DEMOGRAPHIC AND SOCIO-ECONOMIC DETERMINANTS OF MATERNAL MORTALITY -A CASE STUDY OF PUMWANI MATERNITY HOSPITAL, NAIROBI

BY

SABINA NJERI J.

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D E C L A R A T I O N

THIS THESIS IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR A DEGREE IN ANY OTHER UNIVERSITY.

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SABINA NJERI J.

THIS THESIS HAS BEEN SUBMITTED FOR EXAMINATION WITH MY APPROVAL AS A UNIVERSITY SUPERVISOR.

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PROF. Z. MUGANZI

D E D I C A T I O N

Dedicated to Wambui Gicharu and Family

A C K N O W L E D G E M E N T

I would like to thank all those who directly or indirectly helped me in making this thesis a success.

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ABSTRACT

The main objective of the study was to investigate the determinants of maternal mortality among females of the reproductive ages, and to find their significant relationships. The study attempted to investigate seven selected variables, mainly demographic and socio-economic factors and to find out how these operate to determine maternal mortality. Having reviewed the various studies done elsewhere, it was found to be of particular importance to study maternal mortality in one of the oldest maternity hospitals in Kenya.
The assumption was that the hospital receives the largest number of patients and so it was expected that adequate data would be collected.

The research was institutional based where hospital data from the in-patient files was collected. The period covered was 5 years (1990-1994). A sample size of 108 maternal deaths and 1124 survivors was used.

Method of data collection was basically the primary source where the in-patient files, statistical registers, disease index card, annual reports were all used and the necessary information

extracted. Supplemently data was obtained from other relevant sources ie. 1979 and 1989 census reports.

Methods of data analysis included descriptive statistics, which mainly made extensive use of ratios and percentages to demonstrate the relationship between maternal mortality and the selected demographic variables. Cross-tabulations, the chi-square, and the logistic regression techniques were all used for analysis. The results obtained varied depending on the independent variable being studied.

The independent variables were further analyzed using the chi-square technique. Most of the null hypotheses had no significant relationship to the dependent variable thus were rejected.

In the logistic regression, most of the independent dummy variables showed significant relationship. However, dummy variables such as AGE4 (30-34), AGE5 (35+) and BI3 (24 months and above) were significantly related to the dependent variable. The best equation explaining the dependent variable was shown in the logistic regression model with only the significant variables. In this equation, the standard error was low (0.1162) and the constant of beta was greater than 0.5 (ie. 2.3184)

From our findings the classical U-shaped relation between maternal death and maternal age was observed although it did not conform to findings of other studies. Further a curvilinear relationship was observed between parity and maternal death. The study recommends that maternal mortality analysis and interpretation from health facilities would be more useful if only these information sources were improved. The study recommends that nulliparous and primgravida women be encouraged to deliver in hospitals given their high maternal risks. Proper data collection,recording and classification of maternal mortality should be developed.

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INTRODUCTION

1.1 Background

Even though more boys than girls are born, women usually live longer and outnumber men at every age group after about age 25 in most developed countries. However, in some developing countries the death rate of women during their reproductive years is much higher than that of men in the same age group (Fauveau et al, 1989). Childbearing, has a substantial influence on the risk of dying from maternal related causes. When maternal mortality strikes especially at childbirth, the infant has a 95% chance of dying within the same year as was dramatically illustrated in a study carried out in Bangladesh (Chen et al, 1974). Further it has been estimated that for every mother who dies, on average, two live children are left motherless. The fate of surviving children is not documented, but the likelihood that they will receive optimal care and health protection is probably much diminished. Further if maternal death occurs at the peak of a woman's reproductive age, this leads to breakage and disorientation of families as well as reduction of children's survival chances (Family Health International, 1987).

Considering the extent of maternal mortality and morbidity in sub-saharan Africa, this is a disgrace to the modern world. Maternal death is a tragedy that can no longer be tolerated, that women alone should pay such a heavy tribute to procreation. Women, who are the pivots of domestic and market economy, their premature disappearance has incalculable consequences to the family, the community and the nation as a whole.

According to Boerma (1987) an estimated 500,000 women around the World die annually from pregnancy related causes and majority of these deaths (99 percent) occur in developing countries according to World Health Organization (W.H.O.1977). However majority of these deaths are easily preventable through the introduction of health measures aimed at identifying women at high risk and ensuring that they receive special care. An increase in the availability of contraceptives and legalization of abortion services can also reduce maternal mortality by reducing the number of unwanted pregnancies and abortion-related maternal deaths (Darney, 1988).

Maternity is at the heart of women's reproductive health where probability of dying from pregnancy complications is not only high for every age group, but it's spread over a long period of reproductive life.

Pregnancy-related complications be it ante-natal, peri-natal, post-natal cause one-quarter to one-half of all deaths among women of reproductive ages in many developing countries. In some places pregnancy-related causes are a major leading killer of women in this age group (15 -49 years) (Preston, 1976).

Throughout Africa, the extremely high fertility rates of about 10 pregnancies and 8 live births per woman contribute to the high rate of maternal mortality; which exceeds 1,000 maternal deaths per 100,000 live births in some rural areas of the continent (Robert S.W, 1968). An African woman's lifetime risk of dying from pregnancy-related causes is greater than one in twenty, while that of an American woman is one in 6,366 (Ibid). Moreover, it is generally believed that in developing countries, for every woman who dies from pregnancy related causes, roughly 10 to 15 others suffer illness or serious disability (Population Report 1988).

Today, the levels of maternal mortality in the developed and developing World show a greater disparity than any other public health indicator, despite improvements in hospital obstetrics. Maternal mortality received little attention from health professionals and policy makers in the past, partly because of inherent difficulties involved in the study of the subject and perhaps also because of a general neglect of womens' issues (Graham et al, 1989).

However the long neglected tragedy of excessively high maternal mortality rates among women in developing countries finally received attention from the International Community at the Safe Motherhood Conference in 1987.The main goals of the conference were to heighten awareness and concerns among governments, agencies and non-governmental organizations about the neglect of women's health, particularly in the developing world, and to elaborate on the strategies to remedy this desperate situation.

Medical records based on findings indicate that high and uncontrolled fertility directly threatens the health of the mother and the infant which may consequently undermine the health of other family members (Koenig et al, 1988). It has been noted that beyond a certain number, childbearing entails additional danger. This is especially if the woman is of higher maternal age, higher parity (more than five) and has close birth intervals. This has resulted to attention being directed to maternal and child health care (MCH) greatly overlooking maternal mortality.

Maternal mortality is an important index in the evaluation, and assessment of the level of medical care system especially the obstetrical and gynaecological services offered to the female population in any one given society. It also reflects the extent of medical attention received by women during childbirth, thus becoming a concern not only for those in the medical professional but for all.

However there exist variations in the underlying factors that determine maternal mortality in different communities. These variations are mainly shown by the different socio-economic, geographical, political, cultural and traditional factors of the population in any one given community. But generally, within every society and at every socio-economic level, the odds that a mother or her child will succumb to death or disease increases when the mother gives birth either too early or too late in her life.

Data on reproductive health is inadequate, making information on maternal mortality and morbidity scanty due to the limited research in the field. Yet as, Mati (1974) observes, there is plenty of data lying in the Ministries of Health, hospitals and school of medicine in form of annual reports, maternity file records and student dissertations. However most institutional based surveys carried out are concerned with the immediate medical complications leading to maternal mortality rather than other non-medical factors. Our study thus aims at incorporating socio-economic and demographic factors in the understanding of maternal mortality among females of the reproductive ages.

1.2 PROBLEM STATEMENT

Childbearing, is an aspect of human reproduction unique only to women, which at times result in-to loss of life. More than half a million women, nearly all (99%) of them in developing world, die each year from pregnancy or childbearing complications. This amounts to one death every minute. The majority of these deaths occur in the developing World, about 1,025 per 100,000 live births in areas of Africa, and about 570 per 100,000 live births in some parts of Asia (Rinehart and Kols, 1984).

Conversely, the statistics for the developed World range from between 1 and 22 deaths per 100,000 live births (Boerma, 1987). However, most developing countries have no national statistics regarding maternal mortality, and the only available data is as a result of limited research in which statistics are complied from hospital records.

Maternal mortality is defined as " the death of a woman, while pregnant or within 42 days of pregnancy termination, irrespective of duration or the site of pregnancy, from any cause related to or aggravated by the pregnancy or it's management but not from accidental or incidental causes" (World Health Organization 1977 ICD 9). Maternal death's can be direct especially those resulting from obstetric complications of pregnancy, labour and puerperium or indirect from the aggravation of existing conditions during pregnancy or delivery.

Fertility is seldom considered a cause of death, with a two-fold effect on mortality and sex mortality differential. Directly through maternal mortality and indirectly through non-maternal causes of death. Indirectly the effect occurs when a birth to a mother works to change her longevity (shortens a women's longevity) from what it would have been without that birth.

The high but gradual fall in total fertility rate (TFR) of 8.1 (KFS 1978), 7.7 (KCPS 1983), 6.7 (KDHS 1989), and 5.4 (KDHS 1993) all indicate the high risk female population of childbearing age is exposed to. Due to centrality of procreation in the life of African women, early marriages are common with maximum number of deliveries. Age at first marriage for girls in Kenya is considerably low despite it's slow and gradual increase over the years. For instance 17.5 years in 1978, 18.0 years in 1989, 19 years in 1993. These contributes to a high exposure risk to maternal death. The implication is that more women are frequently exposed for longer periods to the morbidity and mortality risk associated with reproduction, hence the frequency, period of exposure and levels of risk need to be reduced. This can be done through the understanding of the risk factors affecting women's reproductive health.

The low contraceptive use despite the high knowledge of well over 70 percent among the females has a contributing factor in one way or the other. Contraceptive prevalence rate has shown very gradual increase over the years e.g. 6 percent in 1977, 14 percent in 1984, 27 percent in 1989, and 33 percent in 1993. This in itself means a possibility of high parity due to short birth interval and which may consequently lead to high maternal death.

Most professional demographers have attempted to investigate the factors related to this female risk. Our study therefore aim at examining the significance of demographic and socio-economic factors as causes of maternal mortality in one of the biggest maternity hospitals in Nairobi.

1.3 STUDY JUSTIFICATION

Holness (1989) observed, that the "incidence of maternal mortality are still widely underrated and not widely reported because the victims die in isolated circumstances far from health centres" especially among those women who deliver at home or those who die after hospital discharge. However, a hospital based survey would otherwise attempt to give a more accurate estimation of the problem though such findings may not depict the actual national figures.

Pumwani Maternity Hospital handles the largest number of expectant mothers while offering specialized maternity services. It was therefore thought that the hospital would assist in giving a more or less accurate trend of maternal mortality experience. The necessary information (data) was obtained from the hospital records. The analysis of maternal deaths using hospital data is more reliable than records in the field, because most of those births and subsequent deaths that occur outside hospitals are difficult to follow for they are rarely recorded.

The purpose of this study is to establish the demographic and socio-economic determinants of maternal mortality covering the period 1990-1994. Demographic and socio-economic factors need a detailed analysis to improve upon the existing studies

(Aggarwal, 1980; Makokha, 1980; Obunga 1988) done in major hospitals in the country. Our study thus aims at providing some backup information to the earlier studies and to identify any missing links in matters related to female deaths.

Findings from this study are aimed at shedding light, to the policy makers, on what role demographic and socio-economic factors play in determining maternal mortality. These findings will further assist in attempts to formulate and implement policies that will help reduce maternal mortality. Such findings are essential for successful planning in maternal and child health programs, as well as in fertility regulation programs.

Maternal mortality in Kenya is an area that has not been fully investigated and it was not until recently when a national survey was carried out whose results are yet to be published. In the past, most studies have concentrated on child health, morbidity and mortality ignoring maternal health, which is considered a rare occurrence. As Stoke (1991) has observed, maternal health and maternal mortality which are virtually important issues, have greatly been overshadowed by other health problems in most developing countries, especially by studies in infant and child mortality. The few studies done on the same have emphasized the causes of maternal mortality at the expense of other factors eg.marital status, ante-natal clinic attendance among other factors.

In addition, the level of maternal mortality is an important indicator of the status of women's medical health, especially in the evaluation and assessment of the level of medical care relating to obstetrical and gynaecological services rendered to the female population in any given society.

In recent decades, medical studies have revealed that uncontrolled fertility directly threatens the health of mothers and infants and may undermine the health of other family members (Koenig, 1988). It has been realized that beyond a certain number, childbearing entails additional danger.

Maternal mortality has been realized to be a public health problem as indicated by an increasing number of publications on the magnitude and significance of the problem. In addition, efforts are now being made to sensitize health policy makers, so that maternal mortality reduction becomes one of their top priorities (Conference on Safe Motherhood Initiatives in Nairobi 1987).

The study therefore hopes to recommend some possible solutions to the major demographic and socio-economic problems observed among the females of the reproductive ages.

1.4 OBJECTIVES

GENERAL OBJECTIVES:

To examine the demographic and socio-economic determinants of maternal mortality among females of the reproductive age groups (15-49) and to assess their significance using hospital based data.

SPECIFIC OBJECTIVES:

(1) To examine the relationship between maternal age and maternal mortality.

(2) To establish the relationship between parity and maternal mortality.

(3) To establish if there exists any significant relationship between marital status and maternal mortality.

(4) To examine the relationship between birth interval and maternal mortality.

(5) To examine the relationship between ante-natal clinic attendance and maternal mortality.

(6) To investigate the relationship between occupation and maternal mortality.

1.5 BACKGROUND OF THE STUDY AREA:

The study was conducted in Nairobi which occupies an almost central position in Kenya. The metropolitan area of Nairobi extends to an area of approximately over 690 square kilometres.

Nairobi's expansion has been contributed to by both locational and pecuniary advantages. Nairobi is central to all means of transportation as major roads, rails and air routes converge and later diverge running to all parts of the country and other continents. This one factor has attracted the establishment of many new industries. A second credit goes to the fact that it's the political capital of the nation thus its subsequent advantage of new industrial and commercial investments monopoly.

Urbanization process has focused on Nairobi as one of the fastest growing urban centres in Kenya. In the period 1962-69 its growth rate was 5.6 percent, and 5.0 percent between 1969-79 (Obudho and Muganzi, 1987).

Analysis of Nairobi's population gives an insight into the appreciation of it's growth. The high in-migration rates from both the rural set up and the neighbouring countries account for Nairobi's high urban growth rate.

With an estimated population of approximately 2.5 million and a growth rate of 7-8 percent per year, most Nairobi migrants are mainly in their reproductive ages (20-49). They are therefore likely to add more children through birth to the already high number of children in the city. As per 1969, females aged 15-49 were 107,874, in 1979 they totalled 189,970 an increase of 76 percent. In the recent census of 1989 the female population in the reproductive ages reached a figure of 339,202 showing an increase of 79 percent (census reports, 1969, 1979, 1989).

1.6 SCOPE AND LIMITATION

A community-based National Survey, on maternal morbidity and mortality can yield an accurate assessment of the socio-economic, demographic and cultural determinants of maternal illnesses and deaths. Accurate information on cause classification of maternal death would also explain the pattern of maternal death. Such observations may be useful in comparative analysis of trends, levels and causes of maternal mortality. Besides, the results would also be useful in the formulation of policies affecting the health of women.

Unfortunately, such an approach is far beyond this study for it requires more resources in terms of finance, manpower and time. However, this kind of study based on hospital records is seen as having a possibility of yielding more robust information if follow-up interviews were done to get a clear picture of events prior to admission.

The current study is limited by lack of adequate data on maternal mortality in Kenya. The state of vital statistics is far from being complete, questions on maternal deaths are rarely included in the censuses or even in other household surveys. Our study therefore made use of hospital records which in most cases may be incomplete especially in matters relating to marital status, occupation, age, parity and birth intervals.

