DETERMINANTS OF MATERNAL AND NON-MATERNAL MORTALITY, EVIDENCE FROM HOSPITAL DATA, NAKURU

by

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THIS THESIS IS SUBMITTED TO THE
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DECLARATION

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

TABITHA NJERI MUTURA

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

DR. Z. MUGANZI

DEDICATION

To all females who never lived to see the fruits of their pregnancy. Also to all mothers who lived to bring up their token from God. More so to my dear mother for enduring the pain of bringing me to this world. May procreation continue, but may the risk be lessened please?

ACKNOWLEDGEMENT

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

First I would like to thank the University of Nairobi for offering me a scholarship which has made my postgraduate studies run smoothly without financial strain.

Special thanks go to my parents and relatives for their sacrifice, prayers and moral support they gave me throughout the period that I have been working on this paper. May God bless them.

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Most sincerely I thank my colleagues at College for their mutual efforts in discussions and other related issues that made the academic atmosphere conducive for acquiring more knowledge.

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of Planning and National Development, especially Prof. G. Barber.

However, neither the above named persons nor the department of Population Institute should be held responsible for mistakes or views in this paper; The sole responsibility is mine.

Finally I say To God Be Glory.

ABSTRACT

The main objective of this research was to find determinants and levels of maternal mortality as compared with non-maternal female mortality in the reproductive age set and to establish its significance. The study analyzed ten variables: socio-cultural, socio-economic, demographic, environmental, medical factors and abortion and their operation variable as related to maternal mortality.

The research was carried out in hospitals in Nakuru Municipality though the data is not representative of any administrative area. The data collected will be institutionally based. Involved were, one Government assisted hospital (Nakuru General Hospital-NGH) and two private hospitals (Menengai Nursing and Maternity Home-MN&MH and Nakuru War Memorial Hospital-NWMH).

Having considered the surveys studies done worldwide, it was found to be of importance to study maternal mortality in an urban set-up which is of its kind in Kenya.

The period of study that was analyzed was 5 years i.e 1981-1985. The sample size was expected to be 150 for maternal deaths and about 1000 for non-maternal deaths.

The data used was collected from the above mentioned institutions. Descriptive statistics, chi-squared method, cross-tabulations and regression techniques were used for analysis.

The analysis showed varied results. For instance, age pattern showed different sequences depending on the variables. Each variable was summarised into two graphs i.e for maternal related cases and non-maternal related

case. The number of sequences depended on the number of categories for each variable.

All variables were analyzed using the chi-square. Most of the null hypothesis have been rejected except for age at first birth, marital status and ante-natal clinic attendance.

As for the regression analysis, six equations were analyzed. While equation 1 and 2 did not offer any valid results, equation 3 and 5 were shown to be the best. In the best equation i.e equation 3, only age residence and ethnicity were analyzed and found to be significantly related to maternal mortality. In this equation, the constant of standard error was low and the constant of beta was greater than 0.5. The findings suggest that maternal mortality is an area that needs much attention and thorough survey.

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INTRODUCTION

1.1 Background

This study is aimed at assessing the maternal mortality phenomena in Nakuru, where reliable data on maternal death are scarce. First, the upper and the lower limits of maternal mortality in a population are determined by the general level of mortality and fertility.

The childbirth event though risky, is an important event in a woman's life as it marks the fulfilment of her femininity. It is evident that the position of women in society and in particular some various form of discrimination subjected to them, have a substantial influence on the risk of dying from maternal cause. Thus it is assumed that this cause is responsible for female disadvantage where it exists. Policies to enhance a decline of maternal mortality would benefit females exclusively and contribute to the increase in the female-male differences in life expectancy. Virtually of all the mortality from this exclusively female risk, there is no equivalent cause of death for men. It should therefore, be a cause of concern for all.

In recent decades, medical records have shown that high and uncontrollable fertility directly threatens the health of mother and infants and may undermine the health of other family members (Koenig et al 1988). Though high fertility can lead to both high infant and maternal mortality, the relatively high infant mortality and comparatively low maternal mortality has prompted most

medical resources to be channelled in maternal and child health (MCH) clinics to care for infants most.

