used.

While some of the results are inconsistent with what is in the literature resume, this study has confirmed the universally accepted view that during the neonatal period endogenous rather

than exogenous factors (i.e., socio-economic, socio-cultural, demographic, environment and health factors) are most important statistically in providing explanation of the variation in neonatal mortality. It should be emphasized that other exogenous factors such as paternal characteristics which have not been captured by the analysis could also be important predictors of neonatal mortality. Furthermore, this study has shown wide variation in the correlates of neonatal mortality across the five years preceding the survey. This suggests the seasonal nature of the causes of neonatal mortality.

Based on these findings the studies recommends the following:

(1) Longitudinal rather than retrospective studies should be carried out with biological factors and paternal characteristics included, using logistics and multiple regression models and data from several sources.

(2) The actual causes of neonatal mortality and their periodicity of occurrence should be closely monitored and studied at the micro level (i.e., district level) and on monthly and yearly basis since planning process in the country is essentially district focused.

(3) The present network of family planning programme should be strengthened through access to medical facilities and training and equipping nurses and traditional birth attendants in order to encourage or stimulate good social and economic behaviour. The same information can be passed through encouraging women education, both formal and informal. Furthermore, immunization coverage should be extended to include all women in the reproductive age group 15-19.

(4) The environment should be improved in general since environmental factors affect both the under fives and under ones.

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CHAPTER ONE

GENERAL INTRODUCTION

1.0 BACKGROUND TO THE STUDY

There is overwhelming agreement in the relevant discussions on infant and child mortality (ICM) that the neonatal period (i.e., the first one month of life) is less critical to the life of the child as biological causes, which are related to birth process or congenital malformations and can not be easily checked, are emphasized. Therefore it is hardly surprising to find that much of the previous research on neonatal mortality has been conducted by medical practitioners. Exogenous or environmental causes (which can be easily checked) are mainly associated with the post neonatal period (i.e., from 1 month to 12 months of life). Yet there is emerging evidence from several developing countries like India and Pakistan that economic and social factors are also important determinants of the endogenous causes of death (Gray, 1974); Nag, 1981).

In Kenya, like in other developing countries, the mortality situation as portrayed by infant mortality rate (IMR) is not very different, namely, high but declining rates in the face of low per capita incomes. But when comparison is made with the countries south of Sahara Kenya enjoys relatively lower infant and child mortality rates. Notable exceptions are South Africa, Botswana, Zimbabwe and the islands of Mauritius, Reunion and Seychelles which are off the coastal zones of Eastern and Southern Africa.

Recent estimates however indicated a mixed up results of the concerted efforts by both government and non-governmental organizations (NGOs) in lowering infant and child mortality rates in Kenya. Between 1984 and 1989, under fives mortality actually declined from 93.1 to 89.2 per 1000 and infant mortality rose from 57.6 to 59.6 per 1000 (Republic of Kenya, 1989d). The upsurge in Infant mortality could be partly explained by resurgence of diseases, such as malaria, tuberculosis, measles, etc., that were once eradicated in the past and partly by the effect of HIV/AIDS epidemic. Yet these results do conceal considerable infant mortality variations by geographical regions and by socio- economic and socio-cultural groups (Anker and Knowles, 1980).

This study is an attempt to investigate the correlates of neonatal mortality at national level, using Kenya's DHS data set. The theoretical model is largely based on community, individual and household variables that are associated with demographic, socio-economic, socio-cultural, environmental and health factors.

On the onset we would like to point out that although Kenya's DHS is a much greater improvement over previous surveys as it includes a wide range of explanatory variables. Yet, like most retrospective surveys, it is replete with errors due to coverage and content which are considered in a more detailed manner in chapter three. Besides, there are omissions of some important factors in the DHS such as polity and policy, natural calamities, wars, AIDS, costs of health services and transport fares to and from the hospitals, weight and height of the children by age, maternal conditions during pregnancy, child care and health immediately after birth, etc which have been documented by several studies to have a strong statistical influence on neonatal mortality.

Before proceeding to the next chapter we would like to give some background information on the country's economy, education and health care delivery system. Although the dramatic decline in mortality in some developing countries since the end of the Second World War has been independent of improvement in economic level and development (WHO, 1980), recent successes of countries like China, Coats Rica, Sri Lanka and Kerala State in India in reducing their mortality rates drastically have, nonetheless, prompted researchers and policy makers to conclude that no long term sustained reductions in infant mortality can be achieved without improvement in the level of economic development (Halstead, 1985). For Tanzania, although Sembajwe (1983) places great emphasis on expansion of rural health facilities as a means to reducing mortality he had this to say. " The decline in mortality is a subject of many factors ....and no single factor can lead to the well being of the population".

1.1.1 HEALTH CARE DELIVERY

Kenya's Health care delivery system typifies that in most developing countries where on the average there are 9.7 doctors per every 100,000 people, the corresponding figure for the developed nations is 158 and in the USA the ratio is 553 (Tadaro 1986). For

Kenya the population physician ratio in 1987 was relatively high (25,000 to 1), population clinical officer ratio was 13,800 : 1, population registered nurse ratio was 11,200 : 1, population enrolled nurse ratio was 3,500 : 1, and population traditional medical practitioner was 250 - 400 : 1. Besides, 80% of births in the country are attended to by traditional nurse/midwife. The health sector absorbed 9 percent of the total ministries' recurrent expenditure over the period 1982/83 - 1985/86 (Republic of Kenya, Statistical Abstract, 1988). This represents the third highest allocation to a single sector.

For all practical and structural purposes Kenya's health delivery care system relies heavily upon borrowed Western medical technology as reflected in a high proportion of given to curative health care. For example, in 1986/7 fiscal year the share of the curative health care in the health sector's recurrent and development budgets was 66 and 35 percent, respectively (Republic of Kenya, Development Plan, 1989-1993).

By no means the distribution of the health facilities between rural and urban areas and between different regions has been uneven. Most of the doctors prefer to operate in the urban areas, particularly in Nairobi, the capital city and in the big provincial capitals in general where opportunities for further studies and private practice are high. For example, in Nairobi the population doctor ratio is estimated at 672 to 1 whereas in the rural areas where the majority of the Kenyan people reside it is 20,000 to 1. In general, we can say that Kenya's health delivery system is a mix of low-cost government hospitals, health centres, sub centres and dispensaries and church and mosque - run hospitals and clinics and high- cost private hospitals and clinics (including traditional medical practitioners).

Since independence Kenya has made impressive progress in improving its health care delivery system. Crude death rate fell from 22 per 1000 in 1962 to 13 per 1000 in 1987. The number of hospitals increased from 148 in 1963 to 254 in 1987. The ratio of hospital beds and cots per 10,000 population increased from under 110 in 1963 to 148 in 1987. The number of doctors per 100,000 population increased from 7.8 in 1964 to 13.9 in 1987, registered nurse from 22.8 to 44.8 and enrolled nurse from 29.9 to 59.9 (Republic of Kenya, Ministry of Planning and National Development and UNICEF, 1990).

Yet, despite this remarkable documented achievement the health care delivery system has failed to keep pace with the high population growth rate believed to be the highest in the World. In the hospitals this is exemplified by acute shortages of trained personnel (e.g., doctors and paramedics), most of whom due to low salaries prefer to work abroad), drugs and beds (reflected in more than 100% bed occupancy) and high daily cost per in-patient. Moreover, the health facilities lack some basic amenities (e.g., water, electricity and waste disposal system) for performing proper operations. According to the Ministry of Health less than 50% and 15% of health facilities have pipe water and electricity respectively while 70% of all water supplies are not treated and more than 60% facilities lack proper facilities for water and waste disposal (Government of Kenya, Ministry of Health, 1978).

1.1.2 ECONOMY

Kenyan economy is a dual economy characterized by relatively large traditional rural agricultural sector and relatively small modern urban industrial sector. Agriculture is the mainstay of the majority of the population as reflected in its greater contribution to employment (more than 80 percent of the total work force) and export earnings. As a result the government gives top priority to agriculture; for example, during the period 1981/82 - 1985/86 expenditure on agriculture was 9 percent of the government total expenditure and its recurrent expenditure was 7.6 percent of the total recurrent expenditure over the same period. However, there are wide variations in disbursement of agricultural resources by regions with those regions which were favoured during the colonial period continuing to receive a larger share in the post colonial era.

Since independence in 1963 up to 1971 Kenyan economy registered one of the highest growth rates in Sub-Saharan Africa. Inflation was checked and kept below 3 percent per annum and the balance of payment was positive. Real total gross domestic product (GDP) grew at the rate of 6.5 percent per annum, agriculture (4.2 percent), manufacturing (8.2 percent), government services (9.8 percent) and others (6.9 percent) (Republic of Kenya, National development Plan, 1989-1993).

From 1973 onwards due to both external and internal crises, arising from rising oil prices, decontrol of commodity prices, increased money supply, devaluation of the shilling and worsening terms of trade, the economy was over heated. Total GDP growth rate slumped to 4.8 percent by 1987 and in 1992 the economy grew by near zero rate(0.4 percent). Growth in agriculture declined to 3.8 percent by 1987, manufacturing to 5.7 percent by 1987 and to 2.6 percent by 1992, government services to 5.7 percent by 1987 and others to 4.9 percent by 1987 (Republic of Kenya, Economic Survey, 1993). Overall employment in 1992 declined but some sectors out side small scale agriculture recorded increases of up to 91,300 jobs and of these the modern sector had an increase of 20,000. Yet, in spite of the pay increases in the modern sector real purchasing power went down by 8.9 percent in 1981 and by 12 percent in 1992. This worsening economic situation has serious consequences for child survival.

1.1.3 EDUCATION

In kenya, like in other developing countries, data on literacy are limited. In 1988, a survey conducted jointly by the Ministry of Planning and National Development and UNICEF showed that 37 percent of Kenya's population was literate (Government of Kenya, Ministry of Planning and National Development and UNICEF, 1990). For the rural population aged over 15 years CBS estimated a literacy rate of 46 percent and of these 65 percent for males and 35 percent for females (CBS, 1977).

Since independence in 1963 Kenya has witnessed impressive expansion of the educational system in both quality and quantity. The share of education in government recurrent expenditure increased from 29.5 percent in 1982/83 to 34.8 percent in 1986/87 (Republic of Kenya, Statistical Abstract, 1988). The number of pre-primary schools rose from 10610 in 1984 to 12192 in 1986 and enrolment by 271.5 percent between 1968 and 1986. The number of primary and secondary schools increased from 6058 to 13849 and 151 to 2592, respectively over the same period. Enrolment in primary schools rose from 892 to 5.03 million and enrolment in secondary rose from 30120 to 522261 (Republic of Kenya, Development Plan 1989-93). The number of public universities also rose from one to four.

While universal enrolment in primary education has been almost achieved in Kenya (94 percent) and there are almost equal number of boys and girls at primary level (the ratio of boys to girls being 13 to 12), there are wide regional differentials. Nairobi Province and the Arid and Semi Arid Lands (ASALs) have the lowest enrolment rates. In Nairobi the enrolment rate is 63 percent and in the ASALs it ranges from 14 to 64 percent (Daily Nation,June 5, 1993). The low enrolment in the ASALs could be explained by the fact that parents consider children as an important source of cheap labour. Indeed, schooling in the area is considered less important than cattle grazing. The other likely reason could be the ever rising cost of education which most parents have failed to meet after the government introduced the cost sharing scheme. In Nairobi on the other hand, besides rising cost of education, lack of places in Standard One have hindered many children of school going ages from joining school.

A second and more serious problem facing the educational system is that of high drop out rates. It has been estimated that between 30 to 47 percent of school age children who enrol at Standard One drop out before reaching Standard Eight, with the rates being Comparatively higher for girls (65 percent) relative to boys (47 percent). The result has been marginalisation of women in higher education (The Science And Technical Faculties are the worst hit) and jobs allocation.

The high drop out rates among girls could be explained by several reasons: (1) Rising cost of education. (2) High repetition rates among girls who reach puberty age while in lower primary and hence have to abandon school for early marriage. (3) Parents do not regard education for girls as an investment in future but rather a waste because once married they do not support their parents financially. (4) During peak periods where workloads are high sending girls to school implies foregone contribution to farm labour. (5) girls show low return on education than boys (6) Due to lack of places in secondary schools more girls are enrolled in Harambee schools which besides being expensive are of low quality. So many girls fail to qualify to join higher education.

1.2 STATEMENT OF THE PROBLEM

One of the major barriers to economic development in Kenya (according to the donor community) relates to its explosive population growth rate which has been estimated at around 3.8 percent per year (Ocholla- Ayayo, 1991); a much alarming higher rate of 4.1 percent has been given by the United Nations in 1979 (also cited by Acholla-Ayayo, 1991). But, in 1993, a much lower growth rate of 3.4 percent per annum has been cited which is still very high by western standards (KDHS, 1993; UNPA, 1993).

One of the factors responsible for the high population is the upsurge in infant mortality (hence neonatal mortality) revealed by recent estimates. Such an increase in infant mortality however modest it may be, could in the short run lead to high fertility (as people bid to make up for those children who die) and hence, fewer resources per capita and irreversible environmental degradation in the future.

Emerging evidence from several developing countries (as mentioned early on in the introductory part) indicates that economic and social factors also make considerable reduction in mortality in general and endogenous causes in particular. Yet much of the previous research on neonatal mortality in Kenya gave prominence to the endogenous causes, partly because they were conducted by medical practitioners, and partly because of its insensitivity to medical cure social scientists think they have a limited role to play in reducing neonatal mortality. This lack of concern for neonatal mortality by social scientists underscores the need for bridging the gap in knowledge of exogenous causes of neonatal mortality. The objective of this study is to establish the relationship between exogenous factors and neonatal mortality. Such a study would enable the government to adopt appropriate policies for achieving considerable long term sustainable reduction in neonatal mortality.

1.3 OBJECTIVES

The general objective of this study is to explore the relationship between socio-economic, socio-cultural, demographic, health and environmental factors and neonatal mortality in Kenya.

The specific objectives of this study is to explore the association of neonatal mortality with:

1. Maternal education.
2. Maternal employment.
3. Maternal age at first birth.
4. Preceding birth interval.
5. Succeeding birth interval.
6. Type of attendance at delivery.
7. Type of attendance in pregnancy.
8. Tetanus injection.
9. Ownership of large animals.
10. Child's sex.
11. Mother's religion.
12. Mother's ethnicity.
13. Current marital status
14. Currently breastfeeding.
15. Five-year groups.
16. Type of floor material.
17. Currently working status.
18. Duration of breastfeeding.

1.4 RATIONALE FOR THE STUDY

A number of studies on infant and child mortality (ICM) levels, trends and differentials have been carried out in Kenya since 1969 by researchers from Population Studies and Research Institute, University of Nairobi (Koyugi and Kimani, 1988), except studies on neonatal mortality (e.g., Kizito, et. al (1991); Koten, 1968; Voorhoeve et al (1983); Johnstone et al (1980); and Meme, (1979), to mention a few). However, these studies are severely limited because all, other than that one by Kizito and others, have dealt with biological causes of neonatal mortality. Even the study by Kizito and others has not covered a wide range of correlates as exhaustively documented in the literature review. In addition, the study by Kizito and others has used different statistical method of analysis to the ones used in this study. In this study we shall focus our attention on those explicitly ignored factors and selected factors whose influence on infant mortality have been shown to be substantial in other developing countries, albeit unknown in Kenya. Notably, we shall cover a battery of 17 selected socio-economic, socio-cultural, demographic, environmental and health factors.

The second reason for undertaking this study is that neonatal mortality makes a critical contribution to infant deaths (estimated about 45 percent for both sexes in Kenya, according to KDHS) and hence, an important indicator of the health status of both the society and the environment in which the child lives. The reason is that the causes of deaths at the neonatal period have been found to be quite distinct (Omondi et al., 1984).

Finally, it is hoped that the findings of this study will be of a great help to the Kenyan government in formulating appropriate strategies and health interventions to curb deaths due to neonatal causes which other developing countries could emulate. In addition, these findings are expected to heighten interest in further research by either employing similar statistical technique(s) of analysis but different data set or by using the same data set but dissimilar methods of analysis.

1.5 SOURCE, SCOPE AND LIMITATION OF THE STUDY

This study uses secondary data derived from the Kenya Demographic and Health Survey of 1989. The survey lasted for 6 months from Dec. 1988 to May 1989. It was carried out by both the Central Bureau of Statistics (CBS) and National Council for Population and Development (NCPD) with financial and technical assistance from USAID. The objective of the survey was to provide a viable demographic database which can be readily available to policy makers and researchers alike.

A number of questions were asked during the survey which include: (1) a complete retrospective life history of previous pregnancies of 7,615 women in the reproductive age span 15 to 49 years, (2) family planning, and (3) personal characteristics.

Kenya's DHS data set was from the very beginning intended to yield high quality information in the way it was manned by well trained researchers and research assistants and pre-tested. Yet it has severe limitations. First, the survey covered all 7,615 women of child bearing age 15-49. But many studies elsewhere have shown that not all women in the reproductive age span 15-49 years are fecund. Furthermore, the fact that the Kenya's DHS did not collect data from children of deceased, institutionalized or uninterviewed mothers means that not all under fives were covered.

Secondly, the way the sample was drawn from the National Sample Survey and Evaluation Programme (NASSEP) master sample leaves a lot to be desired. For example, the sample excludes some 5 percent of Kenya's population, mainly from 4 districts of Northern province. This means the sample is unrepresentative.

Thirdly, as usual with retrospective surveys in Africa, Kenya's DHS is notoriously replete with errors which are beyond the scope of the researcher. Indeed, reliable statistics are available for only 13 rural districts. These errors can at best be explained by differential misreporting of infant deaths and infant births due to what Professor Brass has labelled as memory recall lapse (Brass, 1968; Kpedekpo, 1977) or religious and cultural taboos which tend to make parents prefer certain children of particular sex over others. Also, cultural aspects may make it painful for parents to disclose or remember past deaths. Still for other ethnic groups children who die immediately after birth are never recorded as deaths. The resultant effect is distortion of findings caused by age heaping, age shifting or omission. Age omission is a more serious error since it is a biased error for which nothing can be done about.

Fourthly, Kenya's DHS was designed by researchers whose aims are far from those for the present study. For this reason the Kenya's DHS data exclude certain important variables that are strong predictors of death during the neonatal period.

Lastly, some of the maternal socio-economic characteristics such as education and employment which were measured as per the date of the survey are assumed to remain constant over the five years period preceding which is not always the case. However, given the inelasticities of supply for jobs and schools the magnitude of change in the socio-economic characteristics during the five years preceding the survey cannot be large enough so as to distort the outcome of our final results.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 INTRODUCTION

In this chapter we explore briefly studies on neonatal mortality which have been conducted in developing countries and Kenya. It is hoped that this exercise will enable us to find out what analytical frameworks and conceptual models have been developed and tested on developing countries and Kenyan data. The main aim is to assist us to formulate an appropriate relationship between neonatal mortality and some of the factors included in Kenya's DHS data set that best suits our study. It is further hoped that the same exercise will permit us to choose before hand appropriate statistical methodology(ies) to use in the data analysis.

2.1 LITERATURE REVIEW

2.1.1 CAUSES AND PATTERNS OF MORTALITY

Despite remarkable advancement in medical sciences in the developing countries over the last 25 or 30 years the World Health Organization (WHO) maintains that infectious, parasitic and respiratory diseases are still the main killers of mankind, followed by diseases of circulatory system, cancer, death from violence, and others including gastro-intestinal, diabetes, birth injuries, and diseases associated with the first weeks of life, in that order.

In the developing countries it has been estimated that 40,000 under fives die every day from the first categories of disease (UNICEF, 1984). In Nigeria (Calabar), Asindi and Ekanem (1988) found that infections, low birth weight (LBW) and birth asphyxia were the major causes of neonatal mortality. They associated the majority of deaths of low birth weight children to respiratory insufficiency and prolonged obstruction of labour. For rural Kenya Voorhoeve and others (1983) estimated a perinatal mortality rate of 46.4 per 1000 total births and an early neonatal mortality rate of 16.8 per 1000 total births, with the causes of perinatal deaths being complications (38 percent), LBW (25 percent), infection (7 percent), congenital malformation (8 percent) and Unknown and accidental (21 percent). A recent study of under fives in rural Kenya by Mirza et al (1990) found that the mortality at infancy to be highest (63 percent of all total deaths). Again, Mirza et al (1990) reported ARI (pneumonia and measles) as the commonest of death (49 percent), followed diarrhoeal illness (8.8 percent). At the Kenyatta Hospital (Kenya) the finding of Musoke and Malenga (1984) was important. They found that bacterial infections in neonates was responsible for 20 percent of the deaths. Of this, Kleblsiella was responsible for 34 percent of septicaemia, Escherichia coli for 15.6 percent and staphylococcus albus for 15.1 percent.