The study was based on hospital data, from Pumwani Maternity Hospital which is not only the largest but also one of the oldest in Nairobi with the largest capacity of in-patient intake.
A comparative study would have been more appropriate however, given the time and resource handicap it was not possible. These constrains therefore limited the study to only a single hospital.

The choice of the study area was on the basis of the fact that the hospital handles the largest number of maternity cases in comparison to other maternity branches in Nairobi. On the basis of this assertion, the hospital offered easy access to maternal mortality data.

The major concern of this study was directed to the experience of women admitted to the hospital having considered the fact that a majority of them deliver at home, and only those who develop complications are rushed to the hospital; while those who can afford deliver in private hospital or elsewhere. The hospital therefore cares for a unique category of mothers and mortality figures do not reflect national figures.

Women who survived delivery were only considered as a sample (1124) in this study, otherwise their total inclusion would need both hospital and field based data which was not possible given the time and resource constraints of the research.

Maternal mortality estimates by use of hospital based data is not a true representation of the overall national maternal mortality. Thus, the findings from this study should not be generalized for either Nairobi or Kenya. This is because the number of women considered is not a true representation of the total female population. Further not all births in Kenya take place in hospitals therefore, the reported statistical findings do not accurately reflect the number of deaths during pregnancy or childbirth. Bearing this in mind the findings should be considered as a pointer to the extent of the problem in the country .

CHAPTER TWO

LITERATURE REVIEW

2.1 General review

In this section, an attempt is made to discuss the relevant literature on the relationship between the selected independent variables and maternal mortality. Views of different scholars, both from the developed and the developing countries who have addressed this issue are considered.

The World Health Organization (W.H.O.1994) estimates that maternal mortality ranges from 100 to 1,000 deaths per 100,000 live births in developing countries, ratios that are 10 to 100 times those in the United States and Europe. The levels of maternal mortality in a country or region must be considered in relation to the general levels and patterns of mortality and fertility. If levels of mortality and fertility are high, and life expectancy is low, then mortality among women of reproductive ages can be expected to be high as well. Maternal mortality, which is among the leading causes of death for women aged 15-49 years in developing countries, will then be high in such a high mortality country. However, national estimates of maternal mortality in most developing countries are based on limited and defective data. This problem is most prominent especially in high mortality countries, where the majority of such deaths go unregistered.

In the United States, maternal mortality is believed to be under-estimated by at least 25% (Sach et al, 1982). Further, in high mortality and fertility settings, maternal mortality is a rare occurrence. For example Chen et al, (1974) reported a high maternal mortality ratio (maternal deaths per 1,000 live birth) for Matlab Thana, Bangladesh of 5.7 deaths per 1,000 live birth. By contrast, infant mortality rate for the same period in Matlab was 124 deaths per 1,000 live birth. The maternal mortality exposure between the age 15-49, indicated that the probability of a woman dying from a maternity-related cause was indeed small.

Today at the global level, new attention is focused on the problem of womens' health though most studies on the medical impact of childbearing patterns have been carried out in the more developed countries of North America and Europe. However, demographers, public health workers and physicians have along-standing interest in maternal morbidity and mortality, as an indicator of the success of maternal health programmes and as an explanation of sex differentials in mortality (Buchanan, 1975).

According to Ayesha (1994), Pakistani's rate of maternal mortality is higher than in any of the South Asian neighbours with at least 28,000 women dying from pregnancy related causes each year. The risk of a pregnant Pakistan woman dying from maternal related causes is 31 times higher than that of a woman in the developed countries.

Nowhere does maternal mortality take a greater toll than in sub-saharan Africa. Each year in the region, an estimated 200 million women become pregnant and give birth to 128 million children. Of these 200 million women, it has been estimated that half a million die during pregnancy, labour or in the post-partum period (Holness, 1989).

In Bangladesh 21,600 maternal deaths occur each year (Rochat et al., 1981) compared to only 500 a year in the United States which has a population of nearly two and a half times that of Bangladesh.

In Morocco, according to the Demographic and Health Survey (DHS, 1992) maternal mortality was classified into three types. Evidence indicated that from 1985 to 1991 there were 332 maternal deaths for every 100,000 live births a decline from 1978-84 rates of 359 deaths for every 100,000 live birth. These deaths were mainly attributed to inadequate and in some cases lack of proper medical care.

The work of Boerma and Mati (1989), identified maternal deaths as varying from 4 to 5 per 1000 live birth for the period 1984-87 in the two largest hospitals in Kwale district of Kenya. The overall maternal ratio for rural hospitals in coastal province was 3 per 1000 in 1987 (Ministry of Health Report, 1988).

However information on the levels, trends and correlates of maternal mortality in many developing countries is far more rare, and measurement is much more difficult, than for infant and child mortality. Part of the reason being that reproductive complications are only one of the many causes of death among women of reproductive ages. An accurate classification of maternal deaths by cause is thus required to determine, the levels of maternal mortality.

All the above cases demonstrate the high levels of maternal mortality prevailing in developing countries despite improvement n hospital obstetrics. Although in recent years maternal mortality has declined dramatically in many countries throughout the world, death rates associated with childbearing remain appallingly high in developing countries, in some countries as high as 740 per 100,000 live birth, a figure almost 50 times higher that of developed countries.

2.2 Demographic Determinates

2.2.1 Age

It is well documented that maternal age, parity, and birth interval have a significant impact on maternal health (Yerushalmy, 1970; Buchanan, 1975). Therefore to achieve a reducible minimum rate of maternal mortality, the frequency and timing of childbearing must be regulated (Omran, 1983).

A study carried out in rural Bangladesh in Tangail district by Alauddin (1986), identified a maternal mortality of 56.6 per 10,000 live birth. In it's analysis, it was noted that those women at high-risk were mothers below age 20 and above age 30 and those above parity four. Further explanations indicated that women who were under 20 years of age were at greater risk of death. The effect of higher parity in the 20-29 age group may reflect the consequences of short birth spacing, while the effect in the 45 and above age group may reflect both high parity and increasing maternal age. In the analysis of socio-economic factors the expected inverse relationship was noted.

Atiqur et al., (1986) in their study in Jamalpur district of India, showed that maternal mortality was positively related to maternal age and parity, with mortality risk increasing very sharply beyond age 35 years and beyond parity four among women aged 25-34 years.

Barbara et al., (1986) in their study in Addis Ababa found a maternal mortality rate of 56.6 per 100,000 live birth. Further they noted that 54% of the total deaths studied were due to septic abortion. Comparing their findings with other studies conducted in developing countries they noted that a large proportion of women in these countries fall in high risk category of poor pregnancy outcome because they are either very young (below age 20) or over 35 years, more so they have, had more than four children.

Berry (1977), in her study on the influence of age and parity on maternal mortality in U.S. between 1919-1969, found that these demographic variables (maternal age, parity, and birth interval) had some influence on maternal mortality rates even during an era of rapid overall decline. She concluded that the frequency and timing of births must be regulated if maternal mortality was to be brought to a reducible minimum.

Further she observed that, age and parity distribution in the United States for the same period of study (1919-1969), were more favourable to low maternal mortality than the childbearing patterns prevailing in many less developed countries today. If these more favourable distributions of births influenced maternal mortality rates, she continued to argue that the distribution with broader age ranges and high parity births certainly would contribute to the high rates of maternal mortality now prevailing in parts of Africa, Asia, and Latin America.

According to Buchanan (1975), childbearing, an aspect of human reproduction unique to women, requires optimal ages of 20 to 30 years. The further away from the optimal age a woman is, the greater the risks of her dying from pregnancy or childbirth related causes. The increased risk for such a woman ranges from two to six times that of the minimum risk.

Buchanan further observed, that in the United States death rates associated with pregnancy and childbirth increased by a rate of 10 to 12 percent for each year the mother was past the optimum age range which he considered to be between 20 and 30 years. Further he explains that for those women over 35 years and those aged 20 to 30 years, the former have a two to three time higher risk of pregnancy and child birth complications than the latter which may lead to death.

According to Chen et al., (1974), in their study of maternal mortality in Bangladesh, among women aged 20-29 there was only one death while those aged 40-49 recorded three deaths out of the fifty deaths they considered. However it's worthy appreciating their findings because they were exceptionally thorough.

In Mexico, according to Huerta, (1994) lack of attention to women's nutritional health and the society's indifference to pregnancy are the major causes of one of every seventy two Mexican women likely to die from pregnancy, child-birth and post-partum related conditions. This accounts to four pregnant women dying each day according to official Mexican figure.

Kitagawa and Hauser (1973), show that the number of children a woman has borne past the third child, controlling her education attainment, is positively associated with her subsequent mortality from all other causes combined.

Koenig et al (1988), in their study of maternal mortality in Matlab observed that maternal mortality exhibits a classic U-shaped relationship with maternal age. Maternal mortality rates being higher among women aged 15-19 years reaching a minimum during ages 20-34 and rises again after ages 35 years. In conclusion Kornih says that only with a few exceptions at each parity level, does maternal mortality increase with age. Mortality ratio for women aged 15-19 is three times higher than for women aged 25-29.

Makokha (1980), in his study of maternal mortality at Kenyatta National Hospital between 1972-1977 found that the relationship between age and parity of mother and the risk of dying contrasted the hypothesis that the risk of maternal death increases with age and parity. The analysis revealed that 50% of those dead mothers (in the study) were aged between 15-20 years and 27% were aged between 26-35 years. Only 30% were aged 36 years and over, the maximum age recorded being 40 years.

Ngoka (1987), in his retrospective study of maternal mortality at Pumwani Maternity Hospital, found that high maternal age is an important predisposing factor in maternal death, and that death occurred mostly among primigravida and grandmultiparas.

Nortman (1974), actually analyzed parental age as a factor in pregnancy outcome for specified causes by race in U.S and found out that obstetrical complications rose with age among both whites and blacks. Further, he points out that although the most immediate causes of maternal mortality are medical, obstetric problems are usually, just the last stretch of the road to death.

Nortman (1974), further suggested that effect of womens' age on maternal mortality in developing countries may be attributed to the differences in standards of or quality of medical care. In developed countries improved medical care reduces death due to obstetric causes at younger ages but not at older ages. Maternal death among women over 35 years are often caused by complications arising from other conditions (age, marital status etc) which are less likely to respond to medical care. The contrast between maternal death at younger and older age groups in developing countries is less apparent, probably because a larger proportion of women die from obstetric causes at younger ages.

Obunga (1988), in her maternal mortality analysis of Kenyatta National and Pumwani Maternity Hospitals found that maternal mortality exhibited a classical J-shaped relationship with maternal age. Her findings were in agreement with those of Perkins (1969).

Perkin (1969), studying 18,000 deliveries at a women's hospital in Bangkok, Thailand in 1964 found the expected J-shaped gradient by age in complicated deliveries from 13.3% among women aged 15-19 which dropped to 11.2% at ages 20-24 and rose again to 23.4% and 21.3% among women aged 40-44 and 45+ respectively.

Preston (1976), observed that maternal mortality is the third or fourth largest contributor to female deaths at ages 15-49, accounting for between 10 and 11 percent of the total change. In the analysis of the most influential causes, Preston found that age was an influential factor to maternal mortality than variations in any other cause of death for female death rates in the age interval 40 and above. The finding was unexpected as maternal mortality had the lowest mean and run once on any cause under consideration. Moreover, the large majority of deaths from the cause were recorded in the age interval 20-40 rather than 40 and above. In conclusion he noted that, recorded deaths acted as indicators of a more general health disadvantage suffered by middle aged women in some populations.

Tietze (1976), argues that maternal age results from underlying biological factors in the mother. Very young mothers' reproductive systems, for example may not be adequately prepared for the stress of a pregnancy, while advanced aging seems to reduce the efficiency of the entire reproductive process. According to Tietze's findings, maternal mortality was higher for women under 20 and those above age 35, and for women at parity 0 and very high parities.

According to Winiknoff and Sullivan (1986), citing studies done by Chen and Khan in Bangladesh identified births to women over 40 years to be 2.68 times as risky as those in the lowest risk groups in Chen's data. Yet in another Bangladesh data set with very complete ascertainment of deaths (Khan 1974), risks of pregnancy to women over 40 years were found to be more than nine times as great as those in the lowest risk group. Similarly, maternal risk to women of greater than parity four was 5.35 greater than the lowest risk rates in Khan's data set but not greatly different from the lowest risk rate in Sweden in 1971-80 (Hogberg and Wall, 1970).

Trussell and Pebley (1984), noted that maternal death can be reduced by 14 percent if births were to be eliminated for women under ages 20 and those over 39 years, while only 3.5 percent reduction would occur for parity six or higher and 24.6 percent by eliminating both high risk categories. In their conclusion, they noted that age and parity were a major determinant of maternal death.

According to studies carried out by Kaunitz, (1985b); Wickramasuriya, and Chattapadhyay (1976), maternal mortality especially at the extreme ages of reproduction was noted. Similarly, for parities six or more and parity one, the mortality rate was higher than for the population as a whole.

Such documentary evidence on the relationship between maternal age and pregnancy outcome establishes that risk of morbidity and mortality to women and children is minimal when the mother is neither too young nor too old and when the child is of moderate birth order, not exceeding say the fourth child. Women who become pregnant before or after their prime reproductive ages therefore take on added health risk for both themselves and their infants.

2.2.2 Parity

According to Kornih (1988), mortality ratio among nulliparous women is 9.5 per 100 live birth, parities one through six are substantially lower, although considerable fluctuations are evident at specific parity levels. Maternal mortality risk rises at parities seven and above. He continues to indicate that only with few exceptions at each parity level, does maternal mortality increase with age.

According to Makokha's (1980), analysis on parity, more than 57% of all the cases he considered (99 deaths) were mothers of low parity with between one and three children (gravida 1-3). Nearly half of them were young mothers pregnant for the first time, with 13.1% being grandmultiparous. Makokha's work is worthy appreciating, for it went a long way in recognizing some of the non-medical factors that operate to cause maternal mortality among women of reproductive ages.

Obunga (1988), in her analysis on maternal age and previous parity, noted a J-shaped relationship. However she observed, that the relationship could have been more curvilinear (U-shaped) had parity reporting been complete among all the women studied. In conclusion she noted that maternal mortality was found to be higher among nulliparous women while maternal risk for parities one through three were substantially lower, rising again at parities four and above.

Royston and Lopez's (1994), work from the World Fertility Survey (W.F.S) data, showed that if women wanting no more children had no more, the number of births would fall by an average of 17 percent in Africa, 33 percent in Asia and 35 percent in Latin America. Maternal deaths would decline more sharply, because they would occur disproportionately among women having higher parity births and pregnancies that are unwanted, which more often than not end up in unsafe abortions and subsequent deaths.

Studies have further demonstrated that maternal death is higher among young mothers, grandmultiparous women and un-married mothers mainly due to their socio-economic status (Hartfield and Woodland, 1980; Oronsaye, 1982; Chukwudebelu and Ozumba, 1988).

The relationship between maternal mortality and previous parity is also curvilinear, except for parities one and two, where the association between mortality and maternal age is J-shaped (slightly higher at ages 15-19 than at ages 20-24). This pattern of association is remarkably consistent.

2.2.3 Birth interval

According to Buchanan (1975), a woman needs two or three years between births to fully recover physiologically from one pregnancy and prepare for another. Short birth intervals mean greater risk of mortality for both the mother and the child. Short birth intervals cannot however be compensated by good nutrition, medical care, optimal childbearing age nor even low parity. He concludes by saying that short birth intervals result into frequent incidence of premature births and peri-natal mortality.

Jelliffe (1966), documents that short birth intervals lead to physical exhaustion and nutrition impairment of the mother. This he calls maternal depletion syndrome. He further notes that high parity closely associated with short birth interval depicts a J-shaped maternal mortality phenomena, whereby women with short birth intervals experience higher maternal mortality than those with longer birth intervals.

Elsewhere, Winnikoff (1983) expresses the view that short birth intervals are responsible for low birth weight among the infants, and has a high probability of pregnancy loss among the females.