Maternal mortality is an important index in the evaluation of the level of medical care especially the obstetrical and gynaecological services rendered to the female population of a given community. It reflects both the extent to which women are constrained to non-market activities and the adequacy of medical attention a woman receives during childbirth. The factors underlying maternal mortality differ in various societies. This is due to the influence of different social, biological, economic, geographical, political, environmental, cultural factors as well as habits and customs of the population.

Incidence of major medical events that mostly lead to death such as haemorrhage, infections and obstructed labour are controlled by these factors. Illegal abortion is also prevalent in less developed countries. Most medical practitioners hold the opinion that a large fraction of maternal mortality derives less from the failings and inadequacies of modern medical infrastructure than from ignorance, traditional beliefs system and the generally low position of women in the society whereby they have many responsibilities and few rights.

In the African region, data on maternal mortality and morbidity is very scanty as a result of little research in this field of study. "Nevertheless during the last decade (1970's) Africa has began to know more about problems related to reproductive health as some of these problems have taken a serious turn which threatens Africa's future

" (Mtimavalye 1982). Reproductive health care among women in Africa is increasingly becoming a matter of concern to demographers, public health workers and physicians in most parts of Africa where women of reproductive age (15-49) years comprise 20 per cent of total population. Yet as Mati observed "there is plenty of data lying in the ministries of health, hospitals and schools of medicine in the form of annual reports, maternity files, records and students dissertations which could be used in search of more knowledge concerning this female risk of reproduction".

Likewise, there are no national surveys to ascertain national levels and pattern of maternal mortality and morbidity in East Africa. However the works of Mtimavalye, Armon (Tanzania), Makokha, Ngoka, Aggarawal (Kenya) and Ndugwa (Uganda) have tried to give an insight into the problem even though they have only been conducted in medical institutions.

Kenyan women like their counterparts in other developing countries are also faced with problems related to the childbirth and childbearing. The Kenya females in reproductive age form 23 per cent of the total Kenya population (CBS, 1979). Though the census and surveys do not include questions on maternal mortality and morbidity, female reproductive health needs serious environmental attention. The institutional surveys carried out by physicians are concerned about the immediate medical complications that mostly lead to maternal mortality than other psycho-socio factors. This study therefore need to

incorporate social, economic, environmental and cultural factors in the pursuit of female cause of death in the reproductive age.

1.2 Problem Statement

Childbearing event is a risky event in female's reproductive age, which has been known to consequently lead to death. Maternal death is therefore defined as the death of a woman while pregnant or within forty two (42) days of termination of pregnancy irrespective of the duration or the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. The cause can be direct (maternal deaths resulting from obstetric complication of pregnancy, labour and puerperium and from intervention or any sequence of the above) or indirect (maternal deaths resulting from the aggravation of existing condition by pregnancy or delivery).

In this connection, most professionals in demography, social science and medicine have attempted to explain the factors that have led to this exclusive female risk.

Studies of Mehta and Jayant (1985), and Jelliffe (1966) identify factors associated with maternal morbidity and mortality including poverty, malnutrition, poor education standards, unplanned birth and poor sanitation.

Jelliffe (1966) documents that the short birth interval lead to physical exhaustion and nutrition impairment of mother. This he calls "maternal depletion syndrome". Jelling further notes that the high parity

associated with short birth interval is a J-shaped maternal mortality phenomena.

Elsewhere, Winnikoff (1983) and express the view that short birth interval are responsible for low birth weight for infants and a high probability of pregnancy loss. The short birth interval is an intermediating factor for abortion. In the study abortion is studied as a variable responsible for maternal deaths.