For the Sudan and other developing countries malaria has been found to be a major killer (Farah and Preston, 1981). According to WHO (1987) malaria has become endemic in 102 countries, placing more than 50 percent of the world population at heighten risk. The same source has also reported some 100 million clinical cases and 2 million annual deaths from malaria in the world and of these half the number of the deaths occurred in Africa where about half the children under 3 years are infected. Of these, the neonates are the major victims of malarial attack. In Kenya, high incidence of malaria is found in high mortality areas (Vanuijik, 1974; UN, 1986).

Diarrhoeal diseases have been reported as a major cause of death in rural areas and marginal settlements of developing countries. For the developing nations as a whole, UNICEF (1989) has estimated the death toll from these diseases at about 4 million per annum. In Bangladesh diarrhoeal disease is reported to be responsible for 10 percent of infant deaths (Islam, et al. 1982), and in Rajasthan (India) for 10 and 14.5 percent of childhood mortality and infant mortality, respectively (Gupta, et al., 1981). In their study of aetiology of diarrhoea in pre-term neonates at Kenyatta Hospital (Kenya) Mutanga and others (1990) have found that multiple enteric agents (due to long excretion of enteric pathogens and the use of one incubator for more than one baby) are the cause of diarrhoea in pre-term neonates.

Another principal cause of infant death where the birth environment is unhygienic is neonatal tetanus. Recently WHO has estimated the annual number of neonatal deaths from tetanus disease in developing countries at 800,000 (WHO, 1991). In Uttar Pradesh (Northern India) the study by Smucker et.al (1980) attributed the prevalence of neonatal tetanus to the presence of large number of animals in the households. The same study has also estimated that 66 percent of neonate deaths were due to tetanus disease. In Bangladesh, the proportion of children in the age group 1 to 4 years who die from the disease is estimated at 27.5 percent (Chowdhury, 1982), and in Sri Lanka it is only 1.7 percent of neonatal mortality (Meegama, 1980). Meegama has attributed the lower rate of tetanus mortality in Sri Lanka to the presence of trained midwives and birth attendants and the use of sterile equipment during delivery. Another study for Bangladesh has also confirmed the high prevalence of the disease (D'Souza and Chen, 1983). For Kenya the incidence of the disease is reported to be overwhelmingly high in communities where agriculture is their main stay. Musoke and Malanga (1984), again in their study at Kenyatta Hospital, has reported umbilical infection to be very common and hence, the source of septicaemia. Several authors have reported malnutrition as the most serious conditions affecting the health of children, mainly in the developing countries. In the whole world it has been estimated that at any point in time there are 10 million malnourished and 200 million inadequately nourished children (WHO, 1987; Ibrahim, 1985). For several African countries the proportion of mild severely malnourished under six children has been estimated to range from 20 to 70 percent. Of these South -East Asia had overwhelmingly high proportion (more than 60 percent), followed by Africa with 14 percent and Eastern Mediterranean region with only 13 percent. Other findings in developing countries have been very instructive. For Bangladesh, several studies have estimated the proportion of children dying from malnutrition at 18 percent (Habir and Howlader, 1980; Islam, et. al 1982, cited in Mahadevan et al.(eds), 1986). For Rajasthan (India) the proportion has been estimated at 19 percent of babies (Gupta et. al, 1981, cited in Mahadevan et al. (eds), 1986).

Many reasons have been advanced as causes of malnutrition. Megeema (1980) had this finding for Sri Lanka. His reasoning was that poor nutritional status due to poverty and cultural influence make children vulnerable to infection so they succumb to mortality. However, Wray, (1978) had a different reasoning altogether. He argued that long term morbidity conditions deteriorates absorption and metabolism which, in turn, leads to deterioration of the body system and further nutritional intake may not be sufficient to maintain growth.

2.1.2 MATERNAL EDUCATION

Studies in Africa (Anker and Knowles, 1977; Caldwell, 1979); and in South Asia (Somoza, 1980; Meegama, 1986; Da Vanzo and Habicht, 1986) have found a strong negative relationship between maternal education and infant and childhood mortality. The findings of other studies have also been very instructive. Caldwell and McDonald (1981) found the influence of maternal education to be greater than paternal education. Apeakorang (1984), in Ghana and Meegama (1986), in Sri Lanka found the influence of maternal education to operate only in the post neonatal period. Habicht found maternal education to exert influence after mortality begins to decline. In rural Bangladesh, Bhuiya et al. (1986) noted that maternal education had the most significant effect on the nutritional status of boys while paternal education had a positive effect on the nutritional status of the girls. For Latin America, Palloni (1983), besides finding an inverse relationship found the magnitude of the impact not to be uniform.

Several researchers have found the channels through which maternal education operate to influence mortality to be unclear, as well as, its contribution in lowering mortality. However, Caldwell (1979) is of the view that maternal education affects infant and childhood mortality through breaks in traditional family practices, less fatalism about health, improved child care skills and better child's feeding patterns, Ware (1984), women's own ability to make decisions and understand the importance of hygiene, and Mosley (1984), preference of modern child health-care practice. Ware (1984) also found little variation in knowledge of hygiene and sanitation even between final teacher trainees and those mothers with no education in Africa.

In Kenya, both Ondimu (1987) and Ndede (1989) confirmed an inverse association between maternal education and infant mortality. Atichi (1989) has found that infants of mothers with primary education had an elevated risk of dying than those infants whose mothers have had no education at all. This latter finding by Atichi has been confirmed by a study carried out by Mutai (1987) in two small sub-locations in Kericho districts.

2.1.3 BIOLOGICAL OR GENETIC FACTORS

Studies undertaken in several countries have demonstrated a close relationship between biological factors and child's weight at birth, mother's height and weight and congenital diseases and other unknown causes. About 2 to 3 percent of all births in the world are estimated to result in birth defects. Of these genetic causes account for 25 percent; radiation, viruses, drugs, and chemicals for 5 to 10 percent; and unknown causes for the remaining 65 to 70 percent (Kurzel and Certrule, 1981; Kalter and Warkay, 1983 cited in UNICEF, 1990). Ampofo (1971), in his study " Still birth and its prevention in Ghana" has recorded still births of 62.2 per 1000. In the same study Ampolo has also noted that the highest proportion of still births were in the age group 20 - 24 years, with prematurity and malpresentation accounting for 44% of still births. In Nigeria (University College Hospital), Dawodu and Effiong (1983) have found that mortality rate varied inversely with birth weight and gestational age and was least in 1500-2000 gram birth weight (7 percent) and 34-36 weeks gestation (9 percent). For rural Kenya Voorhoeve and others (1983) have reported that among women who measured 150 cm or less perinatal mortality was 74 per 1000 total births as compared to 44 per 1000 total births for those measuring over 150 cm. Furthermore, they reported that perinatal mortality was high among the 141 primigravidae f 150 cm or less (i.e., 99 per 1000 total births).

UNICEF (1989) and WHO (1987) have argued that of the 140 million children born in the world every year some 22 million were of low body weight at birth. Of this, developing countries had more than 20 million with South Asia topping the list with more than 13 million and the rest divided between Africa and Latin America. Other studies have also been very instructive. For example, Ebrahim (1982) has attributed the 60 percent variations in birth weight to the factors within the environment of the foetus and Mahadevan (1981) associated maternal height and weight in South Central India with low weight at birth and high neonatal deaths. Omran and Standley (1976) have documented that Muslim babies are heavier than the Hindus. Lechtig et al. (1975) reported that maternal food supplementation at the time of pregnancy has been found to reduce the proportion of under weight births and even neonatal mortality.

2.1.4 POLLUTION OF CHOICE

The effect of alcohol and smoking on neonatal mortality, to the best of our knowledge, has been hardly studied in developing countries. However, in developed countries several studies have been carried out which established a closer association between congenital malformation and low birth weight and pregnant mothers who drink alcohol (Norwood, 1980; Newland, 1981; Ebrahim, 1982) and between the incidence of spontaneous abortion and child's height those who smoke. Ebrahim (1982) has observed that mothers who smoke more than 20 cigarettes daily have more than twice the number of low birth weight infants than those who do not smoke. Norwood (1980) has noted that the risk of perinatal death increases directly with smoking with the risk being much greater for those mothers who smoke more than 20 cigarettes per day.

2.1.5 MALNUTRITION AMONG MOTHERS

In general, infant growth and health and that of neonates in particular have also been found to be impaired by chronic malnutrition or recurrent drought when pregnant mothers are fed on poor food of little amounts. In the whole world it has been estimated that 51 percent of pregnant women have low haemoglobin level due to poor diet. In developing countries the proportion is much greater, about 59 percent which is 14 percent more than in the industrialized countries (De Meyer and Adiels-Tegman, 1985 cited in UINCEF, 1990). Winikoff, (1982)) found the impact of a high standard of maternal nutrition during pregnancy in lowering infant and childhood mortality (and hence neonatal mortality) to operate through the effect of birth weight.

2.1.6 SOCIO-ECONOMIC DEVELOPMENT

As mentioned in the introductory chapter much of the mortality decline which has occurred in developing countries after second World War has been largely due to measures independent of socio - economic development. However, some recent evidence emerging from countries such as China, Costa Rica, and Sri Lanka and Kerala state in India has indicated that socio - economic development is an essential condition for achieving long term sustainable reduction in mortality. Nag (1981) from his comparative research study between the two Indian states of West Bengal and Kerala has attributed the lower mortality in the latter to expansion of better educational, health and transport facilities and e.t.c. In Africa, the effect of economic development in general and of introduction of health facilities in particular in reducing infant and child mortality has been relatively slow. A Senegalese study in the early 1970s demonstrated that infant mortality fell only after the introduction of health facilities and until per capita output of food crops was increased through agriculture (Cantrelle, 1971). In his conclusion Cantrelle prescribed abundant and steady food supply as a panacea for reducing child death rate.

2.1.7 MOTHER'S AGE AT FIRST BIRTH

In many developing countries, studies have shown the variable mother's age to have a significance influence on mortality at both perinatal and neonatal period. The younger and oldest mothers have generally higher infant mortality than mothers in their prime ages, 25 to 30 in colombia (Somoza, 1980 and 20-24 in Ghana (Tawiah, 1979). In Ghana, Ampofo (1971) reported the highest proportion of still births among mothers of 20 - 24 age group. UN (1973) has documented that young maternal age was a well known correlate of higher infant mortality. The higher incidence of infant mortality and still births among the older mothers is because of their high susceptible to various diseases such as anaemia, diabetes, heart disease and blood pressure which affect the health of the child in the womb (Meegama, 1980). As for the young mothers it is because of their physical immaturity (Gubhaju, 1986).

2.1.8 BIRTH INTERVAL

A large number of writings on the relationship between infant and childhood mortality and birth interval or spacing have been widely documented in developing countries. Winikoff (1980) found that birth interval of less than 4 years between birth and the next pregnancy was associated with extremely high risk of neonatal and postneonatal mortality. He also reported a consistent negative relationship between post neonatal mortality and length of interval. As for deaths under 1 month he noted that mortality declines as interval increased up to 2 years but rose slightly at 3 years birth to conception interval. Wyon and Gordon in their 1950s Khanna study in India (Punjab) discovered that during the neonatal period mortality declines as the spacing between births increases from 12 to 48 months. However, they found no variation with intervals between 24 to 47 months (reported in Winikoff, 1980). In Guayaquil, in Ecuador, Wolfers and Scrimshaw (1975) noted an inverse association between mortality and birth interval with the effect of neonatal mortality being noticeable in the early years but wears off once general mortality improves in the latter years. Kaman and Mat (1988) found that birth intervals 25-36 months were associated with the most favourable pregnancy outcome and that poor pregnancy outcome was followed by very short intervals. In addition, they found that both beastfeeding and marital status were not effective in prolonging birth interval since 33.4 percent of the women resumed regular menstruation by 4-6 months when they were still breastfeeding and only 31 percent of the married women were abstinent for 3 months postpartum. For Kenya, Voorhoeve et al (1983) found that previous births often had ended in still births or infants deaths, the proportion being 67 percent when the birth interval was less than 12 months and 20 percent when it was 12-23 months. The findings of other authors have also been very important. For example, Jelliffe (1966) noted that the high parity associated with birth interval is a J-shaped maternal mortality phenomena. Omran and Standley found that the mortality of the second child of a pair to be negatively related to birth interval. Shorter birth interval is associated with physical exhaustion and nutritional impairment of the mother i.e., maternal depletion syndrome (Jelliffe, 1966), low birth weight for children and an elevated probability of pregnancy loss (Winikoff, 1983), greater competition among siblings for scarce resources resulting in poor nutrition and high infant mortality (Hobcraft et al., 1983; Winikoff, 1983).

2.1.9 CHILD'S SEX

Studies in Africa, Asia and Latin America have all documented a significant variation in infant mortality by sex. The general finding is that male mortality rates in both neonatal and post neonatal periods are higher than for female (Anker and Knowles, 1979; Somoza, 1980, Wyon and Gordon; D'souza and Chen, 1980). This is attributable to biological difference between the sexes. Female possession of 2x chromosomes, greater average level of oestrogen, higher brain weight and invisible generative organs and easy adjustment to environmental temperature have been found to give greater survival advantage to females compared to their male counterparts (Preston, 76). However, the current observed higher female mortality rates in child ages in some countries are associated with differential parental treatment which tends to favour male children over female in matters of prenatal mother care, food distribution and medical treatment (Nadarajah, 1983). In India (Uttra Pradesh), Mahadevan reported that the weak and handicapped children were not only neglected but were also given all sorts of names because weakness and handicapped are considered sine qua non for death.

Apart from the above cultural practices which discriminate against female children Barbara (1981) has noted extensive infanticide practices in Asia, Africa, America, Australia and Oceania (reported in Mahadevan and others eds , 1986). The same writers also cited Barbara(1981) to have reported wide spread infanticide among the Rajputs of Northern India and Mahadevan (1979) to have reported it among the Gounders.

2.1.10 MARITAL STATUS

In the caribbean Roberts (1975) has documented that illegitimate births have consistently higher mortality than legitimate ones (cited by UN, 1985). For Bangladesh, Behm (1983) has reported that births to widowed or divorced had higher mortality than those of currently married. Explanations advanced for the lower Infant mortality of currently married women include higher socio-economic (UN, 1973) and less attention given to children of the divorced at her parent's family (Morely et al (1968), again, reported in UN,(1985)).

As for mortality among births to Monogamous and polygamous unions studies in Nigeria Caldwell, 1979) and Kenya (Mott, 1980) have reported a higher mortality for the latter which, according to Mott, is due to more traditional child care and health practice among polygamous unions.

2.1.11 RELIGION

The influence of religion on infant mortality is well studied, although to a lesser extent in Africa. Tawiah (1979) from his study in Ghana has established that infants of christian mothers had better chances of survival than those of traditional mothers (cited by Anker and Knowles, 1980). Bonkole and Olaleye (1991) have confirmed Tawiah's finding for Kenya by revealing that the children born to christian mothers are more likely to survive than those born to mothers who are muslims or Other or no religion. In India, Smucker and others (1980) observed higher probability of survival among infants of high-caste Hindus than among infants of low-caste Hindus or muslims. The differentials between the religious groups or castes could be explained by educational differences, but not doctrinal differences between the sects or castes.

2.1.12 BREASTFEEDING

Breastfeeding may be considered a biological and/or behavioral factor or socio-cultural factor. Numerous studies in various developing countries have documented that maternal milk provides the best protection against both malnutrition and infection, especially where conditions of poverty, ignorance, crowding and high morbidity are rampant. Maternal milk has been associated with certain antibodies that protect the child against malnutrition and diarrhoeal diseases (Knodel and Kintner, 1977) and against intestinal and respiratory infection (WiniKoff,1980). Nutrition wise Winikoff maintains that maternal milk is easily adopted to the infant requirements than other food supplementation or substitutes. Furthermore, breast feeding has also been shown to inhibit women from conceiving. At Kenyatta Hospital Musoke and Malenga (1984) have confirmed the benefits of breast milk when they noted the rarity of gastro- intestinal infection because all infants were on fresh human milk.

In the developing countries several studies have conclusively established the fact that children who depend solely on breast milk have a lower probability of mortality than those partially breast fed (Knodel and Kentner, 1977; Da Vanzo et, al (1983); Palloni and Tienda, 1986). Specifically, it has been found in 15 rural communities in Chile that children introduced to bottle feeding within the first 3 months had 3 times higher chance of dying than their counterparts who are wholly breast fed (see Knodel, 1977). For Khanna (Punjab) both Knodel (1977) and Winikoff (1980) reported the number of survivors during the first year of life as 1 out of 20 for Children who were never breast fed compared to 12 percent of 739 for children who were breast fed from birth. The benefits of breast feeding are confined mainly to the first few months of life when maternal milk alone can meet adequately the nutritional needs of the child.

The duration of breast feeding has been found to show a considerable regional variation. Even among the different ethnic groups living within the same country, province or district there are wider differences in the duration of breast feeding. WHO (1987) confirmed the regional differentials in the duration of breast feeding by establishing that the duration of breast feeding is shorter in Latin America than in Asia or Africa.

In the urban and semi urban areas of the developing countries most studies have also revealed that the idea of bottle feeding is picking up very fast. For example, in Kenya several studies reveal an upward trend in bottle feeding at expense of breast feeding in both rural and urban areas (Consminsky, 1984; Ochalla-Ayayo and Munganzi (1986). These studies also maintain that bottle feeding is the cause for high child mortality in the country. Female tendency to emulate fashions of the West and to believe that breast feeding is inferior to artificial substitutes increasing female aspiration to more freedom and equality with men and also rising tendency by more females to take up employment out side the home are advanced by several writers as the causes of high bottle feeding practices and of lower breast feeding practices in the developing countries.

2.1.13 ETHNICITY

In their study of biological and behavioral influences on the mortality in Malaysia Butz and his colleagues (1982) have found significant differences in infant mortality between Malay, Chinese and Indian.

2.1.14 HIV/AIDS

The World has, since the first case was reported in the early 1980s, slided into AIDS. Recent findings indicate that Africa is the worst hit with 71 percent of the 2.5 million reported Aids cases in the World, followed by USA (13 percent), Americas (9 percent), Europe (5 percent), Asia (1 percent) and Other (1 percent). Within Africa Uganda and Tanzania are at the top of the list with 35 percent each of the total reported AIDS cases (211,000) followed by Kenya (30 percent) and Malawi (23 percent). Countries with less than 20 percent of the reported cases include Zaire, Zimbabwe, Rwanda, Zambia, Burundi, Ethiopia, Ghana, and the Congo (Daniels, 1993).

While HIV/AIDS infects and kills its victims indiscriminately irrespective of age, it has now emerged that the newly born children and infants plus women are the most vulnerable. From its study of the state of children in the World UNICEF (1990) estimates that 1 million women in Africa and at least 1.5 million in the World are already infected with the HIV/AID. The same source also estimates the chance of the children of getting infected with the disease to range from 25 to 40 percent. For Sub-Saharan Africa, according to Good (1991), WHO estimates over 700,000 of AIDS cases and approximately 6 million adults who are HIV positive. The same sources also estimates the effect of AIDS to reduce labour force in the region by 15-20 percent and, by the year 2015, the infection rates in urban centres through out Africa to be about 15 percent of all adults aged 30 years and older (also cited in Ayiemba and Oucho, 1994).

2.1.15 WARS

The horrors and sufferings of wars are well documented. Hundreds of thousands of people have been killed either directly as a result of the war or indirectly as a result of famine or infection. A much higher figure than that is displaced internally or externally from their homes. Presently the United Nations High Commission for Refugees (UNHCH) estimates 70 million people in the World as displaced persons and refugees. Aged people,neonates and infants children have not been spared.

Of the 127 wars fought in the world between 1945 and 1989, 125 took place in the developing countries. The estimated war related deaths are put at 21.8 million. Sivard (1989) estimates civilian deaths to have increased from one half of the war dead in the early 1950s to three quarters of the total in the late 1980s.