According to findings published in population report (1975) it is noted that short birth intervals and poorly nourished bodies result in low weight gain during pregnancy, severe anaemia, high rates of both maternal and pre-natal mortality, as well as low birth weight of the off-spring.

2.3 Socio-Economic Determinants.

2.3.1 Marital status

Ewbank (1986), citing the work of Makokha (1980) done in Kenyatta National Hospital noted that out of 2,418 women in the study, most of the maternal deaths that occurred were as a result of abortion related causes, and where most women were stated as single mothers.

A study done in Matlab, Bangladesh by Koenig et al., (1988) showed that of 377 registered maternal deaths, 347 were among married women which was a significant contribution of over 92 percent, a figure perhaps not surprising in view of the strong prescription against sexual activities outside marriage in rural Bangladesh. The remaining 10 percent (30 cases) deaths included 22 women who were never married and only 8 who were either divorced or widowed. From the same study it was noted that non-married women contributed disproportionately to abortion related deaths.

In the analysis of marital status and maternal deaths Koenig (1988) noted a decline in maternal mortality risk among women aged 15-24, nulliparous women and women with no previous pregnancies.

Mutura's (1990), analysis of marital status showed that a concentration of unmarried mothers with the risk of dying from maternal related causes were the highest. From her data, 18% of those mothers aged 17 to 21 years were single mothers and had the highest risk compared to the married women who showed only an 8% maternal death risk.

2.3.2 Ante-natal Clinic Attendance

Eckholm et al., (1990) observe that the actual level of risk involved in bearing large number of children depends on the mother's social milieu. But, generally, one pattern seems to prevail in every country and in every social class ie. where the risk increases as the number of children passes 3 or 4 . Women with high parity are particularly susceptible to the complications and diseases associated with pregnancy, where some basic biological laws appear to be involved. Socio-economic factors, however, are the overwhelming determinants of the level of risk posed by high fertility.

Malone (1980), observes that it would be reasonable to assume that the quality of ante-natal care deliveries in hospitals and health centres in Kenya does influence, not only maternal but also peri-natal morbidity and mortality.

Mutura (1990), analyzed ante-natal clinic attendance and ascertained a higher maternal death for females who never attended ante-natal clinic. From the study, 15 percent of the mothers aged 17 to 23 years never attended ante-natal clinics. However, these mothers recorded a higher probability of maternal death than their counterparts aged 28 and 40 years. However, a notable decline was recorded among mothers who had attended ante-natal clinics with only 8 percent probability cited as the highest among those women aged 24 and 30 years.

From Obunga's (1988) findings, most of the maternal deaths (70%) indicated no education or only primary education. Such women would be said to be less aware of the importance of ante-natal care and hospital delivery. To affirm this most of the deaths among young and inexperienced primigravidas were found to have mostly died of anaemia and eclampsia, conditions that would be detected and controlled with the attendance of frequent and regular ante-natal clinic visits.

According to Okonofua et al, (1990) in a study carried out in Nigeria where about 22,000 women were considered, maternal death rates among mothers aged 14 and below who had received ante-natal care was 500 per 100,000 live birth. Whereas the rate of mothers in the same age group who had not received pre-natal care was 4300 per 100,000 live births a nine fold difference. In conclusion it was suggested that ante-natal care can significantly reduce pregnancy-related mortality and complications among all women, especially the very young women.

2.4 THEORETICAL FRAMEWORK

Mortality in any given society is influenced by a complex set of frequently interdependent and closely related variables including cultural, environmental, socio-economic, biological, and even demographic factors. The effect of these variables on mortality is well demonstrated in a framework.

For the purpose of this study, Makohkha's work at Kenyatta National Hospital (1980) on maternal deaths was adopted. This is because he used an integrated approach in his model. However, the basic fundamental analysis of maternal death is done on the basis of Chen and Mosley's framework of child survival (1984) which is modified to suit the present study. Modification is done because in the original framework they both considered several factors that are not of interest to the present study.

The framework (Chen and Mosley 1984) is based on the premise that all social and economic determinants of mortality necessarily operate through a common set of biological mechanisms or proximate determinants, to exert an impact on mortality. In this study, correlates between maternal mortality and socio-economic characteristics are used to generate causal inferences about the determinants of mortality.

The choice of Chen and Mosley's framework is on the basis of the realization that, socio-economic determinants operate through biological mechanisms (intermediate variables) to produce the levels and patterns of mortality observed in any given population (Mosley, 1980).

Most bio-medical research conducted in both developed and developing countries have focused mainly on the cause of death ignoring to a great extent the social and economic intervening factors. Demographers in their analysis of mortality in relation to socio-economic variables, have ignored to a great extent the fact that these variables have mechanisms through which they operate.

Since medical cause of death is of little interest to social scientists, the mechanisms through which socio-economic determinants operate to reduce mortality differentials have therefore remained fairly unexplained.

Growth faltering and ultimately mortality among women (the dependent variable) are a cumulative consequence of multiple disease processes including bio-social interactions. Rarely does death result from a single isolated cause (diseases). In their studies both Makokha (1980) and Mutura (1990) considered factors such as environmental, socio-economic, socio-cultural, demographic, medical health care, administrative and personal. For the purpose of this study the model based on Makokha's work was used where a selected set of demographic and socio-economic factors were examined.

A study model was developed, where a conceptual model with the following variables was used.

Demographic factors:

Parity

Birth interval

Age at birth

Marital status

Socio-Economic factors:

Ante-natal attendance

Occupation

2.5 CONCEPTUAL HYPOTHESIS:

Demographic and socio-economic factors are a major contributing cause to maternal mortality in any given society.

2.5.1 OPERATIONAL HYPOTHESES

1) Women of higher and lower parities are likely to be associated with higher maternal deaths.
2) Short birth intervals are likely to be associated with higher maternal mortality.
3) Women below age 20 and above age 35 are likely to be associated with higher maternal death.

4) Married women are likely to be associated with lower maternal deaths than the unmarried women.

5) Women with some form of occupation are likely to depict lower maternal deaths than the unemployed.

6) women who attend ante-natal clinic are likely to be associated with lower maternal deaths than those who do not attend ante-natal clinics.

2.6 EXPLANATION AND DEFINITIONS OF CONCEPTS

AGE

Age refers to the number of completed years lived by the woman until the time of her death. The variable measured is continuous. The extreme reproductive period below ages 20 and above 35 are considered high risk years for child bearing experience. Even though the reproductive life span for women range from ages 15-49, ages 20-35 are considered the optimum safe ages to have children. However, it is known that certain complications of childbirth rise with age while others are experienced when a would-be-mother is too young i.e below 20 years. For the purpose of our study, we considered the risk of mortality to mothers to be minimal when the mother is neither too young nor too old i.e ages 20-35 years.

PARITY

This was measured as the total number of children one has ever had including the present live birth with the risk exposure to the woman. However from the data source non surviving children were not included hence the study also omitted them. Frequency and timing of births if not regulated pose risk to maternal health. Risk of dying increases as the number of births exceeds four and are closely spaced.

MARITAL STATUS

This variable was classified as married or not married. The variable has been shown to affect the socio-psychological state of the woman and this in turn determines her health status during pregnancy.

BIRTH INTERVAL

This is an important demographic variable and referring to the time lapse between one birth and the next (previous birth and current birth). The variable was measured in months. Close birth interval is said to be an additional risk factor in causing maternal mortality.

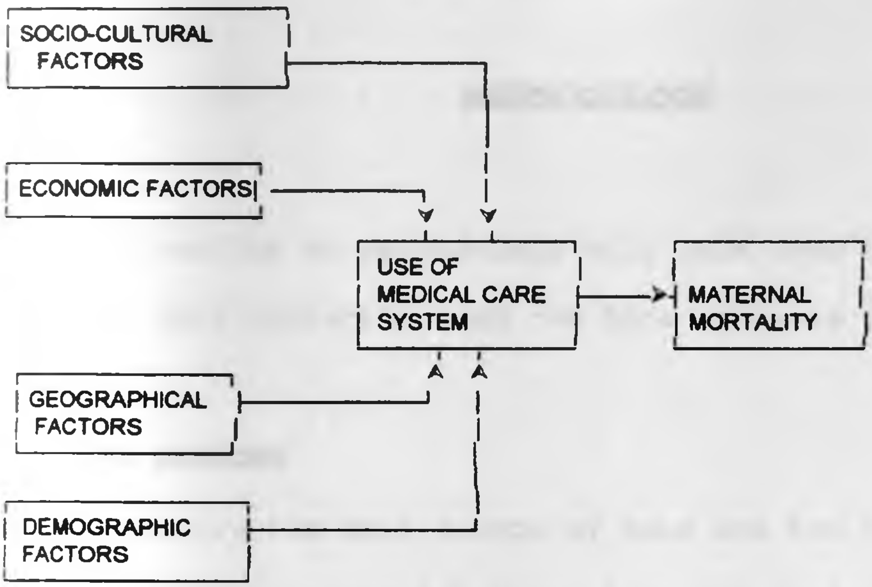
ANTE-NATAL CLINIC ATTENDANCE

This variable was considered from the standpoint of whether the mother has ever attended or never attended ante-natal clinic, and not just the mere number of visits made to a clinic by the woman. The working assumption was that education on preparation of delivery or emergency related care to pregnant women's health are offered in such clinics. Pregnancy complications that may eventually result into death can also be detected early enough and appropriate medical care sought.

OCCUPATION

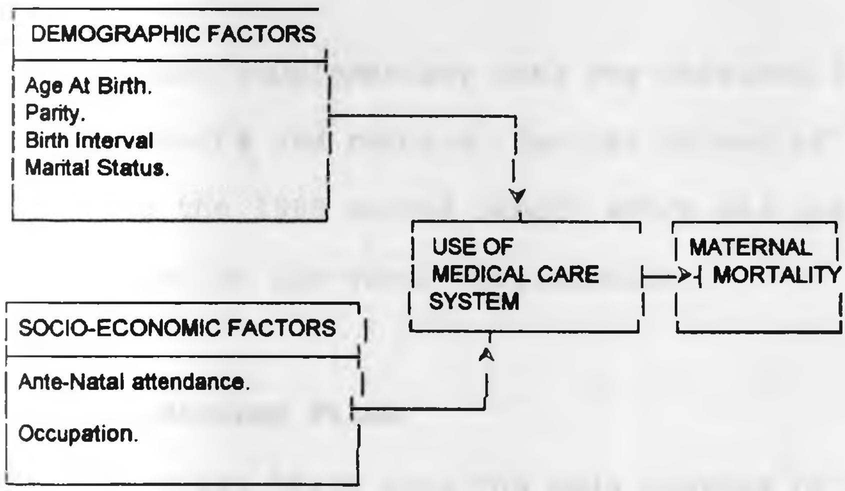
This variable was considered as any form of income generating exercise. It was classified as self-employed, employed, and not-employed. The study considered either the woman's or the husband's employment. The assumption here was that irrespective of who is employed, the income generated would be used by the family members and hence has an important impact on pregnancy outcome eg. ante-natal clinic attendance, proper diet among other things.

Fig 1 CONCEPTUAL MODEL.



Source: Modified from Chen and Mosely framework of Child Survival (1984).

Fig 2 OPERATIONAL FRAMEWORK:



Source: By the Author.Modified from Chen and Mosely frame work of Child Survival (1984).

CHAPTER THRE

METHODOLOGY

The section on methodology will look into the various data sources, data collection and the data analysis procedures.

3.1 DATA SOURCES

Basically the main source of data was the primary source where information was extracted from the in-patient files, disease index cards, disease codes, statistical registers, among others.

Further supplementary data was obtained from the hospital annual reports and returns, Central Bureau of Statistics, including the 1989 census report which was used to provide information on age-group distribution.

3.1.1 In-Patient Files

Basically these were the main sources of data, although additional information was sought from the above named sources. The files provided information on age, parity, marital status, birth interval, occupation and residence. Ante-natal clinic attendance containing details on period of gestation, medical history, family medical history and blood transfusion. From these information we only extracted information that was related to the study. The files also provided a reference point for verification of the information recorded in the disease index cards and the statistical registers in an attempt to find information consistency.

3.1.2 Statistical registers

The statistical registers operate almost like the disease index cards, except that they contain more information about the patient. For instance, apart from the in-patient number, name, and age, it also contained parity, mode of delivery etc. Other information contained included columns for the most serious complications suffered by the patient during pregnancy, and delivery. Such recorded complications included ante-natal problems, ante-partum haemorrhage, blood loss during delivery; prolapsed cord, eclampsia and ruptured uterus. This information was of importance to our study in that it was used to verify the information.

However the statistical register did not contain information on marital status, occupation, date of last birth (on which to base birth interval). The register also omitted some mothers' deliveries especially those who died soon after delivery. Thus if this was to be the only data source of enumerating deaths in the hospitals then it would be incomplete.

3.1.3 The Disease Index Cards

The cards contained details of patients listed according to the codes of disease from which the patient suffered. The diseases are classified according to the World Health Organization (W.H.O.), International Classification Of Diseases (I.C.D.) code. More information contained included the in-patient number, age, sex of the patient and whether the patient had recovered or died.

The disease code classification was not used because the cause of death was not a concern of the study. However, details such as in-patient number, age and whether the patient recovered or died was more appropriate for use.

For the purpose of a comprehensive and accurate analysis this information on the disease index card was an important source of data. Our study also examined marital status, ante-natal attendance, occupation, parity and birth interval. Yet all these variables could not be traced from the cards. The in-patient number was quoted for later tracing of the in-patient files to assist in obtaining the most accurate information possible.

3.1.4 Annual Reports

Such documents contain morbidity and mortality and the general annual reports which summarized hospital activities (eg admissions, operations, deaths, state and quality of facilities among other things). Such reports are prepared monthly, culminating into the more detailed annual report at the end of each year.

These reports proved to be useful at a time when the only possible alternative would have been to physically count the number of admissions for deliveries from the cards and statistical registers.

3.1.5 Limitations of in-patient files as sources of data

This was basically the main source of data though not without it's limitations. Basically, maternity patients include women who may not always, for various reasons, give their correct ages. For instance, there were those who genuinely did not know their ages. There were also those who deliberately mis-stated their ages. Some expectant mothers may have exhorted for being mothers either when too young or too old. Such women may have either exaggerated or understated their ages to appear older or younger. This problem however, resulted to the problem of digit preference and age heaping in some ages. A general trend of such was seen for those ages ending with five, zero, and even numbers. To overcome this problem, the five year age groups were used in the analysis.

In some files there were contradictory information on marital status. For example whereas on the admission forms some patients were reported to be married, to the doctor who examined them they reported being single, this being recorded in the doctor's notes in the files. For the purpose of the study we recorded the information given by the doctor having assumed that the patient might have been more genuine with the doctor than the clerical officer on duty.

Parity recording did not include the current birth but recorded the previous birth only. More so the recording did not consider those births that had died (non-surviving children). For the purpose of our study parity included all births but excluded the non-surviving children. Inclusion of all births gave us the actual total number of children ever born by each woman.

Inclusion of non-surviving children was not possible because our source of data lacked this information.

Form of occupation was not clearly recorded, for it was not specific as to whether it was the woman's or the husband's occupation. However, the assumption was that as long as one of the partners is employed, then this significantly contributed to the presence or absence of maternal mortality in one way or the other.

Either as a time saving device among the officials or the condition of the woman during admission, many of the socio-demographic details of the patient were omitted. Such omissions were found to include age, parity, marital status of the patient, date or year of last delivery, occupation of the patient or the patient's spouses and whether or not ante-natal care had been sought prior to admission in the hospital. A point to note is the fact that most of the in-patient files which were used as our main source of data had the variable birth interval incomplete. For example 28.7% of all the files considered had no information on birth interval. This meant that only 71.3% had any information on the same.