Many of the parties to the conflicts as well as the international community have acknowledged the flight of the civilians caught in between cross fire. Others have however, used food as a weapon. Indeed, a number of examples can be cited. In the

Sudan, both the Sudan Relief and Rehabilitation Association (SRRA) and Khartoum government have agreed, although reluctantly, to allow Operation Life Sudan (OLS) to provide food to all areas of the Southern Sudan behind both Sudan People Liberation Army (SPLA) and Khartoum-controlled lines (Sudan Democratic Gazette, May 1991). Recently, the same parties have accepted NGOs engaged in medical work to launch massive inoculation scheme to save thousands of people of Upper Nile region from the killer disease Kalazaar. However, the recent flare up of war between SPLA factions have barricaded off the follow of needed relief supplies to the South.In December 1989 US troops launched Operation Restore Hope in Somalia to guarantee safe passage of relief conveys to the starving people. Today US Air Force is dropping food and medicine over Eastern Bosnia to save hundreds of thousands of muslims who are starving due to the war. The UN has now established certain areas as safe heavens in Bosnia.

2.1.16 CONCEPTION CARE AND DELIVERY CARE

Omran and Standley (1976) have observed that in developing countries most births occurred at home when compared with those in developed countries which occurred in hospitals. A similar finding is reported by Ampolo (n.d.p) for Ghana. According to this study because of absence of modern midwifery in many parts of Ghana, three fourths of all deliveries in Ghana are attended by untrained personnel including traditional birth attendants and hence maternal mortality is very high, ranging from 5 to 10 per 1000 live births.

For Sri Lanka, Meegama (1980) has noted that prenatal care and the presence of a medically qualified attendant at a child's delivery can avert birth injuries and provide necessary medical care in the case of an emergency.

Studies in Kenya have found inconclusive results on the effect of maternal attendance at a maternal clinic. For example, Ondimu (1987) has reported that maternal attendance at maternal clinic was a main determinant of child's survival up to 3 years. Ondimu (1987) has also noted that the tendency of visiting clinic was stronger relative to mother's education. Ewbank (1986) on the other hand has found no significant association between infant and child morality and out patient visits to hospitals.

2.1.17 ORAL REHYDRATION THERAPY (ORT) AND IMMUNIZATION

ORT (which comprises of oral rehydration salt and home made fluids) and immunization of the mother during the time of pregnancy are important determinants of infant and childhood mortality. For example, ORT has been found to avert diarrhoeal diseases. Tulloch and Burton (1987) estimated that 18 percent of the children with diarrhoea in 1985 were treated with ORT worldwide. By 1989 this percentage had shot up to 25 percent and to prevent the death of some 1 million under fives annually (UNICEF, 1989; UNICEF (1990).

In case of immunization, Smucker et al. (1980) held the opinion that immunization of women with tetanus toxoid in areas where tetanus is the principal killer disease has the effect of reducing infant and child mortality substantially. Inoculation of children with DP and BCG has similar reducing effect on infant and childhood mortality.

2.2 CONCEPTUAL MODELS OF MORTALITY

The process of conceptualizing and modelling in the field of mortality is relatively new compared to fertility. Thus, this does not only reflect that the determinants of mortality are numerous and diverse, but also interrelated (Fegg, 1982; Mosely, 1983; Mahadevan, 1983; UN, 1984; WHO, 1981; reported in Mahadevan et, 1986 (eds)). Besides, they show a considerable regional, cultural and developed versus developing countries variations.

The early mortality models borrowed or drew heavily on the research in the field of fertility, and particularly the terminology of intermediate and proximate determinants developed by Davis and Blake (1956) and Bongaarts (1978). Mahadevan (1986) considers this terminology to be severely limited because it may lead to confusion in explaining causal relationship between several independent variables. Furthermore, he considers them not to be the type that can affect mortality. Another problem relates to the fact that the early models did not go beyond micro or household level with hardly any mention of the macro or community level variables.

Since the early 1980s from purely theoretical, methodological and practical grounds several writers have attempted to incorporate in their theoretical frameworks similar core themes, namely, micro and macro level variables and socio- economic and biological factors (Mosely and Chen, (1984); Kikhela, 1989)). The socio-economic factors are believed to operated through biological factors to affect mortality.

A few of the models which are of relevance to Kenya situation as to other developing countries (e.g., Mosely - Chen (1984), Venkahatacharya Tefsaye (1986), Gandotora (1988), Ventakavharya (1985) transitional model, Morren and Vianen model of malnutrition - infections syndrome and its implication, Jain reproductive life cycle model, Talwar (1988), Nag model and the economic model) and have been developed.These are beautifully summarised by Professor Otieno (for further details see a paper on Uses of Models in Demographic Analysis: With special reference to Kenya situation by Otieno (Undated)).

In this study, however, we shall use (because of no theoretical framework for neonatal mortality) a modified form of Mahadevan conceptual model of 1986 for general mortality.

This model is chosen because it uses altogether new concepts and terminologies. Besides, the model is elaborate which ties very well with one of the more recent approaches in epidemiological research which requires the inclusion of all scientifically relevant variables in a multivariate model (Miettinen, 1976, cited in Hosmer and Lemeshow, 1998).

Before we proceed to outline the theoretical model for the study, a brief discussion and presentation of Mahadevan (1986) general mortality model, Kikhela (1989) model of perinatal mortality and our model will be useful.

2.2.1 MAHADEVAN (1986) MORTALITY, BIOLOGY AND SOCIETY: CONCEPTUAL MODEL

In essence, the Mahadevan (1986) mortality model (which is shown in figure 2.1) posits that infants and children development is affected sequentially by both endogenous and exogenous factors at several stages even before the child is conceived till the time he or she dies.

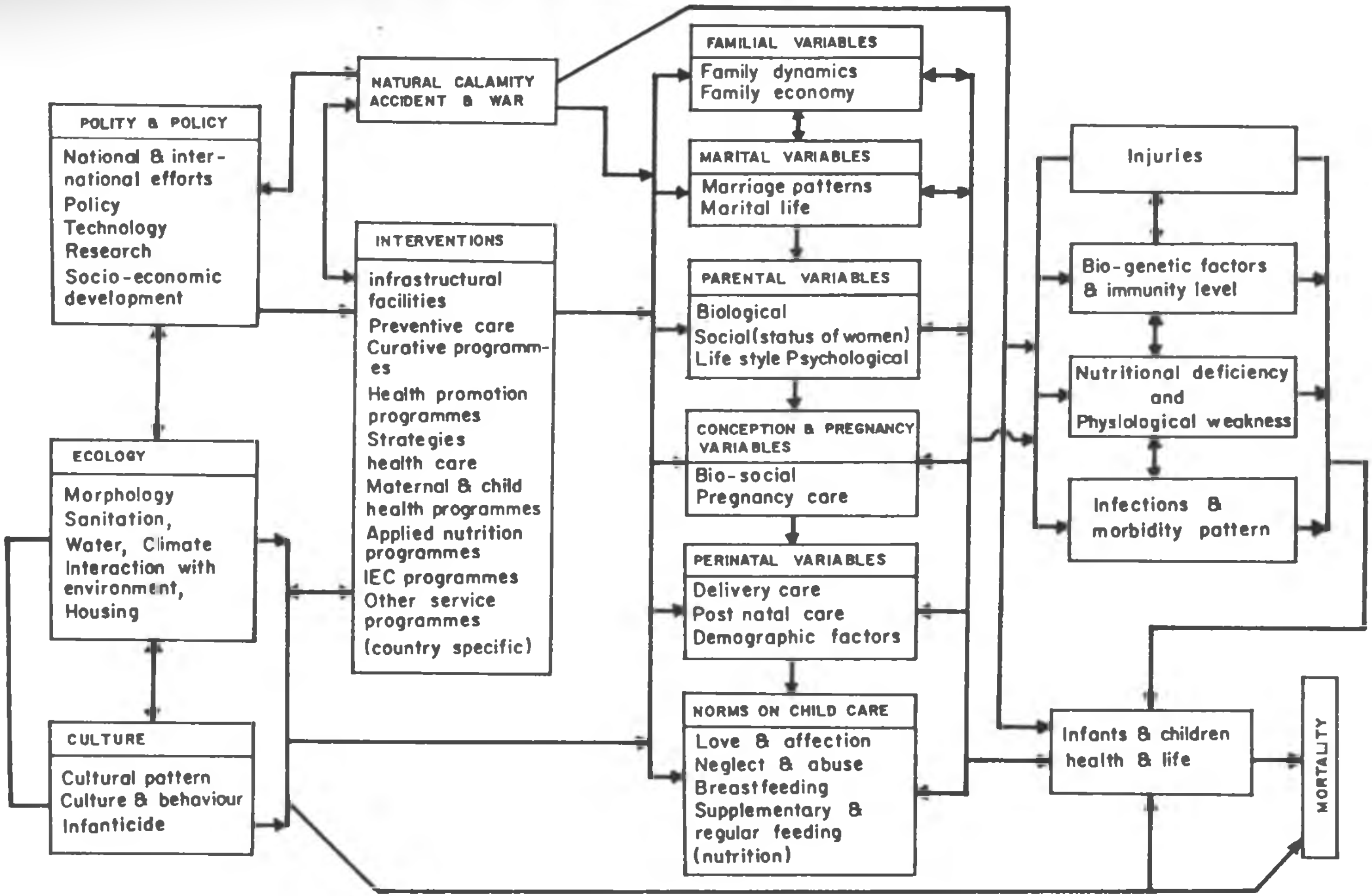
According to Mahadevan, most of the models on mortality developed in the early 1980s were of narrow focus because these models incorporated variables that are associated with the respective disciplines of the authors; consequently, the multi disciplinary model put forward by him to bridge the gap in knowledge of understanding mortality patterns. The strength of his model lies in its ability to improve the explanation of the causal relationship between a relatively large number of diverse and interrelated mortality variables.

As mentioned earlier Mahadevan used altogether different terminologies from those of previous authors. Basically, he employed the terminologies of life affecting variables (LAVs) and imminent variables (IVS) as opposed to the Davis- Blake and Bongaarts intermediate and proximate determinants. He considered the process of human development to be affected by several critical factors in progressive stages in either negative or positive way. He categorized the various progressive stages into two levels: (1) A first level which comprised of structural and macro level variables. (2) A second level of programme interventions which are paralleled by wars , natural calamity and accidents. Figure:1 portrays and summarizes the various critical factors and progressive stages and their respective interactions. The Mahadevan model is by no means without problems. Criticisms labelled against the model include:

(1) The model incorporates a very large number of variables which may cause a problem of statistical nature when multivariate techniques of analysis are used. For instance, the model may make the estimates unstable.

(2) It covers all mortality patterns and hence, a general model which includes all age-groups.

Fig 1 : A CONCEPTUAL MODEL ON MORTALITY : LIFE AFFECTING VARIABLES AND CERTAIN IMMINENT VARIABLES.



Source : Adapted from Mahadevan et al, (eds) 1986.

2.2.2 KIKHELA (1989) MODEL OF PERINATAL MORTALITY

The premise of Kikhela (1989) model of perinatal mortality lies in the two medical concepts of incidence (i.e., frequency of disease in population) and lethality (i.e. frequency of deaths among patients). Kikhela identified two categories of variables which he called care services and individuals. He further sub divided the two broad categories of variables into five sub categories, namely:

(1) variables influencing child's health (i.e., quality of care given to the new born when sick),

(2) variables pertaining to the child (i.e., weight, height, sex, multiple birth),

(3) variables associated with complications in delivery (i.e., assistance at delivery, place of delivery),

(4) variables relating to pregnancy (i.e., prenatal care, mother's nutrition), and

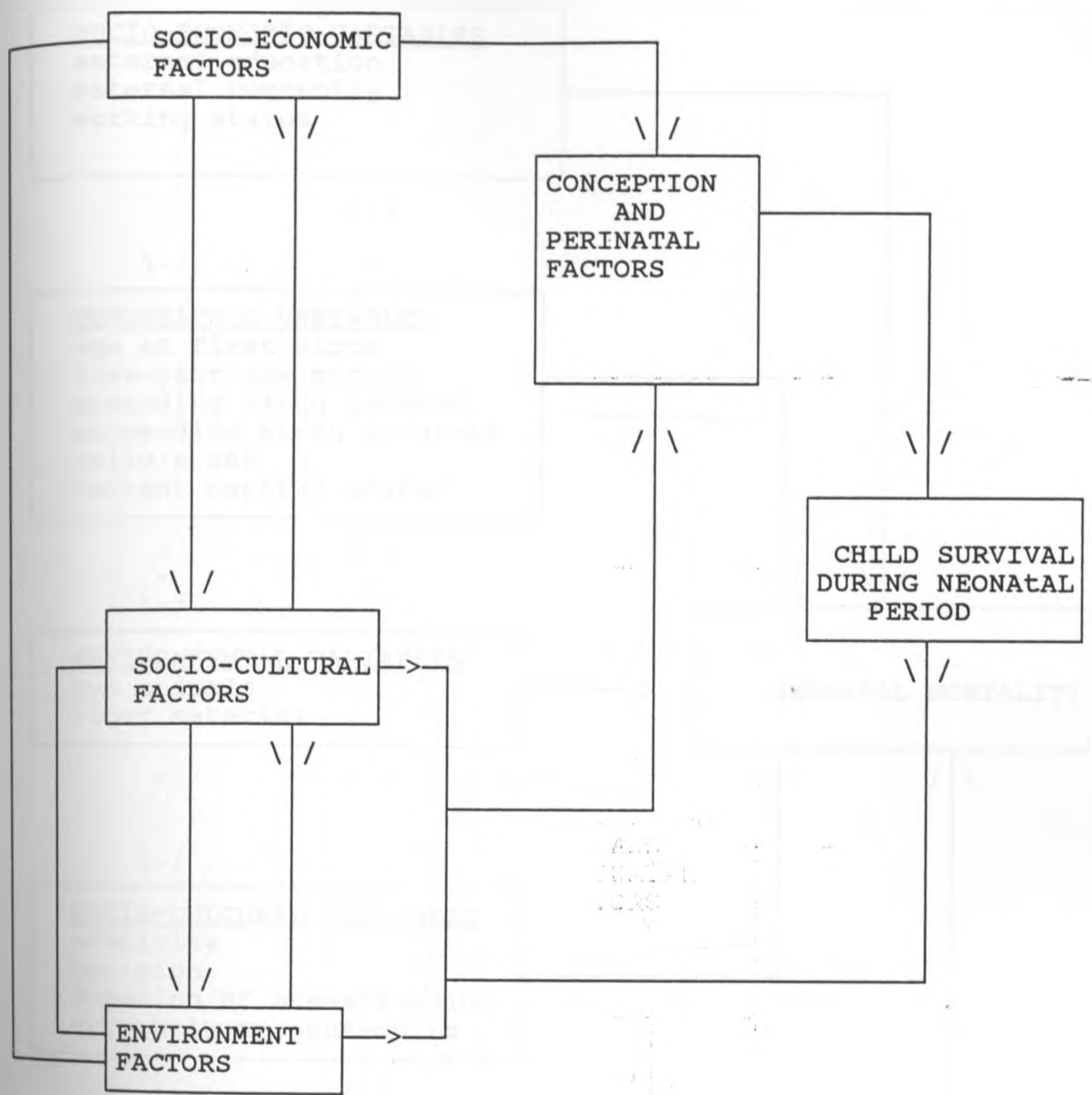
(5) variables relating to the characteristics of the family (i.e., socio-economic, socio-cultural and demographic variables).

The only disadvantage of Kikhela framework is that it does not cover variables beyond the first 7 days of life, hence it is rather very restrictive. The model is depicted in figure 2.2

2.2.3 THEORETICAL FRAMEWORK FOR THE STUDY

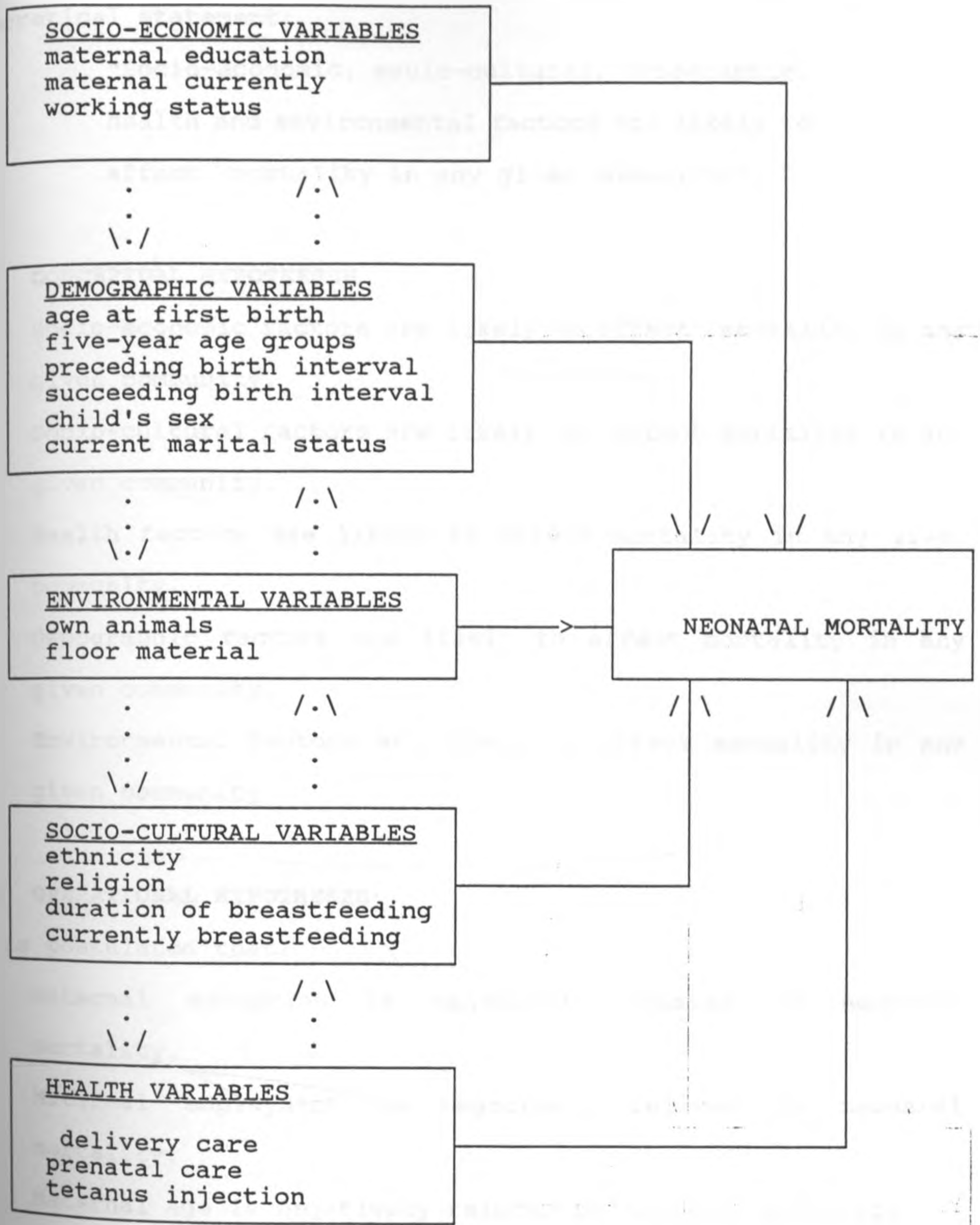
As mentioned before, this study utilizes as its theoretical framework a modified form of Mahadevan conceptual model (1986) which encompasses all mortality regimes. Our model states that in the absence of policy and polity, biological causes, wars, ,AIDS, accidents and natural calamity the most important factors which determine whether a child survives the first month of life are socio-economic, socio-cultural, demographic, environmental and health. By covering only neonatal mortality our model is rather a bit restrictive compared to Mahadevan's general model. Indeed, our model excludes very many of the his specific variables and some of the progressive stages. Only neonatal mortality variables which are covered by Kenya's DHS but neglected in previous studies as well as those variables found to be statistically significant elsewhere are considered here. Figure: 2 portrays the general relationship between the independent variables a d the dependent variable in our model.

FIGURE 2.2 THEORETICAL MODEL FOR THE STUDY



Source: Adopted from Mahadevan et al., (eds), 1986

FIGURE 2.3 OPERATIONAL MODEL FOR THE STUDY



2.3 THEORETICAL STATEMENT

From the above general statement we can derive the following theoretical statement:

> "Socio-economic, socio-cultural, demographic, health and environmental factors are likely to affect mortality in any given community".

2.4 CONCEPTUAL HYPOTHESES

1. Socio-economic factors are likely to affect mortality in any given community.
2. Socio-cultural factors are likely to affect mortality in any given community.
3. Health factors are likely to affect mortality in any given community.
4. Demographic factors are likely to affect mortality in any given community.
5. Environmental factors are likely to affect mortality in any given community

2.5 OPERATIONAL HYPOTHESES

It is postulated that:

1. Maternal education is negatively related to neonatal mortality.
2. Maternal employment is negatively related to neonatal mortality.
3. Maternal age is negatively related to neonatal mortality.

4. Preceding birth interval is negatively related to neonatal mortality.
5. Succeeding birth interval is negatively related to neonatal mortality.
6. Births delivered by trained personnel have less risk of neonatal mortality.
7. Births to mothers who have been attended to by a trained personnel during pregnancy have low risk of neonatal mortality.
8. Births to mothers who have received tetanus injection have low risk of dying during the neonatal period.
9. Births born in households who possess animals have high probability of dying during the neonatal period.
10. Births delivered in mud floor houses have high probability of dying than those born in wood or cement floor material.
11. The duration of breastfeeding is negatively related to neonatal mortality.
12. Births currently breastfed have low probability of dying during the neonatal period.
13. Male births have higher neonatal mortality than female.
14. Births to catholic and protestant women have lower neonatal mortality compared to those of muslim or other religion.
15. Births to married women have lower mortality than those of not married or divorced/ widowed.
16. There are difference in neonatal mortality between ethnic groups.

17. First births to older and younger women have higher mortality during the neonatal period.

2.6 IDENTIFICATION OF KEY CONCEPTS AND VARIABLES USED IN THE MODEL

In general, although mortality is associated with numerous and diverse interrelated variables, nonetheless, evidence from both developed and developing countries have shown that certain variables have profound influence on mortality at early infancy than in the middle or older ages. In this study we focus our attention only on those factors which are covered by our data set, and particularly those which exert strong influence on infant mortality during the first one month of life. In all we have a battery of 18 variables.

Key concept	:	Variable defined.
1. Demographic factors	:	Child's sex - Whether the child is male or female.
	:	Neonatal mortality _ Whether a child is born and died during the same month.
	:	Neonatal death ratio- number of deaths in zero months divided by the number of infant deaths in that year.
	:	Birth interval - Often referred to as inter birth spacing. It measures the speed of giving birth to a preceding or succeeding child. Both preceding and succeeding birth intervals shall be considered.
	:	Marital status- refers to whether a woman is never married, married, living together, divorced, widowed and not living together.

	:	maternal age at first birth- refers to the age of the woman at the time she gave birth to her first child.
	:	Age 5- year groups- refer to the distribution of women in the reproductive aged 15 years and above into 7 age groups.
2. **Socio-cultural factors**	:	Duration of breastfeeding - Refers to length of time in months a woman takes to breastfeed her child.
	:	Currently breastfeeding- refers to whether or not at the time of the interview the woman was still breastfeeding her child.
	:	Religion - refers to the major religious groups that people worship in the country.
	:	Ethnicity - refers to the major tribal groupings in the country to which the mother of the child belongs.
3. **Socio-economic factors**	:	Highest educational level - refers to the highest level of schooling attained by the mother of the child.
	:	Currently working status- Whether the woman was working or not. This is considered a proxy for family income.
4. **Health factors**	:	Birth practices - refers to the type of supervision received at the antenatal clinic and at the time of delivery and during pregnancy (i.e., prenatal care and assistance at delivery.
	:	Tetanus injection - whether a woman has received tetanus injection prior to the birth of her child.

5. Environmental factors : Floor material: refers to the type used for making the floor of the house.

: Ownership of animals- refers to whether or not the household owns some animals.

2.7 DEFINITION OF KEY CONCEPTS

2.7.1 DEMOGRAPHIC FACTORS

These factors are related to the risks of dying during the time of conception as they affect mother's health. They include parity, maternal age at first birth, age of the mother, birth interval (both preceding and succeeding) and sex of the child. Here we explore all, except parity. We note that age at first birth reflects the mother's life cycle style; and maternal age at first birth, age of the mother and the sex of the child reflect biological differences by sex which tend to confer survival advantage to certain ages and sex. Furthermore, the sex of the child reflects cultural taboos which, in turn, reflect parental preferential treatment for some children over others which affect their probability of survival. Birth interval on the other hand reflects cultural beliefs and practices which tend either to increase or decrease period between two preceding or succeeding births. In this study, We do not concern ourselves with the biological causes of death since they are not covered by the data set, but on the sex of the child, age of the mother at first birth, distribution of mothers by five year age groups, preceding and succeeding birth intervals.

2.7.2 HEALTH FACTORS

These refer to the transmission of infectious diseases to children during the time of delivery and after the first four weeks of life. Indeed, they reflect objective and subjective availability of health services and the extent to which unhygienic techniques are used during delivery time. Here we consider three variables, namely, type of assistance received during time of pregnancy, type of assistance received during time of delivery and whether a woman had received tetanus injection during the time of pregnancy. For example, we have assumed that:

1. Children delivered by a doctor or trained midwife/nurse are less likely exposed to a greater risk of acquiring diseases such as tetanus or getting injured during delivery.
2. Mothers who have received assistance from a trained personnel are less likely to develop complications or if there are some complications referral can easily be sought elsewhere.
3. Mothers inoculated against tetanus vaccine before delivery are less likely get both herself and her child exposed to greater risk of death due to tetanus disease.

2.7.3 ENVIRONMENTAL FACTORS

These relate to general exposure to various diseases such as communicable diseases, respiratory diseases, gastro intestine, parasitic diseases and tetanus. Indeed, they reflect the unhygienic or aseptic conditions of the individual household. They include residence (urban- rural), water stagnation, scarcity of water, environmental sanitation(e.g., sewage disposal, type of latrine), housing material, ventilation, crowding, domestication of animals, climate and pollution. However, we shall examine only the ownership of large animals and the type material for floor which are proxies for both socio- economic and socio- cultural conditions of the household.

2.7.4 SOCIO-CULTURAL FACTORS

These are associated with cultural norms which govern life in the society. They include sex preferences, attitude and treatment of illnesses and feeding habits which are practiced amongst different ethnic and religious groups. Of these, we consider religion, ethnicity or tribal groups in the country, duration of breastfeeding and currently breastfeeding.

2.7.5 SOCIO-ECONOMIC FACTORS

These are essentially indexes of economic status of the household. They have been shown to have a strong bearing on the health of both the mother and infant before and after birth. For example, it has been found that the economic level of the individual household can determine the quality and quantity of diet a pregnant woman receives which, in turn, determines the birth weight and height of the child. Furthermore, the welfare of the household also determines the adequacy of food a child receives after birth, especially when supplementary feeding is introduced.We consider two variables: mother's highest educational level and mother's current working status.

CHAPTER THREE

METHODS OF DATA ANALYSIS

3.0 INTRODUCTION

This chapter focuses on statistical methodologies that can be employed to untangle obscured relationship among numerous correlated and interacting variables and to show the strength and direction of relationships. We shall consider descriptive statistics, multiple regression analysis, logistic regression model and relative risk method. Specifically, we shall state definitions, assumptions, mathematical formulae for estimating important parameters, advantages and disadvantages and the test of significance pertaining to each method.

3.1 MULTIPLE REGRESSION MODEL

3.1.1 DEFINITION

Multiple regression is a statistical model which shows the magnitude and direction of relationship between independent and dependent variables. This model helps explain how much of the change in the dependent variable is due to one unit change in the independent variable. In this study we shall use both enter and step wise regressions. We shall also use ordinary least squares (OLS) technique for estimating the unknown coefficients.

3.1.2 ASSUMPTIONS OF MULTIPLE REGRESSION

1. The dependent variable is not dichotomous but may be an intervally scaled or a ratio and that it has a certain probability distribution.
2. The error term (i.e. residual) is not related to any variable and its mean must be zero i.e., $E(e)=0$.
3. The dependent and independent variables are both normally randomly distributed and linearly related.
4. The variance must remain constant or fixed across all levels of the independent variable.

3.1.3 MATHEMATICAL REPRESENTATION

The general form of a regression with k independent variables takes the form of:

$$Y = B_0 + B_1X_1 + B_2X_2 + \dots + B_kX_k$$

where:

B_0 is constant term or the slope of the regression line.

$B_1, B_2, \dots, B_k$ are estimated coefficients of the independent variables.

$X_1, X_2, \dots, X_k$ are the independent variables that may be either separate variables or a function of the basic variables.

Y is dependent variable.

In multiple regression model estimated parameters are usually placed in a table called the analysis of variance or simply called ANOVA. The parameters include:

1. $SSY = \Sigma(Y_i - \bar{Y})^2$ is total sum of squares which captures the variability of the dependent variable before the joint effect of the independent variables.

2. $SSE = \Sigma(Y_i - \hat{Y})^2$ is residual sum of squares or sum of squares due to error. This variables captures the unexplained variability in the dependent variable after the inclusion of the independent variables in the regression model.

3. $SSY - SSE = \Sigma(Y_i - \bar{Y})^2 - \Sigma(Y_i - \hat{Y})^2$ - is regression sum of squares. This captures the reduction in variability due to independent variable.

4. Mean-square of residual= $1/(n-k-1)$ SSE= $1/(n-k-1)\Sigma(Y - \bar{\hat{Y}})^2$

5. Mean- square of regression= $\Sigma(\bar{\hat{Y}} - Y)^2/k$

6. The multiple correlation coefficient (R)- gives the overall measure of the linear association between one dependent variable and several independent variables.
It is computed thus:

$$R = \frac{\Sigma(Y_i - \bar{Y})(Y - \hat{Y})}{(\Sigma(Y_i - \hat{Y})^2(Y - \bar{Y})^2)^{1/2}}$$

7. The square of the multiple correlation coefficient, R^2- measures how much the independent variables taken together can explain the variation in the dependent variable.

R^2 is calculated as follows:

$$R^2 = \frac{\Sigma(Y_i - \bar{Y})^2 - \Sigma(Y_i - \hat{Y})^2}{\Sigma(Y_i - Y)^2}$$

where:

$\hat{Y}_i$ predicted value of the dependent variable for the ith individual.

$\bar{\hat{Y}}$ is the mean of the $\hat{Y}_i$s

$\bar{\hat{Y}} = \bar{Y}$ this condition always holds true.

3.1.4 ADVANTAGE OF MULTIPLE REGRESSION MODEL

Like other multivariate models multiple regression has the ability to model many variables which may be of different measurement scales.

3.1.5 DISADVANTAGES OF MULTIPLE REGRESSION

Multiple regression model creates one substantial problem of multicollinearity i.e., when variables overlap. The problem serious when the overlap is greater because it tends to reduce the reliability of the regression coefficients significantly.

3.1.6 THE TEST FOR SIGNIFICANCE

In order for us to test for the significance of the regression we have to assume that the null hypothesis denoted by H_0 : all independent variables taken together do not explain a significant amount of variation in the dependent variable.This entails calculation of the F statistic which is a measure of the significance overall regression. The F-statistic is calculated by the formula:

$$F=\frac{\text{Mean-square regression}}{\text{Mean-square residual}}$$

If the computed F value exceeds the significance F we reject the null hypothesis H_0 that all independent variables taken together do not explain significant variation in the dependent variable.

An alternative method to the F-test is the two-tail t- test. The T statistic which is computed by the following formula:

$$T=\frac{B^*}{S_B}$$

where

B^*=estimated coefficient

S_B=estimated error of B

We reject the null hypothesis $H_0:B^*\#0$

if

$\|T\|>t_{n-p-2},1-a/2$ i.e., when the calculated absolute value of T exceeds the significant T value.

F is then calculated by the formula

$$F=\frac{B^2}{S^2B}$$

3.2 LOGISTIC REGRESSION MODEL

A logistic regression analysis is a multivariate statistical technique that can be used to obtain the relationship between factors when the dependent or outcome variable is binary or dichotomous. This model because of the interpretability of its coefficients is such a robust analytical tool in epidemiological research. Lemeshow and Hosmer (1989) considered the logistic regression to be biologically a reasonable model. By contrast, Dawyer (1983) found little difference between logistic regression model and multiple regression except in instances where extreme of disturbances are considered the logistic regression has an edge over multiple regression. In this study we shall use enter method which tends to force all the variables in to the equation irrespective of their significance. Unlike in the multiple regression model the best fitting is estimated by the maximum likelihood method. The maximum likelihood estimates are easily obtainable from a number of computer packages.

3.2.1 ASSUMPTIONS OF LOGISTIC REGRESSION ANALYSIS

(1) The dependent variable must be dichotomous or binary, coded zero or 1.

(2) The variables are intervally scaled.

(3) The distribution of the errors must be binomially distributed.

(4) The conditional mean of the regression must be bounded between zero and 1.

(5) There is homogeneity within cells or combinations of variables.

3.2.2 MATHEMATICAL FORMULA

The equation of the logit multiple logistic regression is written as:

$$\ln(rx_i)/\ln(1 - rx_i) = a_k + x_{ib}$$

or equivalently

$$rx_i = EXP(a_k + x_{ib})/(1 - EXP(a_k + x_{ib}))$$

where

$r_x i$ -is probability of dying during the first month of life.

a_k - is overall log-odds of dying for the referent category.

X_{is} - is independent variable denoting individual with the ith characteristic.

b_s - is estimated coefficients for the reference group for independent variable.

3.2.3 ADVANTAGES OF THE LOGISTIC REGRESSION ANALYSIS

(1) It is an extremely flexible and easily used function.

(2) It lends itself to a biological meaningful interpretation.

(3) It is the only approach which affects the relative odds of dying rather than absolute mortality.

3.2.4 THE TEST OF SIGNIFICANCE OF THE COEFFICIENT

Two methods of testing the significance of coefficient will be discussed, namely the maximum likelihood ratio test and the Wald test.

3.2.5 MAXIMUM LIKELIHOOD RATIO TEST (G)

In logistic regression, unlike in the linear regression, the likelihood equations are non linear and thus need iterative procedure to obtain the maximum likelihood estimates. For large data with many variables this procedure has proved to be costly and cumbersome.

Under the maximum likelihood method the objective is to compare the observed to predicted values using the likelihood function. The likelihood function is given by:

$$D=-2\ \mathrm{In}\frac{[\text{likelihood of current model}]}{\mathrm{In}[\text{likelihood of saturated model}]} \qquad (1)$$

where

D=deviance and it is equivalent to the sum of squares in the linear regression model.

Likelihood ratio= likelihood of current model divided by likelihood of the saturated model.

Equation (1) can be further expressed as

$$D= -2\Sigma(\{\hat{Y}_1 \ In(\hat{\pi}[/Y_1] +1 -Y_1 \ In \ [1 - \pi]/[1 -Y_1] \qquad (2)$$

where

$$\hat{\pi}_i=\hat{\pi}(X_i)$$

In order to assess the significance of the independent variable we compare the value of the deviance (D) with or without the independent variable thus:

G=D(the model without the variable- D(model with the variable) (3)

Equation (3) can further be expressed as

$$G=-2 \ In\frac{(likelihood \ without \ the \ model)}{In(likelihood \ with \ the \ model)} \qquad (4)$$

where

G= maximum likelihood ratio test. It is equivalent in its function to the numerator of the F-test in linear regression model. In general for p independent variables under the null hypothesis $\beta_{1=}0$, G will follow a chi-square distribution with p number of degrees of freedom.

For a single independent variable G is given by

$$G=2\{\Sigma[Y_i(\pi_i)+(1-Y_i)In(1-\pi_i)-[n_1In(n_1)+n_0In(n_0)-nIn(n)]\} \qquad (5)$$

Where

$n_1=\Sigma Y_i$

$n_0=\Sigma(1-Y_i)$

n_1/n= constant or the predicted value.

3.2.6 WALD TEST (W)

The Wald test (W) is obtained by comparing the maximum likelihood estimated of the slope of the parameter β_1 to its estimated standard error. Under the null hypothesis that β_1=0 W will be normally distributed. The Wald test is calculated as follows:

$$W=\hat{\beta}_1/SE(\hat{\beta}_1)$$

and the two tail p-value is $P(|Z|)>W$

where Z is a random variable which is normally distributed.

The Wald test has the disadvantage over the likelihood ratio test in that writers such as Hauck and Donner(1977) and Jennings (1986a) have shown that it often fails to reject the null hypothesis when the coefficient is significant. For this reason we use the likelihood ratio test(reported in Hosmer and Lemeshow, 1989).

3.3 RELATIVE RISK METHOD

The relative risk method in the book entitled Social Statistics by Blalock (1979) is the one which we have used in this study to assess the effect associated with each independent variable on the dependent variable since we are interested in comparing a single population. On the other hand if we are interested in comparing two populations the method proposed by Beltaro and Sawyer (1990) would be the best to use.

The relative risk method is essentially a direct standardization method to make survival risks associated with each independent variable comparable. The standardization is usually done when:

1. The units for measurement are not the same.
2. Some of the variables show marked variability.

Standardization is achieved by dividing each independent variable standard deviation by the standard deviation of the dependent and expressing the resultant as deviations from the mean to yield standardized b_s or beta weights (β). The beta weights are the relative risks associated with each independent variable which can be easily compared. Alternatively, the beta weights can be obtained as a ratio of the standard deviation of the dependent variable (not controlled) multiplied by the b_s.

3.4 NEONATAL DEATH RATIO

Although retrospective mortality data are notoriously defective, we have made an attempt to calculate neonatal death ratio which is our dependent variable in the multiple regression model. The neonatal death ratios are obtained by dividing the total number of deaths during the first one month of life by the total number of infant deaths during the year. This exercise is carried out for each of the five years preceding the survey (i.e., 1984, 1985, 1986, 1987, 1988) and also for the whole five years i.e., 1984-1988. This is done in order to access the changes in the relative importance of the variables affecting infant mortality during the one month of life.

The rationale for choosing neonatal death ratio is similar to that of other cause specific death ratios. First, this ratio, according to Barclay (1985), can be utilized in comparing mortality between different populations and secondly, it is suitable for appraising health projects.

The neonatal death ratio can be computed by the formula:

$$\text{Neonatal death ratio} = \frac{D_{0i}}{D_{12i}}$$

where

D_{0i}=total neonatal deaths in year i

D_{12i}=total infant deaths in year i

i= 1984, 1985, 1886, 1987, 1988, 1984-1988.

CHAPTER FOUR

CHARACTERISTICS OF THE POPULATION UNDER STUDY

4.0 INTRODUCTION

In this chapter we describe briefly some of the characteristics of the population under study. No attempt has been made to cross tabulate variables because of the small number of neonatal deaths. This implies that some categories of variables will have few or no observations, causing the Chi-square test to behave aberrantly. The findings of this chapter will undoubtedly be very instrumental as far as the next chapter is concerned when the results derived from the regression analyses and the relative risk method are presented.

4.1 AGE DISTRIBUTION

TABLE 4.1 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY FIVE-YEAR AGE GROUPS

Age- group	Number	Percentage
15 -19	1413	(20.7)
20 - 24	1283	(18.2)
25 - 29	1268	(18.6)
30 - 34	949	(13.9)
35 - 39	860	(12.6)
40 - 44	654	(9.6)
45 - 49	431	(6.3)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.1 gives the distribution of women respondents by age 5 year age groups. It is clear from this table that a majority of women (about 58 percent) are less than 30 years. 38.9 percent of the women are aged between 15 and 25 years. The fact that high percent of women aged below 30 years of age has implications for high fertility and hence high population growth rate.

4.2 MARITAL STATUS

TABLE 4.2 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY CURRENT MARITAL STATUS

Marital status	Number	Percentage
Never married	1784	(26.2)
Married	4291	(63.0)
Living together	240	(3.5)
Widowed	190	(2.8)
Divorced	208	(3.1)
Not living together	90	(1.4)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.2 presents the distribution of women by current marital status. This table shows that the marriage institution is still a universal phenomenon in Kenya: 63 percent of the surveyed women are married. Another second largest category is the never married (26.2 percent); the rest of the categories are relatively smaller (when added together they constitute only 10.8 percent). The above marital profile has far reaching implications for both fertility and child survival.

4.3 EDUCATION

TABLE 4.3 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY HIGHEST EDUCATIONAL

Educational level	Number	Percentage
No education	1726	(25.4)
Primary	3697	(54.3)
Secondary	1361	(20.0)
Higher	3	(0.3)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.3 depicts the distribution of women respondents by highest educational level. As we can not from this table about 25.4 percent of the women had reported they had no education. A majority of women 54.3 percent had attended primary level. Only 20.3 percent had attended secondary level and above. The high proportions of women with no education and primary education have serious implications for fertility and child survival. It is only women with secondary and higher education who have been documented in various studies to have lower fertility and child mortality.