The study was based mainly on the experience of women who enter the maternity hospital for delivery. The obvious inherent problem with generalization from such data usually is the fact that only a select sample of women deliver in hospital. Furthermore, women who suffer serious complications such as cardiac diseases, diabetes etc are more likely to be hospitalized than those whose pregnancies progress without problems; yet are just as exposed to the same health risks brought about by pregnancy, childbirth and the puerperium. In some instances, a maternity patient may be discharged from hospital only to go home and die from the same complications before going back to the hospital.

Since it was not possible to adjust the data used in this study, in order to cater for the above deficiencies, morbidity and mortality patterns obtained from the study are inevitably subjected to some errors. However, the mentioned biases are not an excuse to failure of analysis. The available data was used to find the association between the dependent and the independent variables,which would lead to some understanding of the reproductive problems among women.

3.2 DATA COLLECTION PROCEDURES

The study was based on data from the hospital which basically offers maternity services. Data was collected between

June and July 1995. The selected variables of study from all maternal deaths covering the period 1990-1994 were considered and did not involve any sampling design. From the in-patient files the necessary information was extracted.
However systematic sampling technique was used to select a sample of the surviving women. A sample of 1124 women was selected to represent the surviving women, while the total number of maternal death cases were considered for the period 1990-1994.
Consideration of all the maternal deaths was based on the fact that they were relatively fewer cases (108 maternal deaths) and hence there was no need to sample them.

3.2.1 Sampling Procedure

There were more than 100,000 in-patient files for the five year period, and which could not be considered in total by our study. The large number of the surviving women called for sampling. The main aim of sampling was to select a representative. However given the scope and limitation of our study, a suitable representative population subset was not possible and therefore only a sample of 1124 survivors' files were selected to cover the five year period.

For each of the 5 years, 17 files were selected on a monthly bases with different random start numbers. For instance every 6th, 10th, 3rd, 9th, and 7th in-patient file was selected for the years 1990, 1991, 1992, 1993 and 1994 respectively. The choice of different random start numbers was to try and minimize the possibility of biasses.

Maternal death cases were few and there was no need of sampling therefore all the 108 cases were considered for the five year period.

The main advantage of this sampling method was the reduction in the amounts of work involved in sample drawing, where only a rare list would cause a systematic sample to be less trustworthy. Systematic sampling however, is likely into result to errors especially if there is some trend that runs all through the list, and more so if the random start number is not well chosen. The main inherent error would be either to over-estimate or to under-estimate the situation at hand. In our study therefore this problem was solved by attempting to have different random numbers for each year to cater for the above mentioned error possibility.

3.3 DATA ANALYSIS PROCEDURES

3.3.1 Cross-Tabulations

Descriptive statistical methods, which make extensive use of ratios, frequency distribution, and percentages were used to demonstrate the relationship between maternal mortality and the selected independent variables. Descriptive statistics are useful for they assist in providing various summary measures of the characteristics of the data in question.

Cross-tabulation was used in an attempt to show the would be any relationship between the dependent and the independent variables as well as its strength. The same also suggests whether the relationship is significant or not. Cross-tabulation is important especially with categorical data.

The significance of the relationship is determined by the row and column percentage. If the variation of the column percentage is high then there exists a high chance of having a relationship. The main limitation of this method is the fact that it does not indicate the pattern (direction) nor the magnitude of the relationship.

3.3.2 chi-square

The chi-square technique is a sample distribution that resembles the normal distribution, except that it starts with zero, and is skewed with a long tail to the right. The chi-square technique was also used to analyze the degree of association. The technique is most appropriate especially if the information (data) is classified in table format and involves more than one variable.

The use of the chi-square technique requires the summation of the row and the column totals, which is made possible by the format of the data collected. The technique is a general test that can be used to evaluate whether or not frequencies which have been empirically obtained differ significantly from those which would be expected under a certain set of theoretical assumptions. The chi-square involves a comparison of frequencies rather than percentages. The main use of the technique in this study was to find out whether there exists any association between the dependent variable and each of the independent variables.

The null and the alternative hypotheses are formulated for which the relationship is being sought. In each of the individual cells in the table, computation of the expected values should be calculated. Once the expected values for each cell is obtained then the chi-square value is computed.

The chi-square formula is as follows:

$$\Sigma((F_o - F_e)/F_e)^2$$

where,

F_o=observed frequencies

F_e=expected frequencies

When the chi-square value is obtained, the degree of freedom is selected as follows :

(row - 1)(column - 1)

An error chance that one is prepared to take is selected, where a 10% risk in statistics is accepted. In our study a 5% error chance is adopted.

In our study, the procedure for the chi-square calculation is done by the computer. In the analysis however, the significance that was given by the computer print out was used. The criteria was on the bases of the significance either being less or greater than 0.05. If the significance value of the independent variable was less than 0.05 then the variable was said to be significantly related to the dependent variable.

However, if the significant value was greater than 0.05, then the independent variable in question was not significantly related to the dependent variable. On the basis of this therefore, the null or the alternative hypothesis being tested was either accepted or rejected.

3.3.3 Logistic Regression.

Multivariate analysis assists to ascertain the degree to which the independent variables are related to the dependent variable, and to determine which of the independent variables is most strongly related to the dependent variable.

The technique is the first step towards a statistical methodology that is used to analyze complex models involving numerous correlated and interacting variables. These models enable a researcher to entangle relationships that have been obscured by these complexities.

Logistic regression model is relevant to cases where data is of discrete dependent variable, ie. where we have occurrence or non-occurrence of a particular event. When a variable is thought to depend on others, a special class of log-linear model called logistic model is applied. The dependent variable used should be a binary response ie. maternal and non-maternal (survivors), taking the value of one if the woman died of maternal cause and zero if otherwise (survived). Cause of death depends on a number of factors which may be socio-economic, cultural, demographic, or environmental among other factors.

In general, logistic model is an expansion of the linear probability regression model which expresses the dichotomous Y_1 as a linear function of the explanatory variables x_1 (independent variables). The assumption of the model is the conditional probability that a woman will survive or die given the variables in the model.

The logistic equation can be expressed as:

$$Px = p\ (d = 1/x)$$

$$= 1 / \{ 1 + \exp [- (b_0 + b_1 + \ldots + b_p x_p)] \}$$

Where: d denotes either the presence (d+1) or absence (d+0) of maternal mortality.

x denotes a set of p variables, $x= (x_1, x_2, \ldots x_p)$

Further, the above equation can be expressed as :

$$\ln px/pq = B_0 + B_1x_1 + B_2x_2 + \ldots . + B_px_p$$

Where:

The variables $x_1, x_2, \ldots x_p$ may represent any potential risk factor.

B_s, denote parameters that represent the effects of the x_s on the risk (probability) of maternal mortality.

The equation has the familiar form of a multiple linear regression model, and it is appropriate and useful to think of it in terms of regression when performing a multivariate analysis based on the logistic model. The parameters B_1 are called logistic regression coefficients.

Expressed in terms of logistic, a unit change in the variable x_1 changes the logit of risk (ln px/qx) by the amount B_1. The logistic model is a linear function of the variables x_1, x_2, ..., x_n indicating that the effect of x_1 does not depend on the values of the other variables (Schlesselman, 1982).

3.3.3.1 Assumption of logistic regression

Logistic analysis assumes that the population under study has a nominal distribution structure and that the sample under study is large, drawn randomly and independently from the population. A large sample size is thus a prerequisite for the application of the model, otherwise small sample size will bias the coefficients (Dickson, 1983).

The model also assumes that there exists no multicollinearity between the individual independent variables. The presence of such a relationship affects the regression coefficients by increasing the standard error of the estimates (Blalock, 1963).

Finally the error term is assumed to have a mean of zero, it is thus homoscedastic, ie. it has a constant variance for different values of the x variables, no correlation exists between any two error terms, and consequently the error term in any one equation is uncorrelated with the independent variables. Violation of the above assumptions result in unbiased, consistent but inefficient estimates.

The general assumption of the model is that of conditional expectation of the given X_1 which can be interpreted as the probability of a woman to survive or die given the variables in the model. In logistic analysis however, the dependent variable is defined by logarithm odds also called logit transformation of P(a).

The model takes the following form:

$$\ln (P(x)/1-P(x)) = a + B_x$$

Where:

a+B is logit transformation of P(x) normally denoted as (P).

3.3.3.2 Multicollinearity

This is a condition where one or more of the explanatory variables included in the analysis is or are highly correlated. Correlation among explanatory variables occur in many samples without the explanatory variables being causally related.

Sample variance of the estimated coefficients increases as the correlation among the explanatory variables increase, giving less precise estimates of the true coefficients. Each coefficient is therefore interpreted as having an independent effect on the given variable. If any two or more variables covary or move together in a sample, the harder it is to ascertain the independent effect of one of them holding the other constant. The sample simply does not contain enough information about the variations in the dependent variable associated with changes in each explanatory variables to estimate these effects accurately.

High correlations among the explanatory variables lead to imprecise coefficient estimates and to high correlation among the estimated coefficients, which in turn limit the use of such coefficients to make inferences.

3.3.3.3 Use of Dummy Variables

In our study, indicator (dummy) variables taking the values 1 or 0 to designate the presence or absence of maternal mortality are used to correctly represent the effect of such variables in a logistic regression model. With discrete variables such as Age, Parity each with 5 and 4 categories respectively, indicator variables needed to be used. Some of the variables had more than one category eg. age was designated in five categories. From these dummy categories, a reference category was designated especially the category with the highest number of cases relating to the dependent variable. Such a category is referred to as a reference category. For each of the other categories a variable R_j, for instance is introduced, Which is coded 1 (present) or 0 (absent). If for example age has K categories then K-1 indicator variables are used. The obtained B_j associated with the indicator variable R_j represents the change in the logit of risk for this category relative to the reference category. Equivalently, exp (B_j) represents the relative odds of maternal mortality (dependent variable) for individuals of the particular category R_j as compared to individuals of the reference category. This means that a unit change in a particular variable x_j from x_j to

x_j+1, multiplies the odds of maternal mortality by the factor exp (B_j).

With such discrete variables as age, use of terms such as B_4x_4 in a logistic model would be inappropriate, because it would imply that the logit of risk increases from B4 to $2B_4$ to $3B_4$ to $4B_4$ since the variable x_4 (AGE) assumes arbitrary values 1, 2, 3, and 4. For such an example four indicator variables are introduced with one of the variable being designated as a reference category. In our study AGE1 (15-19) is the reference category, the other ages are coded by use of dummy variables eg. AGE2 coded as R_1, AGE3 as R_2, AGE4 as R_3 and AGE5 as R_4

Likewise parity which is a discrete variable in this study is designated with three dummy variables, with one of the variables being designated as the reference category. In this study parity 1-2 is the reference category, while the other parities are coded by use of dummy variables eg. PARITY (2-3) coded as Q_1, PARITY (3-4) coded as Q_2, and PARITY (5+) coded as Q_3. However, those other variables which do not take a discrete form are designated as taking arbitrary values. Such variables include marital status, birth interval and form of occupation. In general the representation of these variables plus the dummy variables in an equation form would be as follows:

$\ln px/qx = B_0 + B_1x_1 + B_2x_2 + B_3x_3 + B_4R_1 + B_5R_2 + B_6R_3 + B_7R_4 + B_5Q_1 + B_6Q_2 + B_7Q_3$

Thus B_4R_1 represents the change in ln px/qx as the variable age changes from age 15-19 to age 20-24, and $\exp(B_4)$ represents the logit of risk for age 20-24 as compared to age 15-19.

In this study the dummy variables are included in the equation through the stepwise method. In the stepwise method the independent variable with the highest correlation to the dependent variable is entered in the regression model first. The next highest is considered but before it can be entered in the equation, the equation containing these two independent variables is re-examined using the backward elimination approach to determine whether with the second variable, the earlier (first) variable still need be included in the equation. The procedure is repeated until no more independent variable meets the selection or elimination criteria. All this was done by the computer to give us the end results with which to work.

3.3.3.4 Interpretation of Results

An odd is the ratio of frequency of being in one category and is interpreted as the chance that an individual randomly selected will be observed to fall in the category of interest (Hanushek and Jackson, 1977; Mantel, 1973).

The odds ratio is used to measure the effect of the independent variables on the dependent variable. The model transforms the dependent variable to range from -a to +a and thereby eliminates the problem that a+bx will fall outside the unit range (Hall, 1980). Parameters in the model maybe interpreted as ordinary regression coefficients. The coefficient in the model represent the change in maternal mortality expected from a unit change in a particular explanatory variable, the values of the other variables being held constant.

In this study, we cannot talk of relative importance of explanatory variables because our variables are in dummy form. However the obtained coefficient is interpreted as either increasing or decreasing the logit of risk for a particular given category in relation to the reference category.

Positive values indicate that the independent variables or their interactions rise the log odds of the dependent variables, while negative coefficients show lower log odds (Pindyck and Rubinfeild, 1976).

3.3.3.5 Significance of the Model

In examining whether the logistic model fits our data, the expected frequencies were examined under the hypothesized model and a comparison of the result was done on the observed frequencies. The chi-square goodness of fit statistical test was used to ascertain the findings. Generally, depending on the goodness of fit of the chi-square; a selected model based on some theoretical understanding of the interrelationship between variables in the population may be accepted or rejected.

In our study significance of the model was assessed on the basis of the significance level of the logistic equation. From the results any significance level that was greater than 0.05 was considered as not being significant, while any value less than 0.05 was considered significant. Further to asses the best fit for the model in terms of the variables of consideration, the variables were fitted in a stepwise approach. The purpose of this was to assess the impact of each individual independent variable on the dependent variable. Through the use of the stepwise approach, only those variables which had less than 0.05 significance level were considered as fit for the model and which explained the dependent variable.

3.3.3.6 Limitations of the logistic Regression:

The assumption of a large sample size poses a problem in that the magnitude of the chi-square is proportionally related to the large sample size. In this case it implies that a significant effect will always be found between moderate and large sample sizes. However, at times large sample sizes may magnify what was to be a minor difference hence resulting in erroneous conclusions. Small sample sizes may minimize this problem by categorizing data so as to increase the number of observations for each category (Hanushek and Jackson, 1976)

The second assumption of the model that all observed frequencies for cross-classification cells be greater than zero is a limitation in itself. However, the remedy for this is the replacement of each zero sample value with i/r, where R is the total number of cells in the table or adding 1/2 to each elementary cell before analyzing the model with zero cell (Goodman, 1972).

An attempt to collapse categories of given variables in most categorical sample size, as an attempt to minimize on the effect of time and cost has it's own weakness. The main drawback to such an attempt is the loss of vital information which may be unique to a particular category only. The conclusions therefore drawn on the relationship of such categories are usually inconsistent to the underlying population.

High correlation among the independent variables as a result of multicollinearity lead to imprecise and high coefficient estimates. Such results make it difficult to give inferences about the individual coefficient. Conclusions drawn from such coefficients are often more than not misleading.

All these suggestions do not offer a perfect solution in the long run, and therefore considerations were given to the mentioned limitations during data analysis as well as result interpretation.

CHAPTER FOUR

RESULTS OF DATA ANALYSIS

This chapter deals with the analysis of the findings obtained from the research. The methodology is already discussed in chapter three.

The first section of this chapter deals with the age pattern of female deaths where description is made in relation to maternal death and the survivors. Female age is a significant demographic variable in relation to reproduction and a comparative analysis is necessary. Other demographic as well as socio-economic variables were looked into as relating to maternal mortality.

The bivariate analysis was also used where the chi-square findings were explained. The purpose of this section is to assist in determining the variables to be used in the next section whereby the multivariate analysis using logistic regression were applied.

4.1 MATERNAL MORTALITY IN P.M.H (1990-1994)

Pumwani Maternity Hospital (P.M.H.) is the single largest maternity in Nairobi which receives maternity patients from all over the country irrespective of their place of residence, age, marital statues, economic status among other characteristics. The hospital receives more than 20,000 patients annually. Of all the females included in the sample, 90.6 percent were survivors while 9.4 percent died as a result of maternal related causes.

Evidence obtained from the years of study 1990 - 1994 show variations in maternity admission as well as maternal deaths.

Table 4.1.1 P.M.H Maternity Admissions and Maternal Death Distribution (1990-1994).

Period	Maternity Admission	Maternal Deaths	% of deaths to total adm
1990	26,385	17	0.06
1991	28,110	21	0.07
1992	24,494	26	0.12
1993	18,311	17	0.09
1994	17,646	27	0.15
TOTAL	114,946	108	0.09

Source: P.M.H Annual Reports (1994)

From the above Table 4.1.1, during the period 1990 -1992 the hospital received more than 20,000 maternity cases, but in the next two years the number declined to 18,311 and 17,646 in 1993 and 1994 respectively. Likewise maternal deaths changed over time as indicated by Table 4.1.1 and 4.1.2

Table 4.1.2. Annual Maternal Deaths and Percent Total Deaths Distribution (1990- 1994)

Period	Maternity Adm	Maternal Deaths	% of total Deaths
1990	26,385	17	15.74
1991	28,110	21	19.44
1992	24,494	26	24.07
1993	18,311	17	15.74
1994	17,646	27	25.00
TOTAL		108	99.99

Source: P.M.H Annual Report (1994)

From Table 4.1.2, there is clear indication of female death variation over time. For example 1992 and 1994 registered the highest peaks with 24.07% and 25.00% respectively of all the deaths recorded in the hospital. A constant of 15.7% was maintained in 1990, and 1993 which was the lowest death percentage in the five year period.

P.M.H. does not only receive patients from home for delivery but it is also a referral health institution especially for patients with complications beyond the small maternity branches as well as maternity homes. The hospital thus offers specialized services for maternity and other maternity related complications.

Primarily, during the study period the hospital had a mean annual admission of 22,989.2 patients. Despite our sample size being small, the percentage of deaths to admission, shows that death has a low probability of occurrence which ranges between 0.06 and 0.15 (1990 and 1994 respectively, Table 4.1.1) and so is the risk of female death in the reproductive ages. The record shows that in the five year period, the total maternity admissions were 114,946 with only 108 total number of deaths. In general this gives a 0.09% death of the total admission which is a small percentage when compared to the total number of admissions.

The maternal cause of death was highest in 1994 with 25.00% and lowest in 1990 and 1993 with a 15.74% respectively of all the deaths recorded. This could be attributed to poor or incorrect coding of maternal deaths leading to over-estimation of survival cases and under-estimation of maternal deaths.

Table 4.1.3. Annual Distribution of Live Births, Maternal Deaths and Maternal Mortality Ratios.

Period	Live Births	Maternal Deaths	Maternal Mortality Ratio / 000
1990	26,385	17	0.64
1991	28,110	21	0.75
1992	24,494	26	0.98
1993	18,311	17	0.93
1994	17,646	27	1.53
TOTAL	114,946	108	0.94

Source: Based on the Survey Data

4.2 Bivariate Analysis:

4.2.1 Demographic Factors.

4.2.1.1 Age

Primarily the patterns of maternal death and survivors are the same especially in terms of their distribution. Of all the women in our study 9.4% were maternal deaths while 90.6% were survivors out of all the total admissions received in the hospital. In both cases, the percent distribution varies with age. For instance 15.1% of all maternal deaths were recorded among women aged between 15-19 while 18.5% in the same age group were survivors.

The highest peak recorded for maternal deaths was depicted in ages 20-29 with 62.2% while survivors in the same age recorded 71.7%. For ages 30-35+ maternal deaths registered 22.6% while survivors recorded 9.8%. From this illustration it is clear that ages 20-29 had the highest concentration of both survivor and maternal death causes. This means that women in this age bracket have a higher probability of dying from maternal related causes and also higher survival probability from maternal related causes. This is the prime reproductive age group.

Table 4.2.1. Percent Distribution of Survivors and Related Maternal Deaths According to Age.

Causeof Death	15-19	20-24	25-29	30-34	35+	Total
	A G E		G R O U P S			
Mater.	16 (15.1)	40 (37.7)	26 (24.5)	16 (15.1)	8 (7.5)	108 (9.7)
Surv	184 (18.5)	462 (46.6)	249 (25.1)	69 (7.0)	28 (2.8)	992 (9.2)
Total	200 (18.2)	502 (45.7)	279 (25.0)	85 (7.7)	36 (3.3)	1098 (100)

Source: Based on the Survey Data

The high concentration in ages 20-29 may be attributed to the fact that, it is the prime reproductive age when most women are starting their families and hence are actively involved in childbearing. Worthy noting also are the low peaks shown by the extreme ages ie. 15-19 and 30-35+. This may be attributed to the risk complications associated with childbearing at these extreme ages a factor which confirms findings from earlier studies done elsewhere (Nortman, 1974; Makokha, 1980).

However the fact that the 15-19 age group are too young and unwilling to go to hospital for delivery for fear of rebuke due to their young ages may also suggest why we have few cases. The age group 30-35+ may be explained by the fact that majority of these women are approaching menopause, and the few still active are unwilling to go to hospital for they consider themselves too old for childbearing hence prefer home deliveries.

Table 4.2.2 Percent Distribution of Maternal Deaths by Maternal age, P.M.H. 1990-1994

Age groups	PERIOD OF STUDY					
Mater. Ages	1990	1991	1994	1993	1994	TOTAL
15-19	5 (4.6)	0 (0.0)	4 (3.9)	2 (1.9)	5 (4.6)	16 (14.8)
20-24	5 (4.6)	9 (8.3)	12 (11.1)	4 (3.7)	10 (9.3)	40 (37.0)
25-29	3 (2.8)	8 (7.4)	3 (2.8)	5 (4.6)	7 (6.5)	26 (24.1)
30-34	3 (2.8)	3 (2.8)	2 (1.9)	5 (4.6)	3 (2.8)	16 (14.9)
35+	1 (0.9)	0 (0.0)	4 (3.4)	1 (0.9)	2 (1.9)	8 (7.4)
TOTAL	17	21	26	17	27	106

Source: Based on the Survey Data

The above Table shows that female deaths distribution varies with age, a common characteristic depicted by all the years of study.

From Table 4.2.2 age group 20-24 and 25-29 had the highest total death percentages of 37.0 and 24.1 respectively. This may be attributed to the fact that this is the prime age in female reproduction, when most of the women are actively involved in childbearing as already noted earlier. Age group 15-19 had a 14.8% while age group 30-34 had 14.9% and those 35+ had a 7.4%. The reason for this is the fact that majority of the women in the 15-19 age group have not began their reproductive cycle while the 30-34 and 35+ have long began reproduction and majority of them are now approaching their menopause. More so, this same age group had the lowest recorded observations (female populations) from the data.

From Table 4.2.3, maternal causes of death contribute a 9.4% while the rest 90.6% were surviving mothers. This means that from our sample study only 9.4% women died as a result of maternal causes while 90.6% survived. In regard to age distribution probability of survival as well as maternal death risk are high among the age groups 20-24 which are the prime reproductive ages among females. The least affected ages by both maternal risk and probability of survival are those females aged 30+ where we had minimal percentage. The relationship between age and maternal mortality is a reversed U-shaped curve. The reversed situation may be accounted by the fact that the number of maternal deaths were too few (108) hence the results contradicted the expected.

It is argued that childbearing requires optimal age (20-30), and the further away a woman is from this age group, the greater the risk of her dying from pregnancy or childbirth.

A chi-square test was applied to find out whether maternal age influences the probability of dying from maternal related causes.

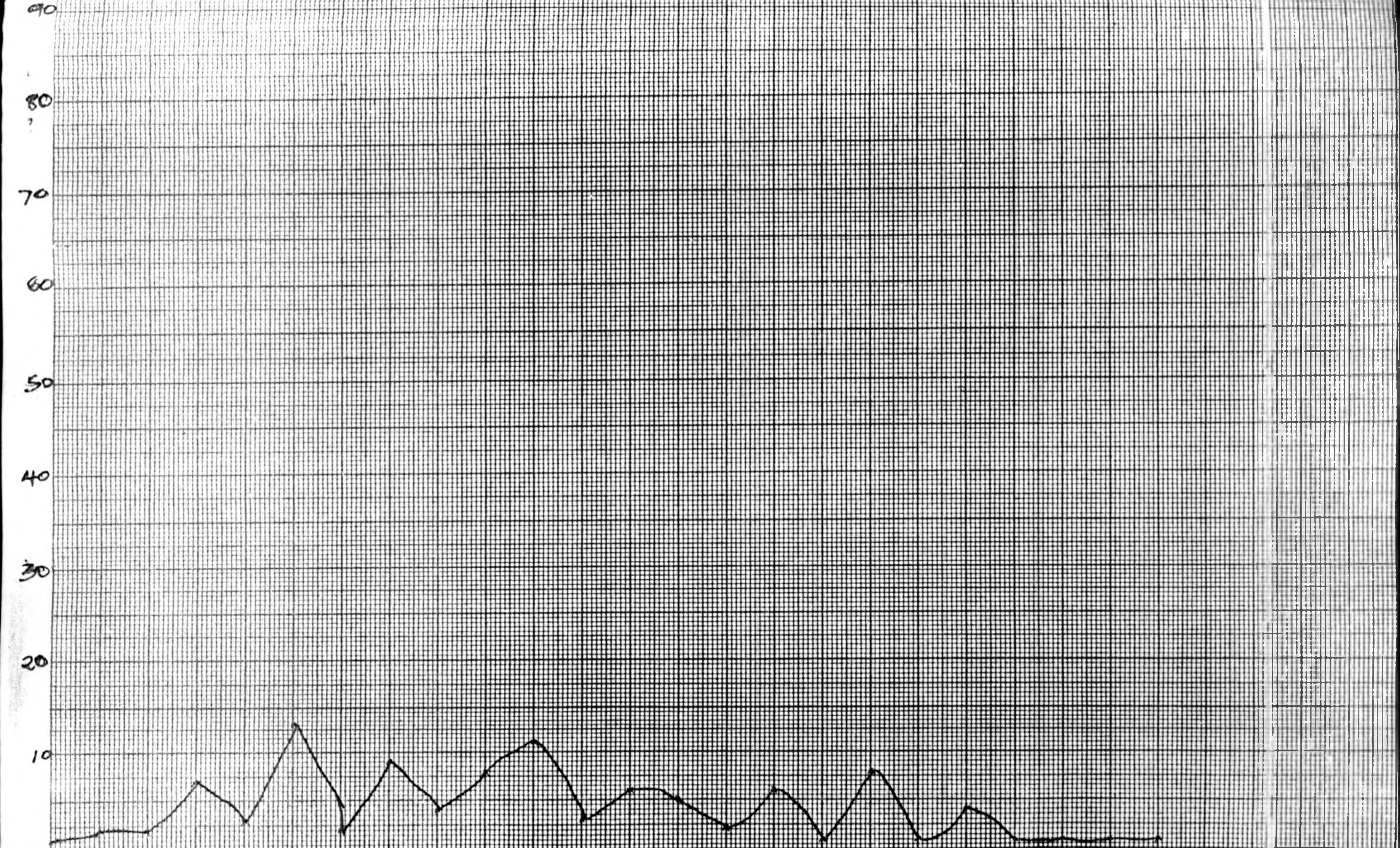
The working hypotheses were:

H_0: Maternal age is not significantly related to maternal death.

H_1: Maternal age is significantly related to maternal death.

The chi-square value obtained was 16.99 with an observed significance of 0.0019. At 0.05 significance test, the two variables were found to be closely associated. From this findings we reject the H_0 and accept the H_1 hypothesis. This finding agrees with findings from other studies done elsewhere (Nortman, 1974; Makokha, 1980; Trussell and Pebley, 1984; Mutura, 1990; Bhatia, 1993).

Despite the acceptance of the H_1 hypothesis the expected U-shaped curve between maternal age and maternal death was not realised. A scatter plot was developed (fig.3) where the figures between ages 15-19 were unreliable. The reason being age misreporting, condition of the mother at the time of admission among others.



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From age 20 onwards the figures taper down as expected but perhaps confounded by the prevalence of HIV AIDS cases which was picking at the time. The trend is however satisfactory. The later ages are likely to have misreports as these were generations that were unable to register births.

Table 4.2.3: Frequency Distribution of Survivors and Maternal Death According to Age.

	AGE GROUPS					
Cause	15-19	20-24	25-29	30-34	35+	TOTAL
Mater	16	40	26	16	8	106
Surv.	184	462	249	69	28	992
% Mat Do age	8	7.96	9.45	18.82	22.22	66.45
% Mat DE(all)	1.4	3.6	2.3	1.4	0.7	9.6

Source: Based on the Survey Data

NOTE: Do - percentage of maternal death according to age.

DE - percentage of maternal deaths according to all deaths.

Overall maternal mortality ratio was estimated to be 0.94 per 1000 in this sample.

4.2.1.2 Parity

According to Kenya Demographic and Health Survey (KDHS, 1993) average age at first birth is generally low i.e. 19 years and it would only be fair to suggest that most women deliver their first babies then.

Table 4.2.4. Percent Distribution of Survivors and Maternal Related Deaths as per Parities

PARITIES

CAUSE	0	1	2	3	4	5+	Total
MATER	35 (4.2)	28 (3.3)	15 (1.8)	14 (1.7)	6 (0.7)	10 (1.2)	108 (12.9
Surviv ors	406 (48.2)	252 (29.9)	179 (21.3)	78 (9.3)	49 (5.8)	50 (5.9)	1014 (120)
TOTAL	441 (39.3)	280 (25.0)	194 (17.4)	92 (8.2)	55 (4.9)	60 (5.3)	1122 (100)

In the parenthesis are the percentages
Source: Based on the survey Data

From our finding, maternal deaths were concentrated at parity zero (first births). For all the maternal deaths 4.2% occurred to women of parity zero which was the highest percentage, an indication of high risk among nulliparous women. Parity one also recorded a high risk where 3.3% maternal deaths occurred, but subsequently deaths decreased with parity only to increase at parity five and above which had 1.2 %.

For all the parity categories considered in our study parity four depicted the lowest maternal deaths of 0.7%. Among the women who survived, the highest peak was recorded for parity zero and one (48.2 and 29.9% respectively). The percentage of survivors declined as parity increased, with the lowest percentage (5.8) recorded at parity four though a slight increase of 5.9% was noted at parity 5+.

Table 4.2.5. Frequency and Percent Distribution of Parity According to Age.

AGES	PARITIES 0	1	2	3	4	5+	TOTAL
15-19	172 (86.8)	25 (12.5)	2 (1.0)			1 (0.5)	200 (100)
20-24	202 (43.8)	167 (33.3)	84 (16.7)	24 (4.8)	5 (1.0)	2 (0.4)	502 (100)
25-29	40 (14.5)	34 (26.5)	82 (29.5)	42 (15.3)	27 (9.8)	11 (4.0)	275 (100)
30-34	1 (1.2)	10 (11.8)	18 (21.2)	18 (21.2)	18 (21.2)	10 (23.5)	85 (100)
35+	1 (2.8)	1 (2.8)	4 (11.1)	5 (13.9)	5 (13.9)	20 (55.6)	36 (100)
TOTAL	434	276	190	89	55	54	1098

In the parenthesis are the Percentages.

Source: Based on the Survey data

It has been argued that the number of children, a woman gives birth to is directly related to her reproductive age, and from our findings this argument is observed. For instance the youngest age group 15-19 records 86.8% for parity zero (first births) and 0.5% for parities five and above, while their counterparts in age group 30-34 register the reverse of this i.e. for parities zero they record 2.8% and 55.6% for parities five and above. Generally parity zero recorded the highest percentage at young ages 15-24 while the same age group shows the lowest among the highest parities.

Table 4.2.6 Percent Distribution of Survivors and Maternal Related Death According to Parity.