4.4 RELIGION

TABLE 4.4 PERCENTAGE OF WOMEN RESPONDENTS BY RELIGION

Religion	Number	Percentage
Catholic	2338	(34.3)
Protestant	3938	(57.9)
Muslim	243	(3.6)
Other	106	(1.6)
No religion	179	(2.6)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

It is evident from table 4.4 that the majority of women are protestants (57.8 percent), followed by Catholics (34.3 percent), Muslims (3.6 percent), Other (1.6 percent) and No religion (2.6 percent). Available evidence in the literature review indicates that religion per se affects child survival through its effect on family life. For instance, the Seventh Day Adventist (SDA) are so obsessed with the healing power of the Holy Spirit to the extent that they do not take their sick to the hospital for treatment. The Seventh Day Adventist are also vegetarians hence, they deprive their children of meat protein which is essential for body building and growth. As for the Muslims they have less secular education and hence low perception of hygiene. In addition, Muslims believe so much in the healing power of the Faki (i.e., muslim equivalent of a traditional healer) and thus have low regard for modern medical practices.

4.5 ETHNICITY

TABLE 4.5 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY ETHNICITY

Ethnicity	Number	Percentage
Kalenjin	584	(8.6)
Kamba	876	(12.9)
Kikuyu	1612	(23.7)
Kissi	389	(5.7)
Luhya	1136	(16.7)
Luo	1004	(14.7)
Meru/Embu	450	(6.6)
Mijikenda/Swahil	302	(4.4)
Somali	10	(0.1)
Other	450	(6.6)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.5 shows that the Kalenjin constitute 8.6 percent of the women surveyed, Kamba 12.9 percent, Kikuyu 23.7 percent (the highest), Kisii 5.7 percent, Luhya 16.7 percent, Luo 14.7 percent, Meru/Embu 6.6 percent, Mijikenda/Swahil 4.4 percent, Somali 0.1 percent and Other 6.6 percent. It has been documented that the impact of ethnicity on child survival is through tribal beliefs and practices and also through their genetic make- up and differences in educational opportunities. For, example the Mijikenda are renowned for having the longest birth intervals and breast feeding periods in the country which are favourable for child survival. On the other hand tribes such as the Luo, Luhya, Digo, and Kipsigi have certain food taboos which are detrimental (or hazardous) for child survival.

4.6 AGE AT FIRST BIRTH

TABLE 4.6 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY MATERNAL AGE AT FIRST BIRTH

Age at first birth	Number	Percentage
10 - 14	783	(11.5)
15 - 19	4102	(60.2)
20 - 24	1683	(24.7)
25 - 29	204	(3.0)
30 - 34	34	(0.5)
35 +	7	(0.1)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.6 provides the distribution of women by maternal age at first birth. During the survey the women who had ever given birth were asked about the age at which they gave to their first children. It is evident from this table that most of the women bear their first children quite early. About 11.5 percent of the women had their first births below the accepted demographic age of menarche of 15, and another 60.2 percent had their first births when they were aged between 15 and 19 years. Early marriages are now reported to be wide spread among the Mijikenda of Kwale and Kilifi districts of Coast province as source for averting famine. The early births are indeed an epitome of the universality of the marriage institution in the country. The implications of early births for child survival are devastating.

4.7 BREAST FEEDING

TABLE 4.7 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY DURATION OF BREASTFEEDING

Duration of breastfeeding (in months)	Number	Percentage
0	182	(2.7)
1-3	694	(10.2)
4-6	666	(9.8)
7-12	1612	(23.7)
13-18	1600	(23.5)
19-24	1270	(18.7)
25-29	222	(3.3)
30 +	567	(8.2)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.7 presents the distribution of surveyed women by duration of breast feeding. The average period of breast feeding is about 17.1 months. About 20 percent of the women breastfed up to 6 months. Another 42.2 percent of the women breastfed between 12 to 24 months. Breastfeeding is indeed universal since only 2.7 percent of the women reported themselves as having not breastfed their children. Hence, the implications for child survival is favourable.

4.8 BREASTFEEDING

TABLE 4.8 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY WHETHER THEY WERE BREASTFEEDING.

Breastfeeding status	Number	Percentage
NO	4578	(67.2)
YES	2235	(32.8)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.8 reports the distribution of women by currently breastfeeding status. About 67.2 percent of the women reported that they were not currently breastfeeding. Breastfeeding has a negative impact on child survival because children not currently breastfed are less stronger than those currently being breastfed.

4.9 TETANUS INJECTION

TABLE 4.9 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY WHETHER THEY HAD RECEIVED TETANUS INJECTION

Tetanus injection	Number	Percentage
No	749	(11.0)
Yes	6057	(88.9)
Don't Know	7	(0.1)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.9 gives the distribution of women respondents by whether they had received tetanus injection during the time of pregnancy. It is evidently clear from the table that there are wide difference between the not injected, injected and don't know categories of women. Approximately 88.9 percent of women reported that they had received tetanus vaccine when they were pregnant. Only 11 percent of the women had not received tetanus injection. Another 0.1 percent had not known that such a program for inoculation ever existed. This high percent of vaccinated women has positive implication for child survival.

4.10 PRENATAL CARE

TABLE 4.10 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY PRENATAL CARE.

Prenatal care	Number	Percentage
No one	1322	(19.4)
Doctor	2064	(30.3)
Trained nurse	3250	(47.7)
Birth attendant	136	(2.0)
Other	41	(0.6)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.10 shows the distribution of women respondents by prenatal care. The table indicates major differences in the usage of prenatal services by pregnant women. The majority of the women were attended to by trained nurses (47.7 percent), 30.3 percent by doctor and 19.4 percent by no one. It is worth noting that traditional birth attendants and other plays no major in prenatal care, their rates being only 2.0 and 0.6 and percent, respectively. The implications of the above accessibility to prenatal care on child survival is diverse. Those attended to by qualified health personnel tend to have minimal complications during delivery.

4.11 ASSISTANCE AT DELIVERY

TABLE 4.11 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY ASSISTANCE AT DELIVERY.

Assistance at delivery	Number	Percentage
No one	790	(11.6)
Doctor	1213	(17.8)
Trained nurse	2303	(33.8)
Birth attendant	1015	(14.9)
Relative	1383	(20.3)
Other	109	(1.6)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.11 presents the distribution of women respondents by assistance at delivery. As is the case with prenatal care a large number of women were attended to by trained nurses (33.8 percent). In Kenya, like in most Sub Saharan African countries because of lack of trained paramedics, relatives and traditional birth attendants still play a major role during delivery. Their respective percent being 22.2 and 12.3 percent. This has implications for child survival.

4.12 RESPONDENT CURRENTLY WORKING

TABLE 4.12 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY WOMEN RESPONDENTS CURRENTLY WORKING STATUS

Currently working status	Number	Percentage
No	6009	(88.2)
Yes	804	(11.8)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

It is apparent in table 4.12 that an overwhelmingly percent of women were currently unemployed (88.2 percent) as compared to those employed (11.8 percent). This finding is expected given the statistically definition of gainful employment currently in use which tends to exclude most rural women. In Kenya most of the rural women are heads of households, some of whom engage on own farm activities and others sell goods in the markets. The unemployed women experience high child mortality since they are unlikely to meet the high costs of both prenatal and delivery care rendered by specialist doctors or hospitals. This conclusion is a partial one since other factors apart from maternal employment such as paternal employment usually determine family income.

4.13 OWN OF CATTLE, GOAT, AND SHEEP

TABLE 4.13 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY WHETHER THEIR HOUSEHOLDS OWN CATTLE, GOAT AND SHEEP

Own cattle, goat and sheep	Number	Percentage
Yes	5268	(77.3)
No	1545	(22.7)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.13 gives the distribution of women respondents by whether their households owned cattle, goats and sheep. This question was to indicate health environment of the household at the birth of the child. According to the table an overwhelmingly large percent of women (77.3 percent) reported that their households owned animals. This in itself means more children are more likely to be exposed to tetanus spores through the use of animal dung either as fuel for cooking, treatment for child navel or plastering the floor and wall of the house.

4.14 SEX OF CHILD

TABLE 4.14 NUMBER AND PERCENTAGE OF WOMEN RESPONDENTS BY SEX OF CHILD

Sex of child	Number	Percentage
Male	3441	(50.5)
Female	3372	(49.5)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.14 gives a summary of the distribution of women respondents by sex of child. During the survey the women were asked the question whether the child the had given birth to was male or female. The implied sex ratio at birth is 102 males for 100 females. This is within the universally accepted range of 102 to 107 males per 100 females. The implications for child survival is that at birth male children have usually high mortality than their female counter parts during infancy. This is because male births tend to lack certain genes and hormones (i.e., oestrogen and progesterone and an extra X chromosome) which been found to give survival advantage.

4.15 MAIN FLOOR MATERIAL

TABLE 4.15 PERCENTAGE OF WOMEN RESPONDENTS BY MAIN FLOOR MATERIAL

Floor material	Actual Number	Percentage
Parquet	9	(0.1)
Vinyl	7	(0.1)
Tiles	13	(0.2)
Wood blanks	43	(0.6)
Cement	2066	(30.3)
Earth	4658	(68.4)
Other	14	(0.2)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.15 depicts the distribution of women respondents by main floor material. The women were asked about the type of floor material of their houses. About 68.4 percent of the women reported they lived in earth floor houses, 30.3 percent in cement, 0.2 percent each in tiles and tiles other and another 0.1 percent each in parquet and vinyl. The implications for child survival is that of exposure to tetanus spores due to aseptic conditions during delivery, particularly in those houses with earth floor material.

4.16 PRECEDING BIRTH INTERVAL

TABLE 4.16 DISTRIBUTION OF WOMEN RESPONDENTS BY PRECEDING BIRTH INTERVAL

Preceding birth interval (in months)	Number	Percentage
7-12	225	(3.3)
13-18	579	(8.5)
19-24	1294	(19.0)
25-29	1247	(18.3)
30+	3468	(50.9)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.16 gives the distribution of women respondents by the duration of preceding birth interval. The average duration between two preceding births is 24.2 months. About 69.2 percent of the women had preceding birth intervals of more than 2 years. Another had 19 percent between 19 and 24 months. Longer preceding birth intervals are indeed universal since only 3.3 percent of the reported themselves as having preceding birth intervals of between 7 and 12 months. Hence, the implication for child survival is favourable.

4.17 SUCCEEDING BIRTH INTERVAL

TABLE 4.17 DISTRIBUTION OF WOMEN RESPONDENTS BY SUCCEEDING BIRTH INTERVAL

Succeeding birth interval (in months)	Number	Percentage
7-12	219	(3.2)
13-18	580	(8.5)
19-24	1302	(19.1)
25-29	1258	(18.5)
30+	3452	(50.7)
Total	6813	(100.0)

Source: Compiled by author based on KDHS (1989)

Table 4.17 presents the distribution of women respondents by the duration of birth between two successive births. The average duration between two successive births is 24.2 months. About 69.2 percent of the women reported preceding birth intervals of more than 2 years. Another 19.1 percent between 19 and 24 months. Longer duration between two successive births is indeed universal since only 3.2 percent of the women recorded succeeding birth intervals of between 7 and 12 months. The implication for child survival is favourable.

CHAPTER FIVE

RESULTS OF THE REGRESSION ANALYSES AND RELATIVE RISK METHOD

5.0 INTRODUCTION

The objective of this chapter is to describe the results of the regression analyses and relative risk method. It is sub-divided into five sections. The first section describes the variables used in the analysis and also assigns abbreviations and design codes to them. The second section discusses the results of the multiple regression analysis. The third section concerns the results of the logistic regression model. The fourth section focuses on the results of the relative risk method in which the significant variables are ranked on the basis of their contribution to neonatal mortality based on their respective beta weights. The five and the last section give summary results for the entire five- year period.

5.1 DESCRIPTION OF THE VARIABLES USED IN THE ANALYSIS

In the analysis we have in all a battery of 17 variables (dependent variable inclusive). As mention in chapter one the variables selected for the analysis are those covered by Kenya's DHS data set and whose contribution to neonatal mortality has been found to be significant elsewhere, although unknown in Kenya. The independent variables are classified into two categories, namely: primary risk factors and secondary risk factors. This is to enable us to know in advance which of these variables have confounding and interaction effects that tend to reduce their significance.

According to Hosmer and Stanley (1986) confounding is present when the secondary risk factor is associated with both the dependent variable and the primary risk factor. On the other hand interaction is present when the relationship between the primary risk factor and the dependent variable varies or depends on the level of the secondary risk factor.

A set of dummy variables has been used to index the categories of variables of interest, coded 0 and 1. According to Kleinbanum and Kupper (1978) the dummies in no way describe meaningful measurement level. For a regression equation having a constant and K categories the number of dummy variable will be K^2-1. In contrast, for regression equation with no constant the number of dummy variable will be K^2.

The method of forming design variables follows the partial method or the reference cell parameterzation method. Under this method the value of zero or the lowest code is assigned to the reference categories, while the value 1 is assigned to the other categories.

Since the number of neonatal deaths is small it is likely that some of the categories of variables will have few or no observations at all. In order for us to capture a significant number of observations in each category the method of collapsing is used where those categories with few or no observation are combined to form a single category of variable. This is particularly the case with educational level, prenatal care, assistance at delivery, current marital status, religion, ethnicity, floor material, age at first birth, preceding and succeeding birth intervals.

5.1.1 DEPENDENT VARIABLE

1. **Neonatal death ratio** - refers to the dependent variable used in the multiple regression analysis. It is a cause specific death ratio and is represented for each of the five years preceding the survey and for the entire period thus:

R84 - Neonatal death ratio for 1984

R85 - Neonatal death ratio for 1985

R86 - Neonatal death ratio for 1986

R87 - Neonatal death ratio for 1987

R88 - Neonatal death ratio for 1988

R8488 - Neonatal death ratio for 1984/88

2. **Neonatal mortality** - refers to whether the child dies during the zero month of age. It is used as a dependent variable in the logistic regression model. It is a dichotomous variable and is coded thus:

0= NMRT1= child survives the first month of life.

1= NMRT2= Child is borne and died the same month

5.1.2 INDEPENDENT VARIABLES

(A) PRIMARY RISK FACTORS. These are only associated with the dependent variable.

1. HEALTH FACTORS

Perinatal care. This is a function of socio-economic and socio-cultural conditions of the household as it affects health care behavoiur. It is a set of dummies and is coded thus:

0= NO one (includes traditional birth attendant and other)=PCARE1 (the reference category)

1= Doctor=PCARE2

2= Trained nurse=PCARE3

Assistance at delivery. Again, this a function of socio-economic and socio-cultural status of the household as it affects delivery care behaviour. It is a set of dummy variables and is coded thus:

0= No one=ASSD1(the reference category)

1=Doctor=ASSD2

2=Trained nurse=ASSD3

3=Birth attendant=ASSD4

4=Relative(includes the no other category)=ASSD5

Tetanus injection. The vaccine protects the child against tetanus disease infestation for a period of 14 days from birth. It is a dichotomous variable and is coded thus:

0=No=TET1

1=Yes=TET2

2. SOCIO-CULTURAL FACTORS

Currently breastfeeding. The implication is that the more a woman breastfeeds the better it is for her children since besides being nutritious compared with other food supplements maternal milk contains certain anti-bodies which avert diarrhoeal diseases. It is a binary variable and is coded thus:

0=No=CBRE1 (the reference category)

1=Yes=CBRE2

Duration of breastfeeding. It has been found that shorter duration of breastfeeding has a negative impact on child survival. It is a dichotomous variable and is coded thus:

0=<15M=DBF1 (the reference category)

1=15M+=DBF2

3. DEMOGRAPHIC FACTORS

Sex of the child. This affects child survival through differential parental treatment (i.e., mother care, health care, feeding practices, etc.) in favour of a particular sex and also through differences in genetic make-up between males and females. It is a binary variable and is coded thus:

0=Female=SEX1 (the reference category)

1=Male=SEX2

Preceding birth interval. Shorter preceding birth intervals have been found to have a negative impact on child survival. This is a function of the both socio-cultural and socio-economic status of the household. It is a dichotomous variable and is coded thus:

0=<30M=PREINT1 (the reference category)

1=30M+=PREINT2

succeeding birth interval. It has been found out that the Shorter the interbirth spacing between an indexed and a succeeding one the higher the probability of dying. This is a function of the both socio-cultural and socio-economic status of the household. It is a dichotomous variable and is coded thus:

0=<30M=SUCINT1 (the reference category)

1=30M+=PREINT2

(B) SECONDARY RISK FACTORS OR CONTROLLED FACTORS.

These factors are associated with both the dependent variable and the primary risk factors.

1. SOCIO-ECONOMIC FACTORS

Highest educational level. This reflects differences in child care, health care and feeding practices. It is a set of dummies and is coded thus:

0=No education=EDUC1 (the reference category)

1=Primary=EDUC2

2=Secondary/Higher education=EDUC3

Current working status. Again, this reflects differences in health care and quality of food intake. It is a dichotomous variable and is coded thus:

0=NO=WSTA1 (the reference category)

1=Yes=WSTA2

2. SOCIO-CULTURAL FACTORS

Ethnicity. This affects child survival through its influence on family life. It is a set of dummy variables and is coded thus:

0=Kalenjin=ETH1 (the reference category)

1=Kamba=ETH2

2=Kikuyu=ETH3

3=Kisii=ETH4

4=Luhya=ETH5

5=Luo=ETH6

6=Meru/Embu=ETH7

7=Mijikenda/Somali=ETH8

Religion. This variable like ethnicity affects child survival through its effects on family life. It is a set of dummy variables and is coded thus:

0=Catholic=REL1 (the reference category)

1=Protestant=REL2

2=Muslim=REL3

3=No religion=REL4

3. DEMOGRAPHIC FACTORS

Age 5-year groups- reflects differences in biological maturity and diseases. It is a set of dummies and is coded thus:

0=15-19=AGE1 (the reference category)

1=20-24=AGE2

2=25-29=AGE3

3=30-34=AGE4

4=35-39=AGE5

5=40-44=AGE6

6=45-49=AGE7

Age at first birth- again, this variable reflects biological maturity by age and also the type of diseases associated with different age groups at the birth of the first child. It is a function of the socio-cultural and socio-economic factors and is coded thus:

0=<20=AGB1 (the reference category)

1=20-24=AGB2

2=25+=AGB3

Current marital status. This reflects consciousness about health and hygiene. It is a set of dummy variables and is coded thus:

0=Not married=MARSTA1 (reference category)

1=Married=MARSTA2

2=Divorced/Widowed=MARSTA3

4. ENVIRONMENTAL FACTORS

Floor material. This reflects exposure to tetanus spores and is a function of socio-economic status of the household. It is a set of dummies and is coded thus:

0=Wood=FLOMAT1 (reference category)

1=Cement=FLOMAT2

2=Earth=FLOMAT3

Ownership of animals. Again, like floor material this variable reflects exposure to tetanus spores and a function of socio-economic status of the household. It is a binary variable and is coded thus:

0=No=OWN1 (reference category)

1=Yes=OWN2

5.2 DISCUSSION OF THE RESULTS OF THE MULTIPLE REGRESSION ANALYSIS

In attempting to find the association between one dependent variable and several independent variables, we have used step wise multiple regression model. This model picks the most significant variables in steps until he overall regression model is obtained. The results of the regression analysis usually consist of estimated coefficients, standard errors and their associated partial F test (or t test) and the analysis of variance table (or simply ANOVA table). Two null hypotheses are tested: (1) H_0: the overall regression is not significant i.e. all the independent variables together do not significantly predict the dependent variable.
(2) H_0: the partial regression is not significant i.e. the independent variable significantly contributes to the prediction of

the dependent variable after controlling for other variable(s). The overall results of the reduced multiple regression for the five years taken one at a time and for the entire period (1984-1988) are discussed separately below.

5.2.1 RESULTS: 1984

Table 5.2 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC, ENVIRONMENTAL AND HEALTH FACTORS, 1984.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	5	6.0541	1.2108	6.8198	0.000	0.2517
RESIDUAL	101		0.1775			

Table 5.3 OVERALL MODEL, 1984

VARIABLE	β	SE β	BETA	T	SIG T
AGE6	-0.5921	0.1406	-0.3878	-4.211	0.0001
REL2	-0.2531	0.0832	-0.2663	-3.041	0.0030
MARSTA2	0.2638	0.0876	0.2781	3.013	0.0033
ETH8	-0.5718	0.2247	-0.2268	-2.545	0.0125
AGE7	-0.4262	0.1773	-0.2076	-2.403	0.0181
CONSTANT	0.4211	0.0728		5.789	0.0000

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R84= -0.42111 - 0.59212 AGE6 - 0.25313 REL2 +0.26384 MARSTA2 -0.57178 ETH8 - 0.42617 AGE7

The F test shows that the overall regression is significant, since the value of significant F (0.0000) is exceedingly smaller than 0.05. Hence the null hypothesis that the overall regression is not significant is rejected. The t- test shows that the five variables (age group 40-44, protestant, married, Mijikenda/Swahili and age group 45-49) significantly contribute to the prediction of neonatal death ratio. So we reject the null hypothesis.

Slightly over 25 percent (R = 0.5017) of the variation in neonatal death ratio is explained by the five variables. So the association is rather weak, or there is practically no relationship or the relationship is nonlinear. This suggests that other factors (i.e., biological factors and other exogenous factors not captured in the analysis) contribute more in explaining the variation in neonatal death ratio. The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

It is evident in the overall estimated model that all the five variables, with the exception of MARSTA2, have negative coefficients. This means there is a tendency for neonatal mortality to decrease by a factor equal to the value of the associated beta coefficients in comparison with the reference category.

Women who reported that they were in the age group 40-44 and 45-49 had neonatal death ratio reduced 0.38776 and 0.20753 times respectively than women in the age group 15-19.

Women who reported that they were protestant had neonatal death ratio lowered by 0.26627 times that of women who reported that they were catholic.

Women who were married had neonatal death ratio increased by a factor of 0.27805 when compared with those who were not married. This is unexpected result since it contradicts what is in the literature review. Married women are more conscious about their health and that of their children and have higher socio-economic status than the single, divorced or married.

Mijikenda/Swahili women are likely to have neonatal death ratio reduced by 0.20753 times that of Kalenjin women.

5.2.2 RESULTS: 1985

TABLE 5.4 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC, ENVIRONMENTAL AND HEALTH FACTORS, 1985.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	6	6.2346	1.0392	6.0672	0.000	0.2777
RESIDUAL	95	16.2306	0.1713			

TABLE 5.5 OVERALL MODEL, 1985

VARIABLE	β	SE β	BETA	T	SIG T
REL4	0.8146	0.2440	0.3823	3.380	0.0011
TET2	-0.1991	0.1170	-0.1617	-1.703	0.0919
AGE2	0.3927	0.1206	0.3060	3.256	0.0016
EDUC3	-0.4493	0.1252	-0.4493	-3.588	0.0005
EDUC2	-0.3409	0.1180	-0.3610	-2.889	0.0048
AGE7	-0.4230	0.2087	-0.1866	-2.026	0.0455
CONSTANT	0.7254	0.1131		6.414	0.0000

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R85 = 0.72538 + 0.81461 REL4 - 0.19914 TET2 + 0.39268 AGE2 - 0.44929 EDUC3 - 0.34087 EDUC2 - 0.42296 AGE7

Examining the F test reveals that all six variables (i.e., no religion, tetanus injection, age group 20-24, secondary/higher education, primary education and age group 44-49) together overwhelmingly contribute to the prediction of neonatal death ratio. The value of significant F (0.0000) is by far smaller than 0.05. We therefore reject the null hypothesis that all the variables taken together do not predict neonatal death ratio. The t- test shows that for each of the six variables the inclusion of variables to the model contribute to the prediction of neonatal death ratio as the value of significant F is much less than 0.05. In such a situation the null hypothesis is rejected.

The six variables have an explanatory power of over 27 percent (R = 0.5270) of the variation in neonatal mortality. We can conclude that the relationship is not strong. This suggests that biological factors are important in providing the needed explanation of variation in neonatal death ratio. But it should be stressed that other exogenous factors not included in the analysis might also be important in explaining the variability in the neonatal death ratio. The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

All the estimated coefficients, with the exception of those of religion and age group 20-24, are negative. This indicates the tendency of neonatal death ratio to go down as compared with the referent category except for the two variables.

The results indicate that children born to women injected with tetanus vaccine during pregnancy and those who had secondary/higher education or belonging to the age group 40-44 have low risks of death at the neonatal period when compared with the reference category whereas those born to women belonging to no religion/other and those aged 20-24 have high risks. The results for the women aged 20-24 and 40-44 is supported by the hypothesized view that older women have wider experience of infant care than younger ones.

5.2.3 RESULTS:1986

TABLE 5.6 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC, ENVIRONMENTAL AND HEALTH FACTORS, 1986.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	4	4.6205	1.1551	5.5716	0.000	0.1499
RESIDUAL	126	26.2137	0.2073			

TABLE 5.7 OVERALL MODEL, 1986.

VARIABLE	β	SE β	BETA	T	SIG T
AGE4	-0.3014	0.1043	-0.2377	-2.889	0.0045
REL4	-0.3895	0.1583	-0.2027	-2.460	0.0152
ASSD3	-0.1865	0.0809	0.1891	-2.304	0.0228
MARSTA3	-0.4038	0.1936	-0.1714	-2.086	0.0390
CONSTANT	0.5495	0.0572		9.609	0.0000

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R86 = 0.54950 - 0.30139 AGE4 - 0.38949 REL4- 0.18648 ASSD3 - 0.40383 MARSTA3

The F test reveals that four variable (age group 30-34, no religion, trained nurse, and divorced/widowed) contribute overwhelmingly to the linear prediction of neonatal death ratio. The null hypothesis of non prediction of neonatal death ratio by these variables is therefore rejected. The t- test shows that for each variable the addition of another variable significantly contributes to the prediction of neonatal death ratio. Again, the null hypothesis of non prediction of neonatal death ratio by an addtion of another variable to the model is therefore rejected.

The results indicate that four variables explain nearly 15 percent (R = 0.3872) of the variation in neonatal mortality. We can conclude that there is weak or no relationship. This finding points to the fact that other factors (i.e., biological factors and other exogenous factors which are not captured in the analysis) are most significant in explaining the variation in neonatal death ratio. The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

Since all the coefficients are negative this means that the above variables significantly enhance child survival during neonatal and post-neonatal period. However, the result for religion is not supported by findings in the literature review that births to women with no religion have higher probability of dying than those of catholic women.

5.2.4 RESULTS: 1987

TABLE 5.8 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC, ENVIRONMENTAL AND HEALTH FACTORS, 1987.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	2	1.9967	0.9984	4.8258	0.0098	0.07912
RESIDUAL	112	23.2384	0.2069			

TABLE 5.9 OVERALL MODEL, 1987.

VARIABLE	β	SE β	BETA	T	SIG T
REL2	0.2120	0.0882	0.2202	2.404	0.0179
ASSD4	0.4216	0.1824	0.2118	2.312	0.0226
CONSTANT	0.1679	0.0711		2.362	0.0199

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R87 = 0.16785 + 0.21198 REL2 + 0.42159 ASSD4

The F test indicates that the two variables (i.e., protestant and traditional attendant) overwhelmingly contribute to the linear prediction of the model. The null hypothesis of non prediction of the model is therefore rejected. Similarly for the t - test the null hypothesis is rejected since the addition of each of the two variable does contribute to the prediction of the model.

The two variables explain about 8 percent (R = 0.2813) of the variation in the dependent variable. This finding suggests that other factors (i.e., biological factors and other exogenous which are not included in the analysis) are most important in explaining the variation in the dependent variable. The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

The results indicate that children born to women belonging to the protestant religion and those who were attended to by traditional attendants at delivery are exposed to higher neonatal mortality.

5.2.5 RESULTS: 1988

TABLE 5.10 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC ENVIRONMENTAL AND HEALTH FACTORS, 1988.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	4	4.5646	1.1411	5.4309	0.0006	0.2064
RESIDUAL	84	17.5527	0.2101			

TABLE 5.11 OVERALL MODEL, 1988.

VARIABLE	β	SE β	BETA	T	SIG T
ETH2	-0.4778	0.1481	-0.3251	-3.227	0.0018
ETH6	-0.3863	0.1417	-0.2711	-2.726	0.0078
AGE3	-0.3050	0.1340	-0.2256	-2.276	0.0254
REL3	-0.4926	0.2246	0.2161	-2.193	0.0311
CONSTANT	0.6803	0.0643		10.575	0.0000

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R88 = 0.89028 -0.47780 ETH2 - 0.38630 ETH6 -0.30496 AGE3 - 0.49260 REL3.

The F test shows that the overall regression is significant, at the 0.05 level of significance. The null hypothesis of non-significance of the overall regression mode is therefore rejected. The test- test shows that the partial regressions are significant. Again, the null hypothesis is rejected.

Twenty percent (R = 0.4543) of the variation in the dependent variable is explained by four variables (i.e., Kamba, Luo, age group 25-29 and muslim). This finding points to the fact that other factors are important in explaining the variation in the dependent variable. The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

All the estimated coefficients are negative. In other words there is a tendency for the dependent variable to decrease when the independent variables are compared with their reference categories i.e., the variables significantly enhance child survival during the neonatal period.

The women who reported that they were Kamba or Luo had lower neonatal death ratio as compared to the reference category (i.e., Kalenjin).

Women who reported that they were aged 25-29 and those belonging to Islam have lower neonatal death ratio when compared with their reference categories. The finding for the muslim contradicts what is in the literature review.

5.2.6 RESULTS: 1984-88

TABLE 5.12 ANOVA FOR NEONATAL DEATH RATIO REGRESSED ON SOCIO-ECONOMIC, SOCIO-CULTURAL, DEMOGRAPHIC, ENVIRONMENTAL AND HEALTH FACTORS, 1984-88.

SOURCE	DF	SSY	MEAN SQUARE	F	SIG F	R^2
REGRESSION	5	5.0186	1.0037	4.4515	0.0006	0.0397
RESIDUAL	538	121.4071	0.2255			

TABLE 5.13 OVERALL MODEL, 1984-88.

VARIABLE	β	SE β	BETA	T	SIG T
REL3	-0.2373	0.0997	-0.1012	-2.380	0.0177
DBF2	-0.0898	0.0412	-0.0925	-2.181	0.0296
AGE4	-0.1491	0.0616	-0.1034	-2.422	0.0158
AGE6	-0.1712	0.0811	-0.0898	-2.111	0.0353
OWN2	0.0959	0.0485	0.0840	1.980	0.0482
CONSTANT	0.4360	0.0345		12.643	0.0000

Source: Compiled by author based on KDHS (1989)

OVERALL ESTIMATED MODEL R84-88 =0.4304 - 0.23728 REL3 - 0.08976 DBF2 - 0.14914 AGE4 0.17123 AGE6 + 0.09593 OWN2

The F test shows the overall regression is significant at the 0.05 level of significance. The null hypothesis of non-prediction is therefore rejected. The t- test shows that the partial regressions are also significant. Again, the null hypothesis is rejected.

About 4 percent (R= 0.1992) of the variation in the dependent variable is accounted for by five variables (i.e., muslim, duration of breastfeeding 30 months and high, age groups 30-34 and 40-44 and owns animals), indicating no relationships. This highlights the fact that other factors (i.e., biological factors and other exogenous factors which are not included in the analysis) contribute more to the explanation of the variation in the dependent variable (neonatal death ration). The reason for the selection of few variables is related to defects in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model. All the estimated coefficients, excepting OWN2, are negative. This has the implication of lowering neonatal death ratios for these variables by their beta values when compared with the reference categories. In other words, the results shows that the variables muslim, duration of breastfeeding 30 months and age group 30-34 or 40-44 enhance child survival during neonatal period while the variable owns animals is detrimental to of survival. Again, the finding for muslim contradicts what is in the literature review.

5.3 DISCUSSION OF THE RESULTS OF THE LOGISTIC REGRESSION ANALYSIS

We have deployed the results of the logistic regression to explore the association between socio-economic, socio-cultural, demographic, environmental, health factors and the dependent variable. This procedure has the ability to estimate the probability that an event occurs when the dependent variable is dichotomous. Two parsimonious logistic regression models have been fitted via the enter maximum likelihood estimation for each of the five years preceding the survey and for the entire period. The test of the goodness of fit is based on the Wald statistics at 0.05 significance level. The results yielded for the data pertaining to each year are expected to provide insights into the seasonality of deaths under one month of age.

The first logistic model is a complete model containing all the seventeen independent variables irrespective of whether they are significant or not. On the other hand the second logistic model is a reduced one containing significant variables estimated from the complete model. The purpose of introducing the reduced model is to reduce the random effect in the analysis. We concentrate on the results of the reduced model. The tables for the complete model are shown in the Appendix.

5.3.1 RESULTS OF THE REDUCED MODEL.

Table 5.14 through 5.19 report summary information of estimated coefficients and their statistical test for the reduced model. Looking at these tables we can see that, with the exception of the years 1984 and 1987, the results of the reduced model are not consistent with those yielded by the complete model. There are a few number of significant variables in the reduced model than in the complete model. Furthermore, the magnitude of estimated coefficients have slightly dropped in the reduced model. The only exception is ethnicity where the magnitude of its estimated coefficient is about halved. To elucidate this the results for the single years and for the entire period are discussed separately.

RESULTS: 1984

The 1984 results are consistent with those yielded by the complete model. The significant variables are four, SEX2, ETH10, REL2, and FLOMAT3. The marginally significant variable, DBF2 has been dropped out from the analysis. Except for ethnicity all the estimated coefficients are negative, indicating a reduction in the relative risk when those variables are compared with their referent categories. The odds ratio for male child to die in the neonatal period is less by 0.47 times that of female child. This result is unexpected because it contradicts the findings of other studies in Kenya (Anker and Knowles, 1979) and elsewhere (Somoza, 1980; D Souza and Chen , 1980) that male births have a heightened risk of mortality than female. The odds ratio for births to die among those who reported that they were Somali/Other is more by 3.4 times when compared with the Kalenjin. The odds ratio for births to die among protestant women is less by 0.35 times that of catholic women. And for births in households with earth floor material the odds ratio is less by 0.03 times that in households with wood floor material. Again, this is unexpected result because it is not supported by findings in the literature review.

TABLE 5.14 LOGISTIC REGRESSION: REDUCED MODEL, 1984

VARIABLE	B	SE	WALD	EXP(B)
SEX2	-.7450	.3580	4.3312*	.4747
ETH10	1.2236	.4092	8.9416*	3.3995
REL2	-1.0345	.3693	7.8489*	.3554
FLOMAT3	-1.1913	.3406	12.2336*	.3038
CONSTANT	-4.3680	.3664	142.1498*	

-2 Log likelihood=414.2291 df=6807

Significance=1.0000 Note * significant at 0.05 significant level

Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for the significant variables can be given by

$$\text{Log odds(N84)} = -4.3680 - 0.7450\ \text{SEX2} + 1.2236\ \text{ETH10} - 1.0345\ \text{REL2} - 1.1913\ \text{FLOMAT3}$$

It can be clearly seen that socio-economic variables such as education and occupation are not included while proximate determinant, FLOMAT3 is included. One possible explanation can be that floor material is also a good proxy for household wellbeing and hence household income (Kizito et al., 1991) which is in turn proxied by education and occupation. A second explanation is that variables such as paternal education and occupation which are not included in the analysis are important proxy indicators for household income rather than maternal education and occupation. A third explanation is data weakness, compounding or multicollinearity which forced out most of the variables from the model.

RESULTS: 1985

The results are inconsistent with those yielded by the complete model. Variables such as education and age which were significant in the complete model are now insignificant. Only three variables, WSTA2, TET2 and MARSTA2 are significant.

TABLE 5.15 RESULTS OF LOGISTIC REGRESSION: REDUCED MODEL, 1985

VARIABLE	B	SE	WALD	EXP(B)
WSTA2	1.0085	.4559	4.8927*	2.7415
TET2	-.8505	.3862	4.8504*	.4272
MARSTA2	-.9405	.4658	4.0767*	2.5612
CONSTANT	-4.7572	.6020	62.4547*	

-2 Log likelihood=401.340 df=6805

Significance=1.0000

Note * significant at 0.05 significant level

Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for significant can be expressed:

Log odds(85) = - 4.7572 + 1.0085 WASTA2 - 0.8505 TET2 + 0.9405 MARSTA2

It is evident that all variables , with the exception TET2, have positive coefficients, indicating a rise in the odds ratios for these variables as compared with the reference category. The odds ratio for births to die among not currently working women is 2.7415 times higher than that of currently working women. The odds ratio for births to die among women who reported they had received tetanus injection during pregnancy is 0.43 less than times that for women who had not received. For births among women who reported that they were married the odds ratios is 2.5612 higher as compared to women who were not married. This is an unexpected result since it is inconsistent with what is in the literature review. Generally married couples are more conscious about their health and that of their children than unmarried women. Moreover, married couples have higher socio-economic status than the unmarried, divorced or widowed.

RESULTS: 1986

The results are inconsistent with those generated by the complete model. Two significant variables, AGE3 and AGE5 and one marginally significant variable, AGE7 in the complete model are now dropped out of the analysis. However, TET2 which was marginally significant in the complete model is now significant. The other four significant variables are: OWN2, ASSD2, ASSD3 and ASSD4.

TABLE 5.16 RESULTS OF THE LOGISTIC REGRESSION: REDUCED MODEL, 1986

VARIABLE	B	SE	WALD	EXP(B)
TET2	1.4469	.6910	4.3845*	4.2498
OWN2	.6533	.3096	4.4533*	1.9220
ASSD2	-.9491	.4832	3.8587*	.3871
ASSD3	-.6497	.3270	3.9466*	.5222
ASSD4	-1.7404	.8169	4.5383*	.1755
CONSTANT	-6.2180	.6922	80.6959*	

-2 Log likelihood=560.321 df=6804

Significance=1.0000

Note * Significant at the 0.05 level

Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for the significant variables is given by:

$$\text{Log odds(N86)} = -6.2180 + 1.4469\ \text{TET2} + 0.6533\ \text{OWN2} - 0.9491\ \text{ASSD2} - 0.6497\ \text{ASSD3} - 1.7404\ \text{ASSD4}$$

The results indicate clearly that the estimated coefficients for two variables, TET2 and OWN2 are positive, while for the remaining three the estimated coefficients are negative. The odds ratio for births to die among women who had been vaccinated with tetanus vaccine during pregnancy is 4.25 times higher than that of women who had not been vaccinated. This result is amazing since it contradicts the finding that births to women who have been vaccinated during pregnancy have lower risk of dying during the neonatal period. For births among women reported that their households owned animals the odds ratio is 1.92 higher when compared to those who reported that their households did not own no animals. The odds ratios for births to women who reported they were attended to by doctors during delivery, trained nurses or traditional attendants are 0.39, 0.52 and 0.18 respectively which indicate lower mortality when compared with those not supervised. The finding for births attended to by traditional birth attendant is un expected because the odds of dying should be higher when compared with those attended to by trained personnel.

RESULTS: 1987

The results are consistent with those yielded by the complete model. The only marginally significant variable (AGE2) has been variable dropped out of the analysis.

TABLE 5.17 RESULTS OF THE LOGISTIC REGRESSION: REDUCED MODEL, 1987

VARIABLE	B	SE	WALD	EXP(B)
FLOMAT2	-2.3765	.6186	14.7582*	.0929
FLOMAT3	-2.2997	.5630	16.6835*	.1003
CONSTANT	-2.8584	.5254	29.6033*	

-2 Log likelihood=448.976 df=6809
Significance=1.0000
Note * significant at 0.05 level
Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for the significant variables is written:

Log odds(N87) = -2.8584 - 2.3765 FLOMAT2 - 2.2997 FLOMAT3

The results show that all the estimated coefficients are negative. This implies less child mortality among these women. The odds ratios for births to die among women who reported that they were in houses with cement and earth floor materials are 0.0929 and 0.1003, respectively when compared with those in wood floor material.

RESULTS: 1988

The results are quite different from those generated by the complete model. One significant variable (AGE4) and one marginally significant variable (ETH3) have been dropped out from the analysis. Only five variables, CBRE2, AGE3, ETH4, ETH7 and PREINT2 are significant.

TABLE 5.18 RESULTS OF THE LOGISTIC REGRESSION: REDUCED MODEL, 1988

VARIABLE	B	SE	WALD	EXP(B)
CBRE2	.8096	.3121	6.7274*	2.2469
AGE3	-1.1168	.5358	4.3451*	.3273
ETH4	1.0314	.4812	4.5945*	2.8049
ETH7	1.1508	.4163	7.6400*	3.1606
PERINT2	.8592	.3298	6.7852*	2.3612
CONSTANT	-5.9268	.3952	224.9220*	

-2 Log likelihood=493.742 df=6804

Significance=1.0000

Note * significant at 0.05 level

Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for the significant variables can be expressed:

Log odds(N88) = -5.9268 + 0.8096 CBRE2 - 1.1168 AGE3 + 1.0314 ETH4 + 1.1508 ETH7 0.8592 PREINT2

Four variables, CBRE2, ETH4, ETH7 AND PREINT2 have positive coefficients and only one variable (AGE3) has a negative coefficient. The odds ratio for births to die among women who reported that they were currently breastfeeding is 2.25 times higher than that of those women who reported that they were not currently breastfeeding. Births to women in the age group 25-29 the odds of dying is 0.33 times less than that of births born to women in the age group 15-19. As for as births to Kisii (ETH4) and Meru/Embu (ETH7) ethnic groups is concerned the odds of dying are 2.80 and 3.16 times higher compared to Kalenjin (ETH1). Births spaced 30 months and above have the odds of dying which is 2.36 times higher than births that of births spaced under 30 months.