Parity	0	1	2	3	4	5+	Total
Surv	40.0	24.9	17.7	7.7	4.8	4.9	100
Mater.	32.4	25.9	13.9	13.0	5.6	9.3	100

Source: Based on the Survey Data

The survivors have a similar pattern to that of maternal deaths. Parity zero recorded the highest percentage of 40.0 and 32.4 for both survivors and maternal deaths while parity one recorded 24.9% and 25.95% for survivors and maternal death respectively. These are the two categories with the highest percentages while the rest of the categories decrease with increase in parity despite a slight increase in parity 5+ (i.e. 4.9% and 9.3% for both survivors and maternal deaths respectively). The high maternal death for parities zero and one may be associated with the fact that, the hospital acts as a referral centre for patients from it's smaller maternity units and even private maternity homes.

Most maternal deaths are seen to be among those females of parity zero although the highest percentage is recorded for parities zero through to parity two. Decline in death rates are registered as parity increases but at parities 5+ an increase is noted though slight and this may be due to the few number of cases recorded for high parities. Table 4.2.7 illustrates this fact where young mothers especially the nulliparous and primigravidas seek medical attention more often than their older counterparts. The other reason maybe the availability of family planning services to all women of reproductive ages and this may have a negative effect on the number of children born i.e. from about 7.4 (KCPS, 1984) to about 5.4 (KDHS, 1993).

Table 4.2.7 : Percent Distribution of Maternal Deaths According to Parity of Mother.

Parities	Frequencies	Percentages
0	35	32.4
1	28	25.9
2	15	13.9
3	14	13.0
4	6	5.6
5+	10	9.3
TOTAL	108	100

Source: Based on the Survey Data

The relationship is a reversed J pattern, a contrast to the available literature. The table 4.2.7 confirms these findings.

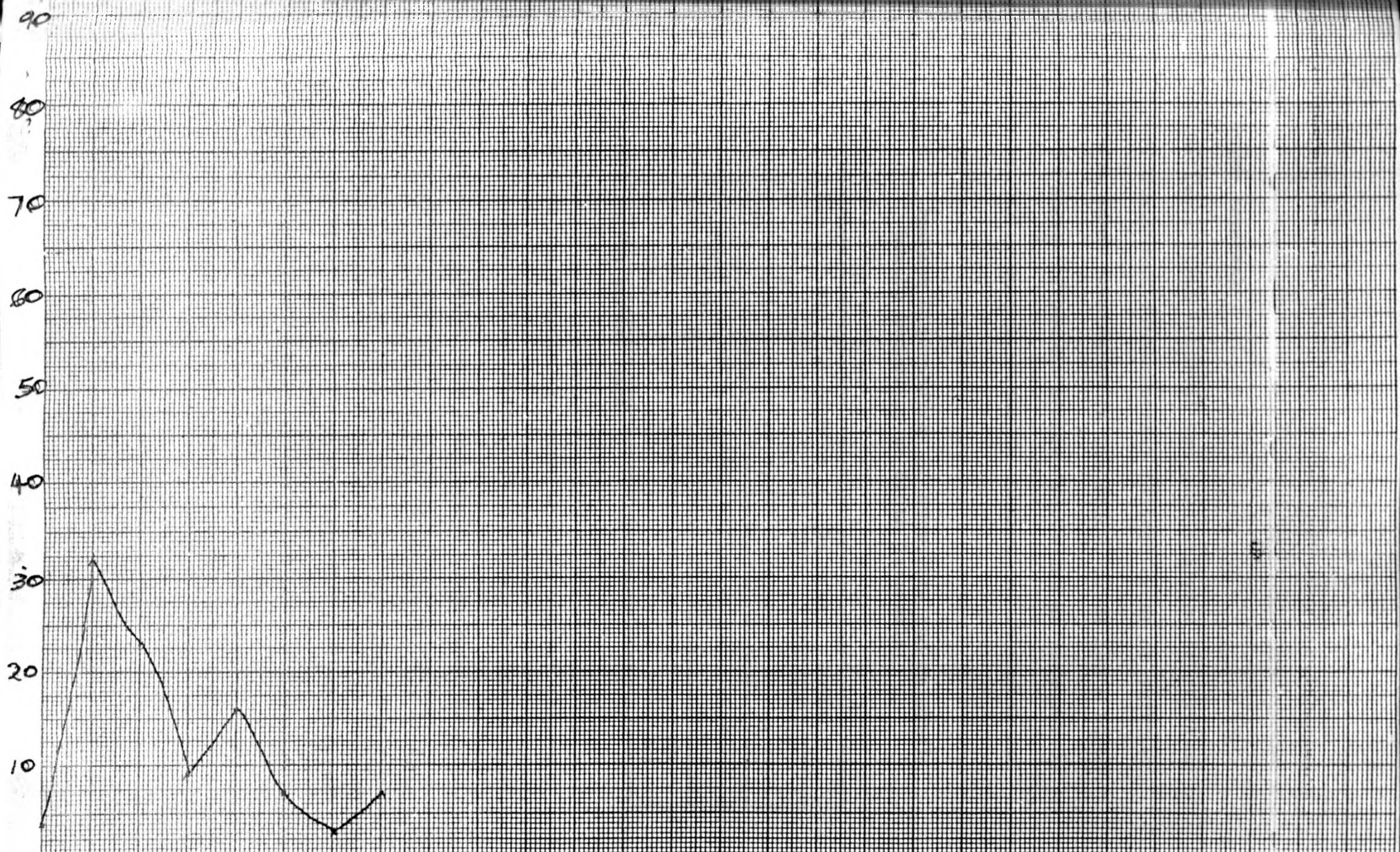
The chi-square technique was also employed to find whether parity is associated with the dependent variable (maternal mortality). The working hypotheses are stated below:

H_o: There is no significant association between parity and maternal death.

H_1: There is a significant association between parity and maternal death.

The chi-square value obtained was 5.62 with an observed significance level of 0.1318. At 0.05 significance level, the two variables were found to have no relationship. Based on these findings we reject the H_1 and accept the H_0 hypothesis. These findings however are in contrast with other studies done elsewhere (Nortman, 1974; Mohammad. R, 1986; Boerma and Mati, 1989). The reason for this could be the fact that in our study majority of the women considered for the analysis were nulliparous (first birth) with no previous birth. The small sample size of the study may also be a contributing factor to such findings.

The chi-square results not confirming the expected, a scatter plot was developed to find the general trend between the two variables. From the scatter plot (fig.4) it was noted that women with first births had lower risks of maternal deaths though the risk increased with parity. The reason attributed to this would be laxity among the officials on duty not to record all the information as a time saving device or lack of further follow-up. It is also noted that from the source of data, the variable parity was not well recorded because 29% of all in-patient files had this variable incomplete.



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4.2.1.3 Birth Interval

The variable birth interval was also analyzed in relation to whether the women died from maternal related cause or survived. Among all the women considered in the study, 32.8% had a birth interval of between 12 and 18 months, 66.1% had an interval of 18-24 months, while only 1.1% had an interval of 24 months and above.

Table 4.2.8: Percent Distribution of Survivors and Maternal Deaths According to Birth Intervals.

	BIRTH INTERVALS			
Cause	12-18 Mths	18-24 Mths	> 24 Mths	TOTAL
Maternal	4 (2.2)	5 (2.7)	1 (0.5)	10 (5.5)
Survivors	56 (30.6)	116 (63.4)	1 (0.5)	173 (94.5)
TOTAl	60 (32.8)	121 (66.1)	2 (1.1)	183 (100)

Source: Based on the survey data.

A peak 2.7% was recorded by women who had a birth interval of 18-24 months, while those with 12-18 interval recorded a 2.2%. The lowest maternal deaths were shown among those women who recorded a birth interval of more than 24 months (0.5%). As for the survivors, the highest peak was indicated by women with an 18-24 months interval, 63.4%. Those who recorded a birth interval of 12-18 months registered a 30.6% while women with 24+ interval recorded 0.5%. From this it was clear that women with longer birth intervals had a low probability of dying from maternal related causes. However this was not the case for the surviving women who recorded the lowest percentages (0.5%) while the highest percentage was registered among women who had a birth interval of 18-24 months. The second highest percentage was recorded among women of shortest birth interval i.e. 12-18 month.

It is worth mentioning that this kind of picture is in contrast to the one shown by existing literature. This fact may be attributed to the few number of observations (cases) recorded in the birth intervals greater than 24 months i.e. 1% for both the survivors and the maternal related causes. The low observations made were as a result of the defective nature of our data, as already pointed out.

For both survivors and maternal related causes a peak is recorded for birth intervals between 18-24 months (i.e. 2.7 and 63.4% respectively). Further it should be noted that from the data collected majority of the women were nulliparous (first births), who had no birth interval and therefore were not considered for the analysis.

Table 4.2.9. Percent Distribution of Birth Interval According to Age.

	BIRTH INTERVALS			
Age Groups	(12-18 Mths)	(18-24 Mths)	(>24 Mths)	TOTAL
15-19	5 (8.6)	9 (7.6)	-	14 (7.9)
20-24	32 (55.2)	56 (47.1)	1 (100.0)	89 (50.0)
25-29	14 (24.1)	39 (32.8)	-	53 (29.8)
30-34	6 (10.3)	9 (7.6)	-	15 (8.4)
35+	1 (1.7)	6 (5.0)	-	7 (3.9)
TOTAL	58 (32.6)	119 (66.9)	1 (0.6)	178 (100.0)

Source: Based on the survey data.

In general the 18-24 month interval had the largest concentration of patients (66.9%), followed by 32.6% recorded by the 12-18 interval while the lowest was 0.6% for the 24+ interval for both survivors and maternal related causes of death.

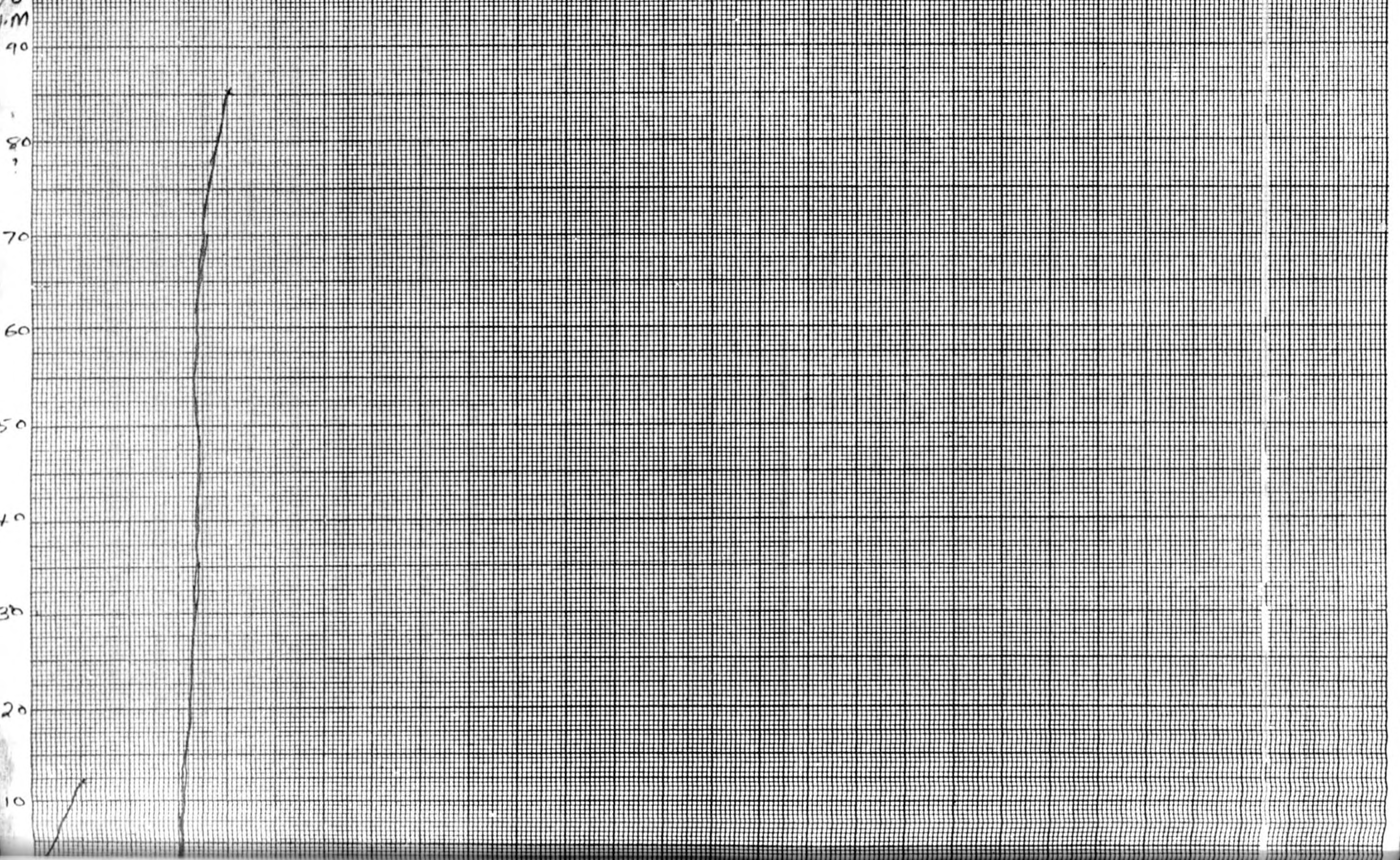
A concentration of patients according to birth interval was depicted at ages 20-24 (55.2%) with birth interval of 12-18 months between the previous and the current birth. The same age group 18-24 months interval a concentration though lower than the 12-18 months category was noted. Ages 25-29 was the second largest age group with the highest concentration, however with a different picture than the former age group (20-24). In this age group the 18-24 interval had the highest percentage followed by the 12-18 interval (i.e. 32.8 and 24.1% respectively). While the 24+ interval category recorded nothing. This concentration maybe attributed to the fact that these age groups are the prime ages of reproduction hence the need for majority of the women in this age-group to have children.

The age groups 15-19 and 35+ had generally the lowest percentages with totals of 7.9 and 3.9 respectively. This suggests that these extreme age groups had generally fewer observations in comparison to the others, which may also account for the low percentage observed in the same.

In an attempt to find whether there exists any relationship between maternal death and birth interval, a chi-square test was conducted. The working hypotheses were stated as follows:

H_o: There is no significant relationship between maternal death and birth interval.

H_1: There is a significant relationship between maternal death and birth interval.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The chi-square value obtained was 8.262 with an observed significance level of 0.0161. At 0.05 significance test, the two variables were found to have a strong relationship. This means the acceptance of the H_1 and rejection of the H_o. These findings are in line with studies done elsewhere (Jelliffe, 1966; Buchana, 1975; winnikoff, 1983; Koenig, 1988).

Despite the strong relationship shown by the two variables the chi-square test may not be valid. This is because some of the cells in the cross tabulation had as few as five cases of the expected frequencies.

To try and cater for the few cases, a scatter plot was developed to find the general trend of the two variables. The scatter plot proved unreliable because the cases were too few to give any meaningful general trend.

4.2.1.4 Conclusion on Demographic Factors

Overall maternal mortality ratio is estimated to be 0.94 per 1000 in this sample. Maternal mortality in developing countries has been estimated to range from 100 to 1,000 live birth (W.H.O., 1987) which are ratios of 10 to 100 times those in the United States and Europe. The situation in P.M.H. is not alarming (although it is an institutional survey) as compared to other parts of the developing countries. A maternal mortality ratio of 0.94 per 1000 is not unexpected bearing in mind that P.M.H. is in a developing country, although this ratio should not be generalized to represent the institution's (P.M.H) maternal mortality ratio nor the country's maternal mortality by any chance.

Generalization of these findings to represent the actual maternal mortality may be misleading because the sample size used was only from a single hospital, whose data as mentioned earlier was not adequate to form a basis for generalization. Findings from our study therefore should be treated as an indicator of the maternal mortality from a selected sample of women in P.M.H for the period 1990-1994.