From the above it clear two of our results are supported by findings in the literature review: Births to older mothers have lower risk of neonatal mortality because of their association with wider experience in infant care while Kisii and Meru/Embu have higher probabilities of neonatal mortality due to certain practices that are detrimental. However two of the results are not supported by findings in the literature review : births widely spaced and currently breastfed have higher probabilities of dying.

RESULTS: 1984-88

The results do not concur with complete model results. Because two variables, AGE7 and PCARE2 which were significant in the complete model are now insignificant. The most significant correlates include OWN2, AGE4, AGE6, ETH3, ETH4, ETH7, FLOMAT2 and FLOMAT3.

TABLE 5.19 RESULTS OF THE LOGISTIC REGRESSION: REDUCED MODEL, 1984-88

VARIABLE	B	SE	WALD	EXP(B)
OWN2	.4838	.1645	8.6441*	1.6222
AGE4	-.6711	.2569	6.8226*	0.5112
AGE6	-.9204	.3510	6.8779*	0.3984
ETH3	.4882	.1649	8.7620*	1.6294
ETH4	.7553	.2645	8.1511*	2.1282
ETH7	.6046	.2654	5.1884*	1.8305
FLOMAT2	-1.1431	.4049	7.9680*	0.3188
FLOMAT3	-1.3824	.3978	12.0775*	0.2510
CONSTANT	-2.4692	.4029	37.5619*	

-2 Log likelihood=1749 df=6802

Significance=1.0000

Note * Significant at 0.05 level

Source: Compiled by author based on KDHS (1989)

The equation of the logistic regression for the significant variables is given by:

Log odds(N8488) = -2.4692 + 0.4838 OWN2 - 0.6711 AGE4 - 0.9204 AGE6 - 0.4882 ETH3 +0.7553 ETH4 + 0.6046 ETH7 - 1.1431 FLOMAT2 - 1.3824 FLOMAT3

The above results indicate that only two variables, own animals and ethnicity have positive effect while another two variables, age of the mother and type of floor material have a negative effect on neonatal mortality. The odds of dying for births in households who own animals is 1.82 times higher than that of those who do not own animals. Births born to women in the age groups 30-34 and 40-44 the odds of dying are o.51 and 0.39 lower respectively when compared to births to women in the age group 15-19. AS far as ethnicity is concerned the odds of dying for births born to Kikuyu (ETH3), Kisii(ETH4) and Meru/Embu (ETH7) are 1.63, 2.13 and 1.83 times higher respectively than of births born to Kalenjins (ETH7). Births born to in households whose floor material is cement (FLOMAT2) and earth (FLOMAT3) the odds of dying is 0.32 and 0.25 times lower respectively when compared to those births born in households whose floor material is wood. This result is an unexpected since it does not tally well with the findings of other studies that births in households with earth floor material have a higher risks of acquiring tetanus disease and hence, of dying during the first month of life.

5.4 DISCUSSION OF THE RESULTS OF THE RELATIVE RISK METHOD

In order to gain insights into the relative importance of the most important correlates of neonatal mortality in terms of their contribution to the variation in neonatal mortality, we use adjusted coefficients (β) and change in the coefficient of determination (R^2). The adjusted coefficients are sometimes called beta weights or standardized regression coefficients.

Table 5.20 through 5.25 gives summary information of the beta weights and their change in R^2 for the five years preceding the survey and the entire period. The results are discussed below.

RESULTS: 1984

The variable which is most highly correlated with neonatal mortality is ETH10 (Somali/Other) with a beta weight of 1.1168. This is followed by REL2 (Protestant) with a beta weight of 1.0079; SEX2 (male) with 0.9771 and FLOMAT3(earth) with 0.9292.

The variable ETH10 seems to explain for only 1.5 percent of the variation in the dependent variable. Together the four variables explain over 4.5 percent of the variation. This is points to the fact that other variables, preferably biological and other exogenous factors not included in the analysis, are most important in explaining the variation in the neonatal mortality. The reason for the few selection of the variable is due to weakness in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

TABLE 5.20 RELATIVE RISK, 1984

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
ETH10	1.2236	1.1168	.1236	.0153	.0153
REL2	-1.0345	1.0079	.1136	.0129	.0024
SEX2	-.7450	.9771	.0717	.0051	-.0027
FLOMAT3	-1.1913	.9296	.1503	.0226	-.0253
TOTAL					.0457

Source: Compiled by author based on KDHS (1989)

RESULTS: 1985

The most statistically important variable is currently working status (WSTA2) with a beta weight of 2.7515 followed by marital status (MARSTA2) with 2.5612 and tetanus injection (TET2) with 0.4272.

Over 0.6 percent of the variability in the dependent variable is explained by WSTAT alone. Together the above variables explain at least 1.3 percent of the variation. This result suggests that other variables, notably endogenous factors and other exogenous factors not included in the analysis, are important determinants of neonatal mortality. The reason for the few selection of the variable is due to weakness in the data, compounding effects, , small sample size, multicollinearity or high probability of inclusion which caused most variables to disappear from the model.

TAbLE 5.21 RELATIVE RISK, 1985

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
WSTA2	1.1085	2.7514	.0827	.0068	.0068
MARSTA2	.9405	2.5612	.0701	.0049	.0019
TET2	-.8505	.4272	.0821	.0067	-.0048
TOTAL					.0135

Source: Compiled by author based on KDHS (1989)

RESULTS: 1986

The most significant correlate is delivery by relative (ASSD4) with a beta weight of 2.0539. While the comparative beta weights for women not injection TET2, delivered by doctor (ASSD2), delivered by trained nurse (ASSD3) and own animals (OWN2) are 1.4444, 0.6625, 0.3069 and 0.2922 respectively.

Overall these variables explain about 2.4 percent of the variability in the dependent variable. The explanatory power for the other variables is 0.43 for ASSD4, 0.02 for TET2, 0.29 for ASSD2, 0.62 for ASSD3 and 1.1 for OWN2. This result reflects the overwhelming importance of biological factors and other exogenous factors not captured in the analysis in explaining the variations in neonatal mortality. The reason for the few selection of the variable is due to weakness in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

TABLE 5.22 RELATIVE RISK, 86

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
ASSD4	-1.7404	2.0539	-.0659	.0043	.0043
TET2	1.4469	1.4444	.0638	.0041	.0002
ASSD2	-.9491	.6625	.0564	.0032	-.0030
ASSD3	-.6497	.3069	.0577	.0033	-.0063
OWN2	.0653	.2922	.0659	.0043	-.0106
TOTAL					.0244

Source: Compiled by author based on KDHS (1989)

RESULTS: 1987

The most important correlate of neonatal mortality is cement floor (FLOMAT2) with a beta weight of 2.7981. Earth floor ranks second with a beta weight of 2.4643.

The two variables have explanatory power of slightly over 5.4 percent of the variation in the dependent variable: 2.76 for FLOMAT2 and 0.42 percent for FLOMAT3. This result suggests that other factors (i.e., biological factors and other exogenous factors not captured in the analysis) are most significant in explaining the variation in neonatal mortality. The reason for the few selection of the variable is due to weakness in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

TABLE 5.23 RELATIVE RISK, 1987

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
FLOMAT2	-2.3765	2.7981	-.1660	.0276	.0276
FLOMAT3	-2.2997	2.4643	-.0178	.0003	.0273
TOTAL					.0549

Source: Compiled by author based on KDHS (1989)

RESULTS: 1988

The most important correlate of neonatal mortality is maternal age 25-29 (AGE3) with a beta weight of 1.5141. This is followed by Kisii (ETH4) with a beta weight of 1.2558, Meru/Embu (ETH7) with 1.2122, birth interval 30 months and high (PREINT2) with 0.7170 and women currently breastfeeding with only 0.6394.

About 6.5 percent of the variation in the dependent variable is explained by the above variables. This result indicates that biological factors and other exogenous factors which are not included in the analysis are most important in providing the explanation for the variation in the dependent variable (neonatal mortality). The reason for the few selection of the variable is due to weakness in the data, compounding effects, small sample size, multicollinearity or high probability of inclusion which caused most variables to disappear from the model.

TABLE 5.24 RELATIVE RISK, 1988

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
AGE3	-1.1168	1.5141	.0670	.0049	.0049
ETH4	1.0314	1.2558	.0705	.0050	-.0001
ETH7	1.1508	1.2122	.1040	.0108	-.0109
PREINT2	.8592	.7170	.0958	.0092	-.0201
CBRE2	.8096	.6394	0.0952	.0091	-.0292
TOTAL					.0652

Source: Compiled by author based on KDHS (1989)

RESULTS: 1984-88

The most significant correlates are two: FLOMAT3 and FLOMAT2 with beta weights of 1.3649 and 1.1488, respectively. The comparative beta weights for the other variables are 0.8018 for AGE6, 0.4958 for ETH6, 0.4279 for AGE4, 0.3983 for ETH7, 0.1998 for ETH3 and 0.1977 for OWN2.

About 5.0 percent of the variability in the dependent variable is accounted for by the above variables i.e. 95 percent of the variation is unexplained. This result suggests that biological factors and other exogenous factors which are not included in the analysis are responsible for most of the variation in neonatal mortality. The reason for the few selection of the variable is due to weakness in the data, compounding effects, multicollinearity, small sample size or high probability of inclusion which caused most variables to disappear from the model.

TABLE 5.25 RELATIVE RISK, 1984-88

VARIABLE	B	BETA	R	R^2	R^2 CHANGE
FLOMAT3	-1.3824	1.3649	.0748	.00556	0.0056
FLOMAT2	-1.1431	1.1488	.0575	.0033	0.0023
AGE6	-.9204	.8018	.0520	.0027	-.0004
ETH4	.7553	.4958	.0584	.0034	-.0038
AGE4	-.6711	.4279	.0517	.0027	-.0065
ETH7	.6046	.3983	-.0111	.0001	-.0066
ETH3	.4882	.1998	.0612	.0037	-.0103
OWN2	.4838	.1977	.0707	.0050	-.0153
TOTAL					.0508

Source: Compiled by the author from KDHS (1989)

5.5 SUMMARY OF THE RESULTS OF THE REGRESSION ANALYSES, 1984-1988

In this section we summarize the results of the multiple and logistic regression models and relative risk method for the entire period, 1894-198. This is because from purely statistical point of view the data for the aggregate period are by far better than those for the single years.

5.5.1 SUMMARY OF THE RESULTS OF THE MULTIPLE REGRESSION ANALYSIS, 1984-1988

SOCIO-CULTURAL CORRELATES OF NEONATAL MORTALITY

The result showed that Muslim religion is negatively related to neonatal mortality. This result has not confirmed the findings of Bonkole and Olaleyo (1991) for Kenya and Smucker et al (1980) for northern India which documented that births to muslims have higher probability of dying than those of other religions. The result also showed that the duration of breastfeeding 30 months and high is negatively related to neonatal mortality (refer table 5.13). This finding is supported by studies in Kenya (Musoke and Malenga, 1984) and else where (Knodel and Kentner, 1977; Winikoff, 1980). A possible explanation is that maternal milk contains certain anti-bodies that deter diarrhoeal and other infections. Another explanation is that there are plenty of maternal nutrients during the neonatal period.

DEMOGRAPHIC CORRELATES OF NEONATAL MORTALITY

The result revealed that age of the mother is positively related to neonatal mortality. In particular, age groups 30-34 and 40-44 increases the risk of child survival. This finding is consistent with findings from other developing countries (Somoza, 1980; Tawiah, 1979). One possible explanation is that older mothers have a higher probability of exposure to diseases such as heart diseases, anemia and blood pressure than young women.

From the above it is clear that only a few of socio-cultural and demographic variables are selected by the model as most important correlates. The reason for the few selection is related to defects in the data, compounding effects, multicollinearity high probability of inclusion which caused most variables to disappear from the model or small sample size of neonatal deaths. Furthermore, the variables seem to explain about 4 percent of the variation in the dependent variable. This highlights the fact that other factors (i.e., biological factors and other exogenous factors not included in the analysis) contribute more to the explanation of the variation in the dependent variable.

5.5.2 SUMMARY OF THE RESULTS OF THE LOGISTIC REGRESSION ANALYSIS, 1984-1988

ENVIRONMENTAL CORRELATES OF NEONATAL MORTALITY

The result showed that ownership of animals is positively associated with neonatal mortality. This finding is consistent with the finding of Smucker and others (1980) for Uttah Pradesh (northern India). The reason is that births in households who own animals have a higher risk of exposure to tetanus spores. Again, the result showed that floor material is inversely related to neonatal mortality. This finding is amazing since it has contradicted the findings of other studies elsewhere (Smucker et al., 1980) which documented that births born in households with earth floor materials are positively related to neonatal mortality..

DEMOGRAPHIC CORRELATES OF NEONATAL MORTALITY

The result revealed that maternal age is negatively related to neonatal mortality. Specifically, maternal age groups 30-34 and 40-44 are associated with lower neonatal mortality. This finding is supportive of other findings in the literature review that the older women have considerable experience in infant care.

SOCIO-CULTURAL CORRELATES OF NEONATAL MORTALITY

The result found wide mortality difference between ethnic groups during the neonatal period. Kikuyu and Meru/Embu have lower mortality while Kisii has high mortality. This finding is gives support to the findings of other studies in the country (Anker and Knowles, 1979; Mott, 1980; Henin, 1983) and in Malaysia (Butz and others, 1984). The difference in mortality is related to certain practices within ethnic groups such as polygyny and early marriages and also feeding practices which may enhance or inhibit child survival during the neonatal period.

It is evident from the above findings that a small number of demographic, environmental and socio-cultural variable have been selected by the model as most important correlates. The reason for the few selection is related to defects in the data, compounding effects, multicollinearity, high probability of inclusion which caused most variables to disappear from the model or small sample size. Furthermore, the variables seem to explain about 5 percent of the variation in the dependent variable. This suggests that other factors (i.e., biological factors and other exogenous factors not captured in the analysis) contribute more to the explanation of the variation in the dependent variable.

5.5.3 SUMMARY OF THE RESULTS OF THE RELATIVE RISK METHOD, 1984-1988

The analysis ordered the variables in descending order of significance based on their respective beta weights as follows: earth floor material, cement floor material, age group 45-49, Meru/Embu, Age group 30-34, Mijikenda/Somali, Kisii and households who own animals in their compound. All the variables take together explain about 5.0 percent of the variability in the dependent variable i.e., 95 percent of the variation is unexplained. This result suggests that biological factors and other exogenous factors which are not included in the analysis are responsible for most of the variation in neonatal mortality.

CHAPTER SIX

SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.0 INTRODUCTION

In this chapter, an attempt is made to sum up the findings of the study and give some recommendations which are deemed necessary panacea for policy and further research. It is subdivided into three sections: the first deals with the summary of findings, the second concerns discussion of the results for the entire period (i.e., 1984-1988) and the third outlines the recommendations.

6.1 SUMMARY OF FINDINGS

Owing to its critical contribution to first year deaths as development proceeds and to its insensitivity to medical cure and checks (because it is a product of biological factors), neonatal mortality has become an issue of the day which is hotly debated and heavily researched upon in both developed and developing countries. Although there are evidence from some developing countries like India an Malaysia that economic and social factors are also important correlates of neonatal mortality, nonetheless, much of previous research on neonatal mortality in the developing countries has been dominated by medical practitioners who put a lot of emphasis on biological causes at the expense of exogenous ones. So substantive areas of research still remain where at least social scientists can contribute to fill the gap in knowledge of exogenous causes of neonatal mortality.

This study has sought to examine the correlates of neonatal mortality with a view of establishing that the findings in the literature review also apply to the Kenyan setting. The general objectives of the study was to explore whether or not socio-cultural, socio-economic, demographic, environmental and health factors are the principal causes of the variability in deaths in first month of life. In doing so, we have used a number of statistical techniques of analysis which include descriptive statistics, multiple and logistic regression models and relative risk method.

A few conceptual and methodological problems emerged during the analysis of data. First, most retrospective surveys in the developing countries, the Kenya DHS is notoriously replete with errors of content and coverage that are beyond the scope of the research. Besides, some of the maternal socio-economic characteristics such as education and employment are assumed to remain constant over the five years preceding the survey which is not always necessarily the case. Furthermore, some of the variables (such as polity and policy, natural calamities, wars, AIDS, cost of health services and transport to and from hospitals, weight and height of children by age, maternal conditions during pregnancy and so forth) which have been found to exert a strong influence on child survival during the neonatal period have been omitted in the data set.

The second problem relates to the maximum likelihood approach to estimation with the step wise logistic regression procedure. In theory the approach appears simple and straight forward but in practice because of the considerable iterative computation involved when there are a large number of observations the method is time-consuming. Indeed, it took us 14 days continuously using this procedure without obtaining any results. One possible explanation is the small capacity of our computers coupled with slow speed which do not permit all the variables to processes at one go. For this reason we abandoned the forward step wise method in favour of the enter method. This method tries to force all the variables into the equation. Even under this method it took us 7 days to obtain results.

Also some findings emerged from the study. Not only are these findings intuitive but also interesting. Some of the findings revealed by the multiple regression and logistic regression analyses and the relative risk method do support what is available in the literature resume as stipulated in our hypotheses and the theoretical framework while others do not. First, the most statistically important correlates of neonatal mortality which have been selected by the multivariate analyses are distinctly dissimilar. This does not augur well with the view put forward by writers like Dawyer that the difference between the two methods is negligible. A likely explanation is that either our data set is replete with errors or because of the use of different variable selection procedures in the analyses (i.e., enter and step wise).

Secondly, for some variables the results of the estimated beta and exponentiated (β) (i.e., odds ratio) relative to the referent category obtained by the two methods of analysis are unexpected since they contradict the findings in the literature review. This point will become clear when we discuss the results of the regression analyses for the entire period (i.e., 1984-1988). Thirdly, in spite of the huge battery of socio-economic, socio-cultural, demographic, environmental and health factors which are used in the analysis the study found a few to be statistically important. All our hypotheses are therefore not fulfilled. The reason for the few selection is related to defects in the data, compounding effects, multicollinearity, high probability of inclusion which caused most variables to disappear from the model or small sample size . Furthermore, the study also found that the significant variables tend to make practically little contribution in explaining the variation in the dependent variable. The R^2 values ranged from 4 to 27 and from 1 to 7 percent for the multiple and logistic regression models respectively. The low R^2 values do not imply the models are not good (Morrison, 1972 also reported in Maddala, 1983) but rather they suggest that other factors (i.e., biological factors associated with the circumstances of birth and probably paternal characteristics) are most important in explaining the variation.

Fifthly, in the logistic regression the estimated coefficients tend to be weaker as the marginally significant variables are included in the analysis.

6.2 DISCUSSION OF THE RESULTS OF THE REGRESSION ANALYSES, 1984/88

DISCUSSION OF THE RESULTS OF THE MULTIPLE REGRESSION MODEL FOR 1984-1988

The result found is a negative relationship between muslim religion and neonatal mortality. This finding does not support the findings of Bonkole and Olaleyo (1991) for Kenya and Smucker et al (1980) for northern India which documented that births to muslims have higher probability of dying than those of other religions. The result also showed that the duration of breastfeeding 30 months and high is negatively related to neonatal mortality (refer table 5.13). This finding is supported by studies in Kenya (Musoke and Malenga, 1984) and else where (Knodel and Kentner, 1977; Winikoff, 1980). A possible explanation is that maternal milk contains certain anti-bodies that deter diarrhoeal and other infections. Another explanation is that there are plenty of maternal nutrients during the neonatal period. The result also supports the hypothesis of negative relationship between neonatal mortality and maternal age (30-34 and 40-44). The reason is that older women have wider experience in infant care than younger ones.

DISCUSSION OF THE RESULTS OF THE LOGISTIC REGRESSION MODEL, 1984/88

The analysis revealed that maternal age (i.e., 30-34 and 40-44) is negatively related to neonatal mortality. This finding is consistent with the findings of other studies in the literature review which documented that older women have lower neonatal mortality because of their considerable experience in infant care.