4.2.2 Socio-Economic Factors

4.2.2.1 Marital Status

The marital status variable was also analyzed in relation to age pattern of mortality. For the maternal death the highest peak was recorded among the married women (7.7%) while the single women recorded 2.0%. For the survivors, the married women still had the highest percentage of 74.9%, while the single women recorded 15.5%.

Table 4.2.10. Percent Distribution of Survivors and Maternal Related Deaths According to Marital Status.

	MARITAL STATUS		
Cause of death	Married	Single	Total
Maternal	86 (7.7)	22 (2.0)	108 (9.6)
Survivors	840 (74.9)	174 (15.5)	1014 (90.4)
Total	926 (82.6)	196 (17.5)	1122 (100)

In the parenthesis are the total percentages

Source: Based on the Survey Data.

According to our findings (Table 4.2.11) married women depict a peak at ages 20-24 and 25-29 (46.8 and 27.4% respectively). These are the same age groups with the largest concentration (74.2%) of the entire married female population. From this, it is only clear that 25.8% of the remaining married women are to be redistributed to the rest of the age groups. The age group 35+ has 3.7% while 8.4% is recorded in age group 30-34 as married. Majority of the married women are in the 20-24 age group (46.8%) and this may easily affirm the fact that marriages in Kenya start early and are almost universal. For instance the Kenya Demographic and Health Survey (KDHS, 1993) quotes 19 years as the mean age at marriage.

The single mothers in our study show a somehow different picture from their married counterparts. Age groups 15-19 and 20-24 record the highest percentage (39.0 and 40.5% respectively). Of the entire single women population these two age groups consist of 79.5% hence only 20.5% of the single women are to be found in the rest of the age groups. Age groups 30-34 and 35+ have the lowest percentage (4.6 and 1.5) respectively. Generally, the population of single women decreases with increase in age, while large proportion of single women in a population are expected at younger ages. Our findings however confirm this expectation.

Table 4.2.11: Percent Distribution of Marital Status According to Age.

Marital Status	AGE GROUP					
	15-19	20-24	25-29	30-34	35+	Total
Single	76 (39.0)	79 (40.5)	28 (14.4)	9 (4.6)	3 (1.5)	195 (17.9)
Married	124 (13.7)	423 (46.8)	247 (27.4)	76 (8.4)	33 (3.7)	903 (82.2)
Total	200 (18.2)	502 (45.7)	275 (25.0)	85 (7.7)	36 (3.3)	1092 (100.0)

Source: Based on the Survey Data.

Table 4.2.12 Characteristics of Marital Status as a Cause of Maternal Death.

Cause	MARRIED	SINGLE	TOTAL
Maternal	79.6	20.4	100
Survivors	82.8	17.2	100

Source: Based on the Survey Data

Perhaps high maternal death rate would have been expected among single mothers, but to the contrary. From Table 4.2.12 both the survivors and maternal related deaths for the married women recorded the highest percentage of 82.8 and 79.6 respectively. It is worthy noting that of all the married women majority of them did not die (were survivors), while for the single mothers a high number of the deaths that occurred were due to maternal causes. The single mothers may have recorded high maternal deaths due to the fact that most of them are young, and unemployed thus have no source of income and therefore may seek abortion.

According to Kenya Demographic and Health Survey (KDHS 1993) mean age at marriage is quoted as 19 years. Reproductive age attainment thus means marriage and as such a woman becomes a potential risk candidate of maternal related cause. Soon after marriage women are expected to begin childbearing almost immediately. This therefore supports our findings in Table 4.2.12 where more than half of all maternal deaths are recorded by the married women.

Table 4.2.13. Percent Distribution of Maternal Deaths According to Age and Marital Status of the Mother.

	MARITAL	STATUS	
AGE GROUPS	MARRIED	SINGLE	TOTAL
15-19	37.5	62.5	100
20-24	82.5	17.5	100
25-29	92.3	7.75	100
30-34	87.5	12.5	100
35+	87.5	12.5	100
TOTAL	387.3	112.7	100

Source: Based on the Survey Data

Most of the single mothers are young which means a substantial risk to the health of both the mother and the child. Early childbearing also tends to restrict educational and economic opportunities for women. Most of these young mothers have low levels of literacy, as well as knowledge and awareness of their reproductive health not to mention their low financial status. The societal norms and reactions towards pre-marital pregnancy may result in an increased failure of ante-natal clinic attendance and sometimes may lead to increased inclination towards abortion and subsequent death.

4.2.2.2 Ante-Natal Clinic Attendance

Ante-natal clinic attendance (A.N.C.) was also analyzed in relation to female age. Of all the women in the study 80.2% attended A.N.C while only 19.8% did not attend. Despite the high percent attendance, there is an increased maternal death of 8.1% among those women who attended, while those who did not attend record only 1.9% maternal deaths. As for the survivors a significantly high percentage was recorded among mothers who attended A.N.C (72.1%) while the non-attendance recorded 18.0%.

Table 4.2.14: Percent Distribution of Survivors and Maternal Deaths According to Ante-Natal Clinic Attendance.

	ANTE-NATAL CLINIC ATTENDANCE		
Cause of death	YES	NO	TOTAL
Maternal	87 (8.1)	20 (1.9)	109 (9.9)
Survivors	778 (72.1)	199 (18.0)	972 (90.1)
Total	865 (80.2)	219 (19.8)	1079 (100)

In the parenthesis are the total percentages

Source: Based on the survey Data.

Generally the picture that emerges among females who attended A.N.C. in relation to age distribution varies throughout the age-groups. The prime ages of 20-29 record the highest percentages of A.N.C. attendance of 46.1 and 24.8 respectively. The 15-19 ages indicate a fairly low percentage of 17.8, while ages 30-34 and 35+ have among the lowest percentages 7.9 and 3.4 respectively. The low percentages among the 15-19 may be explained by the fact that majority of these females are young mothers, who are un-married and have no form of employment hence may be unwilling to be associated with early motherhood. As a result of this majority of them may not seek A.N.C. care. More so, those still active in childbearing may be unwilling to attend A.N.C in fear of rebuke from the clinic officers as a result of their age.

Table 4.2.15 : Percent Distribution of Ante-Natal Attendance According to Maternal Age.

	AGE GROUPS					
A.N.C.A	15-19	20-24	25-29	30-34	35+	TOTAL
YES	151 (17.8)	391 (46.1)	210 (24.8)	67 (7.9)	29 (3.4)	848 (100)
NO	42 (20.1)	93 (44.5)	56 (26.8)	12 (5.7)	6 (2.9)	209 (100)
TOTAL	193 (18.3)	484 (45.8)	266 (25.2)	79 (7.5)	35 (3.3)	1057 (100)

In the parenthesis are the column Percentages.
Source: Based on the Survey Data.

Non-attendance depicts a peak among the 20-24 ages (44.5%), a second peak is also shown by the 25-29 ages (26.8%). This may be attributed to the fact that these same age group had the largest concentration of females in the study. The rest of the age groups had substantially low percentages of less than 10% except for ages 15-19 which had 20.1%.

Generally the age group 20-24 recorded a total of 45.8%, of all the women included in the study, and this may explain why this group had both the highest percentage of the A.N.C attendance and non-attendance.

The total number of non-attendants and attendants of A.N.C indicate an under-estimation in all the age-groups with the most affected age group being 30-34 and 35+. The reason that may be given for this under-estimation in these age groups would be that females in the older ages tend to ignore the need to go for ante-natal clinics.

Association of maternal death and ante-natal clinic attendance was done using the chi-square technique. The working hypotheses were stated as follows:

H_0: There is no significance relationship between maternal death and ante-natal clinic attendance.

H_1: There is a significant relationship between maternal death and ante-natal clinic attendance.

The chi-square value obtained was 0.974 with an observed significance level of 0.7550. At 0.05 significance level test, the two variables were found to have no relationship hence leading to the acceptance of the H_0 and rejection of the H_1 hypothesis. This findings confirm the findings of other studies done elsewhere for example Boerma and Mati, (1989); Mutura, (1990), but contrast findings such as those of Mohammad, (1986) and Jagdish, (1993).

4.2.2.3 Form of Occupation

Form of occupation was also analyzed in relation to maternal cause of death and the survival status of the women considered in the study. Of all the women under study 56.9% were employed, 19.5% were unemployed, while 23.6% were self-employed. Out of all the employed women only 1.3% died of maternal related causes, while 55.7% survived.

The unemployed women associated with maternal deaths recorded an 8.0% while 11.5% were recorded as survivors. 2.0% of all maternal deaths were experienced by women who were self employed in contrast to 21.6% survival cases among the same category of women.

Table 4.2.16 : Percent Distribution of Survivors and Maternal Related Deaths According to Form of Occupation.

	FORM OF OCCUPATION			
Cause of Death	Employed	Unemployed	Self-Employed	TOTAL
Maternal Death	12 (1.3)	77 (8.0)	19 (2.0)	108 (11.3)
Survivors	534 (55.7)	110 (11.5)	207 (21.6)	851 (88.7)
TOTAL	546 (56.9)	187 (19.5)	226 (23.6)	959 (100)

In the parenthesis are the column percentages.
Source: Calculated from the Survey Data

From our findings it was noted that the unemployed women had a higher (8.0%) chance of dying from maternal related causes in comparison to those who were either employed or self employed (1.3 and 2.0 respectively).

This may be attributed to the fact that the employed are in a better position to attend ante-natal and post natal clinics regularly, to have proper and quality diet among other things. All these assist to minimize the risk of dying from maternal related causes.

On the other hand the employed had a higher survival chance of 55.7% than the rest of the occupation categories. In comparison to the unemployed the self-employed had a higher survival chance (21.6%) than the former who had 11.5%. In conclusion, therefore, it was noted that the unemployed women had a higher probability of dying from maternal related causes not to mention their lower survival probability in comparison to the other.

Existence of would be any relationship between form of occupation and maternal mortality was tested using the chi-square technique. The working hypotheses were stated as shown below:

H_0: There is no significant relationship between maternal mortality and form of occupation.

H_1: There is a significant relationship between maternal mortality and form of occupation.

The chi-square value obtained was 214.183 with an observed significance level of 0.0000. At 0.05 significance level test, the two variables were found to have a perfect relationship. This confirms the acceptance of the H_1 and rejection of the H_0 hypothesis, which is in line with the findings of Barbara, (1986).

Table 4.2.17 Summary of observed significance in cross tabulation between dependent variable and independent variables

Variables	Observed significance	Significance level	Accept/Reject
Age	0.0019	0.05	Accept
Parity	0.1318	0.05	Reject
Birth interval	0.0161	0.05	Accept
Marital Status	0.4035	0.05	Reject
Occupation	0.0000	0.05	Accept
Ante-natal	0.7550	0.05	Reject

Source: Complied by the author

Summary of findings:

In this section the would be association between the various variables and maternal mortality was sought. From Table 4.2.17 we find that age, birth interval, and occupation had a closer association with maternal mortality. The existence of would be any relationship was done on the basis of the value of the significant level. A significant value of less than 0.05 shows a strong relationship while that greater than 0.05 means no relationship exists between the variables.

4.5 Multivariate Analysis.

4.5.1 Regression Analysis Results.

Regression has been applied as an analytical tool in this study for the purpose of predicating, estimating and smoothing the data. Logistic regression model is used where the variables are included in the equation through the stepwise method.

Table 4.5.1 Description of variables as used in the Regression Model.

Variable Name	Operational Definition	Explanation
Dependent Maternal Mortality		
Independent 1. Age	A set of dummy variables with the following: AGE1, AGE2, AGE3 AGE4, AGE5+	AGE1 is the omitted category (Reference)
2. Parity	A set of dummy variables with the following: PAR0-1, PAR2-3, PAR3-4, PAR5+	PAR0-1 is the omitted category (Reference)
3. Marital status	A set of dummy variables with the following: MAR1, MAR2, MAR3	MAR1 is the omitted category (Reference). MAR3 was incomplete thus it was ignored in the analysis.
4. Occupation	A set of dummy variables with the following: Occup1, Occup2, Occup3	OCCUP1 is the omitted category (Reference). OCCUP2 was incomplete thus ignored for nalysis.
5. Birth interval	A set of dummy variables with the following: BI1, BI2, BI3	BI1 is the omitted category (Reference). BI2 was incomplete thus it was ignored for analysis.

Source: Complied by the author.

In this study all the variables are treated as either categorical or binary variables. The emphasis on categorical variables is based on the theoretical as well as the empirical relationship of these variables.

The logistic regression used in our study uses the reference category approach. This is the approach whereby the independent variable category with the highest / maximum number of cases relating to the dependent variable is called the reference category. In this case all the other variables are regressed against the reference category. In this analysis therefore, the reference category is not regressed, for it is assumed that if other categories would yield any results then the reference category would have an even more significant relationship (results).

The elimination of the reference category in the regression equation reduces it's overshadowing effect on other variables. For example the age category 20-24 is used as the reference category for it has the maximum number of cases. All the other age groups are regressed against it.

According to the results in Table 4.5.2 nearly all the variables in the model are not significant except for only three dummy variables; namely AGE4, AGE5, BI3 hence the hypothesized relationship is not clear. In the analysis however, the logistic package automatically ignores an observation especially if the variable is incomplete. For instance in the analysis the dummy variable OCCUP2 and BI2 were incomplete and therefore were ignored (their coefficients are not shown). The ignored variables have no results shown and therefore are not included in the interpretation of the regression model.

Table 4.5.2. General regression analysis with all variables.

VARI	COEFF.	STD ERR	SIGN.	R	EXP(B)
AGE2	-.1276	.3030	.6736	.0000	.8802
AGE3	-.4221	.3391	.2133	.0000	.6557
AGE4	-1.2347	.4109	.0027	.0027	.2902
AGE5	-1.5149	.5542	.0063	.0063	.2198
PAR2-3	.2954	.3149	.3482	.0000	1.3436
PAR3-4	.3886	.4906	.4283	.0000	1.4750
PAR5+	.1160	.4636	.8024	.0000	1.1230
OCCUP3	.2079	.5966	.4399	.0000	1.2311
MAR2	.2258	.7063	.4007	.0000	1.2533
BI3	.9873	4.3136	.0378	.0570	2.6840
CONST	2.2275	.2949			

Source: Complied by the author.

Most of the variables as shown in Table 4.5.2 are not significant. The reason could be the number of observations used which was only 108 (maternal deaths) and the sampled 1125 survival cases. This makes the regression of the full variables invalid in hypothesis testing. False conclusions of there being perfection in variation between actual and expected parameters is nullified. However the low standard error of 0.2949 depicts some model consistency with the expected results. There is no problem of autocorrelation because the standard error shows that errors are uncorrelated.

Multicollinearity which arises when the independent variables are linear functions of each other would have been suspected to occur, but according to the results it is non-existent. The small values of the estimated coefficients indicate non-existence of multicollinearity. Presence of multicollinearity would have led to imprecise coefficients estimates and high correlations among estimated coefficients (Hanushek and Jackson, 1977). Further correlation would have been shown by infinite or high standard errors (Gujarati, 1976). All this indicate absence of multicollinearity in the results. Effects of high correlation in a population is that the coefficient values cannot be estimated precisely.

Coefficients of most dummy variables in our equation are greater than 0.5 except for dummy variable AGE4 and AGE5 (ie. age 30-34 and 35+) and BI3 (more than 24 months), whose coefficients are less than 0.5. However, the lower coefficients and standard error's constants, obtained from the regression equation analysis, as evident in Table 4.5.3 with the reduced model as the best. The model has only three dummy variables namely AGE4 (30-34), AGE5 (35+), and BI 3 (more than 24 months) which had lower than 0.5 coefficient values hence significant to the dependent variable. This equation shows a lower goodness of fit of 0.5406 in comparison to 0.5941 (Table 5.4.2).

In an attempt to obtain better results, an analysis was done using the stepwise version so as to obtain the more significant variables. Only variables AGE4, AGE5, (i.e. 30-34 and 35+) and BI3 (more than 24 months) showed a strong significance with the dependent variable. The results of this are shown in Table 4.5.3. below.

Table 4.5.3 Regression Analysis of Significant Variables Only.

VARI	COEFF	STD ERR	SIGN	R	EXP(B)
AGE4	-.9365	.3012	.0019	-.1038	.3920
AGE5	-1.1965	.4205	.0044	-.0926	.3022
BI3	1.0174	.4704	.0305	.0614	2.7661
CONST	2.3184	.1162	.0000		

As shown in Table 4.5.3 a comparison between regressed categories and the reference category is made. The obtained difference between the two logits of risk tell whether the category has a lower or higher risk of dying from maternal mortality causes. If positive, there is a higher chance of the women in that category dying from maternal related causes as compared to the women in the reference category. Likewise a negative sign shows a lower chance of a woman dying from maternal related causes in comparison to the woman in the reference category.

Expressed in terms of logit, a unit change in the variable x_j changes the logit of risk (ln px/qx) by the amount B_j. The logit of risk analysis is done on the basis of the dummy variables.

From Table 4.5.3 the coefficient of AGE4 is -.9365 which is higher than the coefficient of AGE5 -1.1965. This does not mean that age 35+ is a less important dummy variable in explaining maternal mortality risk. The interpretation is however, that a change from AGE4 to AGE5 is associated with a decrease of -1.1965 in the logit of risk, or equivalently, that the relative odd of maternal mortality is decreased by 69.7% relative to the woman in the reference category.

Table 4.5.4. **General Regression Model with all Variables and % Logit of Risk**

VARIA	B	STD ERR	SIGN	R	EXP(B)	% L O R
AGE2	.1276	.3030	.6736	.0000	.8802	-11
AGE3	-.4221	.3391	.2133	.0000	.6557	-34
AGE4	-1.2347	.4109	.0027	.0027	.2902	-70
AGE5	-1.5149	.5542	.0063	.0063	.2198	-78
PAR2-3	.2954	.3149	.3482	.0000	1.3436	34
PAR3-4	.3886	.4906	.4283	.0000	1.4750	47
PAR5+	.1160	.4636	.8024	.0000	1.1230	12
OCCUP3	.2079	.5966	.4399	.0000	1.2311	23
MAR2	.2258	.7063	.4007	.0000	1.2533	25
BI3	.9873	4.3136	.0378	.0570	2.6840	168
CONSTA	2.2275	.2949	.0000			

Source: Complied by the author.

Using the results of Table 4.5.4 for instance the logit of risk for a woman dying from maternal cause given that she is age 20-24 years is 0.1276 which means that such a woman has a relative odds of -11% lower risk of dying from maternal causes than the woman in the reference category. This is to say that a woman in the reference category has a higher probability of dying from maternal related causes than the woman in the age group 20-24. Also, the relative odds of risk for a woman of PAR3-4 is 47%

higher than the woman in the reference category. Any diversion therefore from the reference category's logit of risk will give the relative risk of a female's death from maternal mortality caused by the changed category since the rest are assumed to be constant.

Table 4.5.5 Reduced Regression of Significant Variables and % logit of Risk.

VARIA	COEFF	STD ERR	R	SIGNIF	EXP(B)	% L O R
AGE4	-.9365	.3012	-.1038	.0019	.3920	-60
AGE5	-1.1965	.4205	-.0926	.0044	.3022	-69
BI3	1.0174	.4704	.0614	.0305	2.7661	176
CONST	2.3184	.1162		.0000		

Source: Complied by the author.

Although maternal age has been shown to be associated with maternal death, these findings are not confirmed in the logit of risk. Throughout the analysis a decrease in the logit of risk is maintained for all age groups in relation to the reference category. This is to say that increase in age is associated with lower maternal death risk. However, ages 15-19 confirm the relationship of higher maternal deaths in relation to age. It is a well known fact that advanced ages 35+ is associated with higher maternal mortality. However, from the regression equation a contradiction is noted. This contradiction can be explained by the few number of observations used in the sample survey.

Parity is said to relate to maternal mortality but in our study it did not yield any significant results, and this is attributed to most of the mothers being nulliparous, which was considered as the reference category. However, the relationship portrayed in the bivariate analysis confirms the expected results. Generally from the regression equation all the parity categories show a high logit of risk of maternal mortality than that of the reference category. The highest logit of risk being for women with parities 3-4 (47%) and parity 5+ (12%) portraying lowest logit of risk.

From the regression analysis the variable occupation is not significant. Despite it's insignificance it indicates that a woman with no form of occupation has a 23% higher logit of risk of maternal death than the woman in the reference category (employed). This thus confirms the earlier findings in the bivariate analysis.

Duration or time lapse between the previous and the current birth (birth interval) is also an important factor for consideration. From the regression equation it is clear that those women with shorter birth intervals have a higher risk. For instance women with a birth interval of more than 24 months have a higher logit of risk of maternal mortality than the women in the reference category. From Table 4.5.4 women with a birth interval of 24 months and above have a 168% logit of risk as compared to those women in the reference category. The other category of 18-24 months birth interval was incomplete hence was ignored in the analysis.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS.

5.1 Summary.

Findings from other demographic studies relating to maternal mortality have been confirmed by our study. The situation existing elsewhere is not quite different from that of Pumwani Maternity Hospital. Hence the conclusion from this study, that demographic and socio-economic factors determine maternal mortality holds.

The high death rates in the 20-29 ages are not anything unusual, since for most women this is their reproductive peak and thus are involved in childbearing. This may mean that they are exposed to a higher risk of maternal death. Moreso, the other reason for such a picture would be the effect of age heaping (digit preference). Women are generally known to deliberately cheat their ages or otherwise to prefer a certain digit number. This may be the case for such results in this age groups. However, this is the same age group with the highest female population in our study and thus it's bound to give us such a result. The extreme ages (15-19 and 35+) had very few observations, and may be why they did not yield the expected results.

Maternal mortality in relation to parity shows a reversed J-shaped trend. Findings indicate that most women who die are nulliparous followed by the primigravidas. This may be an indication that most womens' physiology is not fully developed and hence are among the high risk category of maternal mortality in childbearing.

Marriages in Kenya are not only universal but also start early (ie.19 years). This means that women in such unions are supposed to begin reproductive cycle almost immediately. From our findings more than half the maternal deaths occurred to the married women, and this fact may be attributed to the reason mentioned above.

Source of income (form of occupation) may to some extent determine maternal death. Women with no form of occupation had significantly higher maternal deaths compared to their counterparts. Form of employment will influence one's diet, hygienic standards, regular visits to the ante-natal clinic among other things.

Although the variable ante-natal clinic attendance did not yield any significance on the dependent variable, other studies have shown it's significance. This is because it is from such clinics that early pregnancy complications are deduced and preventive measures taken.

Short birth intervals are a health threat to mothers especially because the body has not fully recovered it's strength. Findings have shown that more deaths occur to mothers with shorter birth intervals than those with long birth intervals.

5.2 Conclusion

Information on the levels, trends and correlates of maternal mortality in many developing countries is scarce, and measurement is much more difficult, than for infant and child mortality. Part of the reason is that reproductive complications are only one of the many causes of death among women in the reproductive ages.

Also lack of data on the event has proved difficult for the accurate assessment of the magnitude thus, an accurate classification of death by cause is required to determine, the level of maternal mortality. Furthermore, even in high mortality and fertility settings maternal mortality is still a rare occurrence. This implies that measurement problems and costs of maternal mortality studies are substantial which further complicates the problem.

There is misclassification of information and this limitation must be considered when interpreting data on maternal mortality. Perhaps the most appropriate step is to consider the general level of mortality in a given population, the health status, and hence to estimate the level of maternal mortality in accordance with these basic data.

Maternal mortality inferred from our study shows a variation between 0.64 (1990) and 1.53 (1994). The overall maternal mortality being 0.94 per 1,000 live birth.

Maternal mortality exhibit a classic U-shaped but reversed relationship with maternal age. Mortality rates are low among women aged 14-19, reaches a maximum during ages 20-29 and then declines again among the 30-35+ age groups. The reversed U-shape relationship can be attributed to the few number of cases in the extreme ages, while a concentration is seen at the prime ages. Moreso the reversed U-shaped relationship may be attributed to lack of a common denominator where age classification for each year among other variables was not possible to obtain, given the inadequate nature of our data .

The relationship between maternal mortality and parity is curvilinear. Nulliparous and primigravida women showed high mortality risks (7.5%). Subsequently maternal mortality ratios were lower for parities two through four only to exhibit a slight increase in parity 5+. This results suggest that high parity is closely associated with maternal death especially when women cannot be in a position to meet the psychological demands of repeated pregnancy and childbirth.

Birth interval showed that women with prolonged intervals generally survived while those with shorter intervals died of maternal causes. However, most women in the study were nulliparous with (birth interval) while the shortest birth intervals 6-12 months were very few to be considered.

Majority of the married women who were primigravidas were in the 20-29 age groups. These are the same women with the highest risk of maternal mortality as already shown. These findings are in contradiction to the existing literature. The reason for this would be the high concentration of females in this age group in our sample, which would be due to age heaping.

Women who attend ante-natal clinic show a higher risk than those who do not attend A.N.C, although it is generally argued that at such clinics early pregnancy complications may be realized.

Women with some form of occupation showed minimal maternal mortality risk compared to their counterparts with no occupation, who depicted maximum maternal mortality risk. However a reversed situation was noted among the survivors. Those women with some form of occupation depicted the highest risk (55.7%) while the unemployed showed the lowest risk (11.5%).

It is worth noting that all the analysis and findings in this report are based on the available data from Pumwani Maternity Hospital for the period 1990-1994. These results do not include deaths which might have occurred outside this particular hospital or the mentioned period of study.

However, it would be realistic to those concerned to speed up strategies of intervention and to avail statistics in an attempt to bring maternal mortality risks to a reducible minimum. This would be an attempt to join those others who have championed and spearheaded this crusade against maternal deaths in the world.

5.4 Recommendations.

Maternal mortality analysis and interpretation from health facilities would be more meaningful if improvement of other data sources was done. For instance if proper classification of all causes of death among women of reproductive ages, further details on deliveries both at home and in hospitals, would go a long way in the evaluation of the levels, trends, and causes of maternal mortality. However the realization of this goal should not only be a concern to the government but should also include community participation. Such realizations would reveal whether the proportion of maternal deaths shown by health facilities are higher or lower than just the mere coverage of deliveries. Further, a clear description and definition of responsibilities and roles at all levels would assume a more rational use of personnel and especially so in record keeping and completion.

Nulliparous and primigravida women should be encouraged to deliver in hospitals, given their higher maternal mortality risk. This would be an attempt to reduce the number of primigravida and nulliparous deaths as a result of childbirth. Those nulliparous and primigravida mothers who happen to deliver at home, should be encouraged to seek medical attention for examination of any after birth complications which may result to death.

Given the low income among majority of the women in the reproductive ages, obstetric, basic pregnancy care as well as drugs should be made available in all health centres. In the light of cost sharing currently in use, the charges should be kept as minimal as possible especially for those women seeking obstetric care.

Form of occupation is a significant factor in lowering maternal mortality as observed in the analysis. Despite insufficient formal employment women should be encouraged to establish small scale businesses. Women should not only start group project activities but also should be active participants of the same. Such women groups should start small income generating projects, where individual members enjoy the benefits. Small loans and grants, should be facilitated by the government, non-governmental organizations as well as individuals to assist women get established.

Crusades on family planning programmes, sex and family life programmes should all be given a wider coverage. Increased contraceptive use is believed to lower the risk of maternal mortality by reducing the proportions of births occurring to the youngest and the oldest women. There should also be reduction in the proportion of births at higher parities and at the same time lengthening of birth intervals.

Lastly, there is a need to develop medical and socio-anthropological research to provide knowledge on better information gathering, analytical tools and an exchange information programme on research and experience in different parts of the world.

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APPENDIX

Variables names as used in Bivariate Analysis (Table 4.2.1)

Mater. .... Maternal Related Cause.

Surv. .... Survivors of Maternal Death.

Variables as used in Table 4.2.2

Surv. .... Survivors of Maternal Death.

Mater. .... Maternal Related Cause.

% of Mat to all (D) .... % of Maternal to all Deaths.

Variable names as used in Regression Model (Table 4.5.2)

AGE 2 .... Age group 20-24

AGE 3 .... Age group 25-29

AGE 4 .... Age group 30-34

AGE 5 .... Age group 35+

PARITY

PAR 2-3 .... Women with 2 to 3 children.

PAR 3-4 .... Women with 3-4 children.

PAR 5+ .... Women with more than 5 children.

MARITAL STATUS

MAR 2 .... Single

OCCUPATION

OCCUP 2 .... Not Employed

BIRTH INTERVAL

BI 3 .... Birth interval of over 24 months

VARI .... Variable Name

Coeff .... Coefficient

Std Err ...... Standard Error

Sign .... Significance

R ....

Exp(B) .... Exponential

Const .... Constant

Variable names as used in Table 4.5.3

Age

Age4 .... Age 30-34

Age5 .... Age 35+

Birth Interval

BI3............................... More than 24 Months

Vari .... Variable Name

Coeff .... Coefficient

Std Err .... Standard Error

Sign. .... Significance

Expo(B) .... Exponential

Const .... Constant

Variable names as used in General regression model (Table 4.5.4)

Age2 .... Age 20-24

Age3 .... Age 25-29

Age4 .... Age 30-34

Age5 .... Age 35+

Parity

PAR2-3 .... Women with 2-3 children

PAR3-4 .... Women with 3-4 children

PAR5+ .... Women with more than 5 children

Occupation

OCCUP3 .... Self Employed

Marital Status

MAR2 .... Single

Birth Interval

BI3 .... Birth Interval of over 24 months

Const .... Constant

Vari .... Variable name

B .... Beta

Std Err .... Standard Error

Sign. .... Significance

Exp(B) .... Exponential

% L.O.R .... % of Logit Of Risk

POPULATION EXTRACTION FORM 1995

SHEET NO.

PUMWANI MATERNITY HOSPITAL

101	102	103	104	105	106		107			108			109			110				111				
I.P No.	Age	Parity	Marital status single married divorced separated	Level of education done L. primary U. Primary secondary and above	Has the patient ever attended ante-natal clinic		What is the patients form of occupation Employed Unemployed Self-employed									When did the patient die? 1. Before child birth 2. During child birth 3. Within 6 weeks after child birth 4. Any other				What is the birth internal between previous and current birth? 1. < 6 months 2. 12 months 3. 18 months 4. 24 months 5. More than 24 months				
					Yes	No																		
							1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	4	5

POPULATION EXTRACTION FORM 1995

SHEET NO.

PUMWANI MATERNITY HOSPITAL

101	102	103	104	105	106		107			108			109			110				111				
I.P No.	Age	Parity	Marital status single married divorced separated	Level of education done L. primary U. Primary secondary and above	Has the patient ever attended ante-natal clinic		What is the patients form of occupation Employed Unemployed Self employed									When did the patient die? 1. Before child birth 2. During child birth 3. Within 6 weeks after child birth 4. Any other				What is the birth internal between previous and current birth? 1. < 6 months 2. 12 months 3. 18 months 4. 24 months 5. More than 24 months				
					Yes	No	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	4	5.

POPULATION EXTRACTION FORM 1995

SHEET NO.

PUMWANI MATERNITY HOSPITAL

101	102	103	104	105	106		107			108			109			110				111				
I.P No.	Age	Parity	Marital status single married divorced separated	Level of education done L. primary U. Primary secondary and above	Has the patient ever attended ante-natal clinic		What is the patients form of occupation Employed Unemployed Self-employed									When did the patient die? 1. Before child birth 2. During child birth 3. Within 6 weeks after child birth 4. Any other				What is the birth internal between previous and current birth? 1. < 6 months 2. 12 months 3. 18 months 4. 24 months 5. More than 24 months				
					Yes	No	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	4	5