The analysis also revealed wide mortality difference between ethnic groups with births to the Kikuyu and Meru/Embu having comparatively lower odds of dying than Kisii. This finding has been supported by the studies of Anker and Knowles (1979) and Mott (1980) for Kenya and Butz and others (1984) for Malaysia. The difference in mortality is related to certain practices within ethnic groups such as polygyny and early marriages which may enhance or inhibit child survival. Furthermore, the analysis showed that ownership of animals is positively associated with neonatal mortality. This finding is consistent with the finding of Smucker and others (1980) for Uttah Pradesh (northern India). The reason is that births in households who own animals have a higher risk of exposure to tetanus spores. In addition, the result showed that floor material is inversely related to neonatal mortality. This finding is amazing since it contradicts the findings of other studies elsewhere (Smucker et al., 1980) which documented that births born in households with earth floor materials are positively related to neonatal mortality.

6.3 RECOMMENDATION FOR FURTHER RESEARCH AND FOR POLICY

Most of the problems of child survival during the neonatal period have been found by this study to be of biological or endogenous nature rather than exogenous. Thus, at this point there is very little we can do except conjecture the real causes during this period. The only area open to us as social scientists is the whole infant period where exogenous causes (i.e., those variables which are existing even before the child is born), are more critical on child survival. This is not to deny the fact that social scientists can do much in the understanding of the actual causes of neonatal mortality by conducting community rather than hospital based studies.

However, in the light of the our findings there are two areas of further research and another two of policy which if implemented could greatly improve child survival during the neonatal period.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. Since the most important correlates of neonatal mortality selected by the multiple and logistic models are distinctly dissimilar and unimportant in accounting for the variation in neonatal mortality, it is recommended that these two methods should be tested on altogether different data set, using similar selection procedure with biological and paternal characteristics (i.e., education and occupation) included in the analysis. Such a study should utilize several sources of data (i.e., censuses, surveys and hospital records) and should be carried out on longitudinal rather retrospective basis to enable a substantial proportion of neonatal deaths to be captured.

2. Since this study reveals the seasonality of deaths during the neonatal period it is absolutely necessary that the actual causes and their periodicity of occurrence are monitored and studied in depth at the micro level (i.e., district level) and on monthly and

yearly basis. This is because planning in the country is district focused.

RECOMMENDATIONS FOR POLICY

1. Since certain tribal and religious groups, through their beliefs and behaviour and differences in educational opportunities, have comparatively higher neonatal death rates and, since deaths during the neonatal period are more associated with the circumstances surrounding birth it is recommended that the present network of family planning programme should be strengthened through easy access to maternal and child health centres (i.e., either MCH centres are located within short walking distance or the network or roads and transport improved or both) and well trained and equipped nurses and traditional birth attendants (TBAs) in order to encourage change their attitudes and beliefs to suit the requirements of modern society (i.e., improved diet, late marriages, longer duration of breastfeeding and birth spacing, consciousness about health of the child and mother, etc). The same information can also be disseminated through women education, both formal and informal. Furthermore the immunization coverage should include all women in the reproductive age group 15-49.

2. Since environmental factors (i.e., water, sanitation, sewage disposal, housing conditions, malaria etc) are responsible for most deaths for the under fives and for the under one month as well it is recommended that the environment should be generally improved.

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APPENDIX 1 RESULTS OF THE LOGISTIC REGRESSION: COMPLETE MODEL, 1984

VARIABLE	β	SE	WALD	EXP(β)
SEX2	-0.7368	0.3672	4.0258**	0.4786
WSTA2	-1.1863	0.7718	2.3626	0.3053
TET2	-0.8440	0.5161	2.6738	0.4300
OWN2	0.2081	0.3931	0.2802	1.2313
CBRE2	-0.3884	0.4235	0.8409	0.6782
EDUC2	-0.1600	0.5224	0.0938	0.8521
EDUC3	-0.2153	0.6117	0.1239	0.8063
AGB2	-0.5132	0.5704	0.8096	0.5986
AGB3	-7.5569	42.8664	0.0311	0.0005
AGE2	-0.6142	0.5697	1.1623	0.5411
AGE3	-0.6636	0.6277	1.1175	0.5150
AGE4	-0.9969	0.7300	1.8650	0.3690
AGE5	-0.5809	0.6890	0.7109	0.5594
AGE6	-8.7771	225.5045	0.1184	0.0002
AGE7	-8.5597	30.6315	0.0781	0.0002
ETH2	1.1761	1.2737	0.8526	3.2417
ETH3	1.7466	1.2060	2.0972	5.7348
ETH4	1.2696	1.4215	0.7977	3.5594
ETH5	1.4221	1.2442	1.3064	4.1460
ETH6	0.7252	1.2724	0.3248	2.0651
ETH7	-5.9306	31.6631	0.0351	0.0027
ETH8	-0.2237	2.1117	0.0112	0.7995
ETH10	2.5873	1.2359	4.3821**	13.2932
PCARE2	0.9875	0.5748	2.9509	2.6845
PCARE3	0.4892	0.5563	0.7734	1.6310
ASSD2	-0.6150	0.6093	1.0185	0.5406
ASSD3	-0.1345	0.4945	0.0740	0.8741
ASSD4	-1.3263	0.8311	2.5466	0.2655
ASSD5	-0.8371	0.5716	2.1451	0.4329
REL2	-1.1501	0.3852	8.9143**	0.3166
REL3	-0.5016	0.8681	0.3338	0.6056
REL4	-0.1346	0.7282	0.0341	0.8741
MARSTA2	0.9154	0.5573	2.6983	2.4978
MARSTA3	0.1722	1.0092	0.0291	1.1879
FLOMAT2	-1.2139	0.8480	2.0491	0.2970
FLOMAT3	-2.4906	0.8770	8.0644**	0.0829
PREINT2	0.1739	0.3467	0.2515	1.1899
SUCINT2	-0.2332	0.3461	0.4541	0.7920
DBRE2	0.7153	0.3691	3.7567*	2.0449
CONSTANT	-3.2402	1.4677	4.8737	

-2 Log Likelihood X^2=369.584 df=6773 significanci=1.000

Note ** significant at 0.05 level

* marginally significant at 0.05 level

Source: Compiled by author based on KDHS (1989)

APPENDIX 2 RESULTS OF THE LOGISTIC REGRESSION: COMPLETE MODEL, 1985

VARIABLE	β	SE	WALD	EXP(β)
SEX2	0.1463	0.3552	0.1696	1.1575
WSTA2	1.1565	0.4920	5.5252**	3.1787
TET2	-1.0924	0.4875	5.0207**	0.3354
OWN2	0.5539	0.4120	1.8080	1.7401
CBRE2	-0.1359	0.3824	0.1262	0.8730
EDUC2	-1.1495	0.4671	6.0562**	0.3168
EDUC3	-1.3845	0.6068	5.2057**	0.2504
AGB2	1.0719	0.4102	6.8276	2.9210
AGB3	1.3098	0.8549	2.3476	3.7055
AGE2	-0.2257	0.7075	0.1018	0.7979
AGE3	-0.5566	0.7332	0.5763	0.5731
AGE4	-2.3464	1.0218	5.2730**	0.0957
AGE5	-1.2844	0.8438	2.3171	0.2768
AGE6	-1.5621	0.9192	2.9248	0.2076
AGE7	-8.8199	19.9339	0.1958	0.0001
ETH2	-0.9273	0.8864	1.0944	0.3956
ETH3	0.1425	0.6452	0.0488	1.1532
ETH4	0.2352	0.8144	0.0834	1.2651
ETH5	-0.8144	0.7670	1.1273	0.4429
ETH6	-0.3546	0.7278	0.2374	0.7014
ETH7	0.5272	0.7836	0.4526	1.6942
ETH8	-1.7623	1.8245	0.9330	0.1717
ETH10	0.4732	0.7392	0.4098	1.6051
PCARE2	0.5575	0.5714	0.9520	1.7463
PCARE3	0.4380	0.5328	0.6756	1.5495
ASSD2	0.2006	0.7263	0.0763	1.2222
ASSD3	0.2442	0.6192	0.1556	1.2766
ASSD4	0.4713	0.7168	0.4322	1.6020
ASSD5	0.7573	0.5908	1.6458	2.1325
REL2	-0.0426	0.3833	0.0123	0.9583
REL3	-6.8371	24.4666	0.0781	0.0011
REL4	0.3387	0.7258	0.2178	1.4031
MARSTA2	1.6130	0.6934	5.4112**	5.0178
MARSTA3	1.3529	0.9575	1.9966	3.8687
FLOMAT2	-0.4554	1.3236	0.1184	0.6342
FLOMAT3	-0.6529	1.3302	0.2409	0.5205
PREINT2	-0.6184	0.3732	2.7459	0.5388
SUCINT2	0.0032	0.3545	0.0001	1.0032
DBF2	-0.2949	0.3648	0.6529	0.7447
CONSTANT	-4.3029	1.6605	6.7138	

-2 Log Likelihood X^2=366.246 df=6773 significance=1.000
Note ** signignificant at 0.05 level

Source: Compiled by author based on KDHS (1989)

APPENDIX 3 RESULTS OF THE LOGISTIC REGRESSUON: COMPLETE MODEL, 1986

VARIABLE	β	SE	WALD	EXP(β)
SEX2	0.3979	0.2948	1.8217	1.4886
WSTA2	-0.3267	0.4948	0.4360	0.7213
TET2	1.4033	0.7436	3.5616	4.0688
OWN2	0.6382	0.3178	4.0323**	1.8930
CBRE2	-0.1389	0.3444	0.1628	0.8703
EDUC2	-0.4171	0.3947	1.1170	0.6589
EDUC3	-0.1923	0.5071	0.1439	0.8250
AGB2	-0.6424	0.4505	2.0333	0.5260
AGB3	-0.8936	1.2865	0.4824	0.4092
AGE2	0.8372	0.5104	2.6907	2.3099
AGE3	1.2882	0.5690	5.1257**	3.6264
AGE4	0.3046	0.7528	0.1637	1.3561
AGE5	1.3167	0.6331	4.3261**	3.7311
AGE6	-0.2837	1.0429	0.0740	0.7530
AGE7	1.4019	0.7407	3.5819	4.0630
ETH2	0.7970	0.9925	0.6449	2.2190
ETH3	1.0319	0.9143	1.2736	2.8063
ETH4	1.3629	1.0082	1.8274	3.9076
ETH5	1.6699	0.9048	3.4067	5.3118
ETH6	0.8411	0.9584	0.7702	2.3189
ETH7	1.7232	0.9472	3.3101	5.6025
ETH8	0.2122	1.6232	0.0171	1.2364
ETH10	0.8283	1.1203	0.5467	2.2894
PCARE2	0.2278	0.4711	0.2338	1.2559
PCARE3	0.2490	0.4234	0.3460	1.2828
ASSD2	-1.0828	0.5598	3.7413*	0.3387
ASSD3	-0.8435	0.4088	4.2568**	0.4302
ASSD4	-1.8599	0.8549	4.7326**	0.1557
ASSD5	-0.2420	0.3977	0.3703	0.7851
REL2	-0.4316	0.2975	2.1053	0.6495
REL3	-1.0296	1.3964	0.5437	0.3572
REL4	-1.0605	1.3147	0.6507	0.3463
MARSTA2	-0.7172	0.4373	2.6902	0.4881
MARSTA3	-6.8930	11.4266	0.3639	0.0010
FLOMAT2	-0.3281	1.2924	0.0645	0.7203
FLOMAT3	-6.4330	0.2911	0.2473	0.5256
PREINT2	0.1234	0.2949	0.1798	1.1314
SUCINT2	0.4926	0.2949	2.7914	1.6366
DBF2	0.0365	0.2929	0.1155	1.0372
CONSTANT	-6.5512	1.7363	14.2356	

-2 Log Likelihood X^2=520.644 df=6773 Significance=1.000

Note ** significant at 0.05 level

* marginally significant at 0.05

Source: Compiled by author based on KDHS (1989)

APPENDIX 4 RESULTS OF THE LOGISTIC REGRESSION: COMPLETE MODEL, 1987

VARIABLE	β	SE	WALD	EXP(β)
SEX2	-0.4530	0.3468	1.7056	0.6357
WSTA2	-0.6000	0.6273	0.9150	0.5488
TET2	-0.7455	0.5078	2.1555	0.4745
OWN2	0.1647	0.4099	0.1614	1.1790
CBRE2	-0.6702	0.4389	2.3316	0.5116
EDUC2	0.3952	0.5199	0.5779	1.4847
EDUC3	0.5771	0.6360	0.8235	1.7809
AGB2	-0.1721	0.5140	0.1121	0.8419
AGB3	1.0117	0.7638	1.7546	2.7503
AGE2	-1.4319	0.7451	3.6928*	0.2389
AGE3	-0.3423	0.6312	0.2941	0.7101
AGE4	-0.7515	0.7168	1.0993	0.7497
AGE5	-0.2881	0.6718	0.1839	0.0884
AGE6	-2.4262	1.3798	3.0916	0.4289
AGE7	-0.8464	0.9417	0.8079	1.4375
ETH2	0.3629	0.9069	0.1601	2.0599
ETH3	0.7226	0.7912	0.8342	3.8031
ETH4	1.3358	0.8641	2.3896	1.5170
ETH5	0.4168	0.8479	0.2416	1.9759
ETH6	0.6810	0.8331	0.6683	0.4498
ETH7	-0.7995	1.4465	0.3055	2.5204
ETH8	0.9244	1.2198	0.5744	0.2686
ETH10	-1.3146	1.8521	0.5038	0.5204
PCARE2	0.1892	0.5708	0.1099	1.2083
PCARE3	0.5721	0.5046	1.2852	1.7719
ASSD2	0.9352	0.7436	1.5818	2.5476
ASSD3	1.0364	0.6521	2.5263	2.8191
ASSD4	0.9037	0.7519	1.4445	2.4688
ASSD5	0.6295	0.6843	0.8461	1.8766
REL2	0.7043	0.4100	2.9517	2.0225
REL3	- 0.0930	1.8982	0.2403	0.3943
REL4	0.0968	1.1261	0.0074	1.1016
MARSTA2	0.6625	0.5801	1.2777	1.9396
MARSTA3	1.0666	0.7232	2.1752	2.9054
FLOMAT2	-2.2885	0.6798	11.3338**	0.1014
FLOMAT3	-2.1871	0.6578	11.0544**	0.1122
PREINT2	0.2091	0.3380	0.3826	1.2325
SUCINT2	-0.0247	0.3353	0.0054	0.9756
DBR2	-0.2414	0.3413	0.5001	0.7855
CONSTANT	-4.4538	1.2976	11.7803	

-2 Log Likelihood X^2=412.472 df=6773 Significance=1.000

Note ** significant at 0.05 level

* marginally significant

Source: Compiled by author based on KDHS (1989)

APPENDIX 5 RESULTS OF THE LOGISTIC REGRESSION: COMPLETE MODEL, 1988

VARIABLE	β	SE	WALD	EXP(β)
SEX2	-0.1968	0.3180	0.3830	0.8214
WSTA2	-0.3140	0.6261	0.2516	0.8214
TET2	0.4138	0.6039	0.4696	1.5126
OWN2	0.4386	0.3611	1.4749	1.5506
CBRE2	0.9657	0.3565	7.3396**	2.6266
EDUC2	-0.0859	0.4840	0.0315	0.9177
EDUC3	-0.5761	0.6505	0.7843	0.5621
AGB2	-0.2042	0.4970	0.1688	0.8153
AGB3	1.2718	0.7130	3.1816	3.5672
AGE2	-0.2909	0.4831	0.3625	0.7476
AGE3	-1.5222	0.6740	5.1010**	0.2182
AGE4	-1.3788	0.7216	3.6506*	0.2519
AGE5	-1.1046	0.7188	2.4296	0.3314
AGE6	-0.9190	0.7686	1.4296	0.3989
AGE7	-0.8521	0.9020	0.8924	0.4265
ETH2	0.3022	1.1829	0.0653	1.3528
ETH3	1.8142	1.0194	3.1676	6.1363
ETH4	2.1094	1.0847	3.7819*	8.2434
ETH5	0.8293	1.0860	0.5832	2.2917
ETH6	0.3159	1.1557	0.0747	1.3715
ETH7	2.1828	1.0586	4.2521**	8.8715
ETH8	1.2413	1.4527	0.7302	3.4602
ETH10	0.2471	1.5952	0.0240	0.7811
PCARE2	0.6954	0.4828	2.0743	2.0045
PCARE3	0.1544	0.4737	0.1063	1.1670
ASSD2	0.0749	0.6063	0.0153	1.0777
ASSD3	0.2097	0.5290	0.1571	1.2333
ASSD4	0.0646	0.6740	0.0092	0.9375
ASSD5	0.1747	0.5797	0.0908	0.8397
REL2	-0.0355	0.3301	0.0116	0.9651
REL3	-0.7480	1.4835	0.2542	0.4733
REL4	-0.3782	1.1409	0.1099	0.6851
MARSTA2	-0.0286	0.4749	0.0036	0.9718
MARSTA3	-0.4123	0.8237	0.2505	0.6622
FLOMAT2	-0.6472	1.3108	0.2438	0.5235
FLOMAT3	-0.8026	1.3071	0.3770	0.4482
PREINT2	0.8626	0.3339	6.6738**	2.3694
SUCINT2	0.0532	0.3120	0.0291	1.0546
DBF2	0.0484	0.3149	0.0236	1.0496
CONSTANT	-6.3010	1.7950	12.3229	

-2 Log Likelihood X^2=460.693 df=6773 Significance=1.000

Note ** significant at 0.05 level
* marginally significant at 0.05 level

Source: Compiled by author based on KDHS (1989)

APPENDIX 6 RESULTS OF THE LOGISTIC REGRESSION: COMPLETE MODEL, 1984-88

VARIABLE	β	SE	WALD	EXP(β)
SEX2	-0.1635	0.1468	1.2417	0.8491
WSTA2	-0.1908	0.2501	0.5823	0.8263
TET2	-0.2181	0.2404	0.8227	0.8040
OWN2	0.4476	0.1669	7.1964	1.5645
CBRE2	-0.0179	0.1702	0.0110	0.9823
EDUC2	-0.3131	0.2073	2.2808	0.7311
EDUC3	-0.3390	0.2620	1.6740	0.7125
AGB2	-0.0526	0.2070	0.0645	0.9488
AGB3	0.4918	0.4059	1.4682	1.6352
AGE2	-0.2101	0.2522	0.6945	0.8105
AGE3	-0.2629	0.2777	0.8963	0.7688
AGE4	-0.9688	0.3442	7.9215**	0.3795
AGE5	-0.3045	0.3098	0.9662	0.7375
AGE6	-1.3584	0.4295	10.0018**	0.2571
AGE7	-0.9675	0.4402	4.8306**	0.3800
ETH2	0.1860	0.4235	0.1928	1.2044
ETH3	0.9356	0.3670	6.50000**	2.5487
ETH4	1.1590	0.4180	7.6881**	3.1868
ETH5	0.6051	0.3847	2.4734	1.8314
ETH6	0.2926	0.4012	0.5317	1.3399
ETH7	1.0440	0.4194	6.1957**	2.8406
ETH8	-0.0232	0.6517	0.0013	0.9771
ETH10	0.7733	0.4327	3.1934	2.1669
PCARE2	0.5670	0.2373	5.7083**	1.7629
PCARE3	0.3954	0.2224	3.1609	1.4850
ASSD2	-0.2518	0.2767	0.8281	0.7774
ASSD3	-0.0712	0.2281	0.0974	0.9313
ASSD4	-0.4544	0.3146	2.0859	0.6349
ASSD5	-0.0731	0.2374	0.0948	0.9295
REL2	-0.1817	0.1532	1.4059	0.8339
REL3	-0.7366	0.6018	1.4981	0.4788
REL4	-0.0900	0.3943	0.0521	0.9139
MARSTA2	0.3140	0.2353	1.7803	1.3689
MARSTA3	-0.0488	0.3822	0.0163	0.9523
FLOMAT2	-1.1789	0.4136	8.1226	0.3076
FLOMAT3	-1.5391	0.4154	13.7264**	0.2146
PREINT2	0.1918	0.1459	1.7268**	1.2114
DBF2	0.0682	0.1478	0.2128	1.0706
CONSTANT	-2.4154	0.6093	15.7149	

-2 Log Likelihood X^2=1720.745 df=6773

Significance=1.000 Note ** significant at 0.05 level

Source: Compiled by author based on KDHS (1989)