According to the 1979 census, Kenya's total fertility rate was 8.1 (CBS 1979), 7.7 (KCPS 1984), and 6.7 (KDHS 1989). This shows that the probability a woman in Kenya is exposed to the childbearing risk is quite high in comparison with most developed countries where the fertility rate is less than replacement rate e.g Sweden. The mean age at marriage of 18.6 years was recorded in 1979 (CBS) whereby 55 per cent of Kenyan women become mothers before they reach age 20 (KDHS 1989). The median age at first birth is between 18.2 for 25-29 years old people and 19.7 for the 45-49 age group as shown in the Table 1.1. This is a further evidence to the fact that the age at first birth for Kenyan women is constant according to age groups. Therefore fertility rate without any contraception would be high and therefore would be the maternal mortality risk.

In the absence of contraception, most women would be subjected to short birth interval and therefore high parity. The consequences could lead to maternal deaths.

In India, New Delhi, a widely advertised clinic in 1980-1981 recorded 5,918 clients undergoing early abortion. An

unexpectedly high percentage of both young and nulliparous females were recorded as the majority attendants. In Kenya using World Fertility Survey, percentages of pregnancies terminating in miscarriage, still birth and induced abortion is 5.7 per cent whereby miscarriage records 4.7 per cent , still birth 0.8 per cent while induced abortion is claimed not to be distinguished in a population having 33,746 pregnant women. This indicate the conspicuous difference between legal and illegal abortion in a society.

At KNH, abortion from teenagers constitute a large proportion of all emergency admissions to the gynaecological ward (Aggarwal and Mati, 1982). This is because of the methods administered and the complication experienced after. The action is vulnerable to the young, unmarried and unemployed women who are socially and economically unprepared to take care of children single handedly.

Table 1.1 Per cent Distribution of Women by Age at First Birth, According to Current Age, Kenya, 1989

Curr. Age	No Birth	Age at first birth <15	16-18	19-20	21-23	24-25	25*	Total	*
15-19	78.6	2.3	14.0	5.1				100	----
20-24	21.5	4.0	28.0	26.4	15.3	4.8		100	19.3
25-29	5.3	11.1	29.2	27.2	16.4	8.3	2.5	100	18.7
30-34	2.9	15.1	32.0	22.4	14.0	9.4	4.3	100	18.2
35-39	2.2	11.3	28.7	27.5	16.6	9.8	3.9	100	18.6
40-44	2.3	14.7	29.2	20.7	15.8	10.6	6.6	100	18.6
45-49	2.8	10.2	21.2	22.7	17.7	13.4	11.9	100	19.7
Total	22.5	8.8	25.6	20.9	12.5	6.8	2.9	100	----

* Medium age at first birth
Source: Kenya Demographic Health Survey, 1989

The experience of most developing countries mentioned in the literature review and Kenya in particular provides evidence that abortion is among the leading causes of maternal mortality. It is in this context of complexity of relationship between mortality and demographic, socio-economic and cultural factors that the study will attempt to examine. Evidenced by either medically diagnosed cause or abortion, this study addresses the problem as it relates to hospital based survey in Nakuru. Or it may be that the same factors producing high death rates from non-maternal mortality related causes could be the same causes of maternal mortality. The study will establish whether or not there is significant difference between age group contribution of females maternal deaths as compared with the female non-maternal death in the same age 15-49. Other female causes of death will be analyzed for comparison purposes only.

The situation is of such concern that public health personnel, midwives, doctors and non-governmental organization representatives from 22 francophone African countries met in Niamey, Niger, in January, 1989 to discuss how to stem the tide of death which was called a "disgrace to the modern world".

The study will examine the significance of maternal death as compared with the non-maternal ones. The extent to which non-medical factors determine female death in the childbearing age will also be analyzed in an attempt to establish the levels and pattern and trends of maternal mortality and morbidity in Nakuru for the five year period.

1.3 Problem Justification

Statistical analysis has shown that there is significant difference between the age distribution of maternal deaths and of overall population (Ngoka, 1980). A few population based longitudinal studies have provided estimates of maternal mortality. Population based studies are the best method for estimating the level of maternal mortality, but have rarely been carried out. The most important reason for the lack of good population based studies on maternal health is the relative rarity of maternal death, particularly compared to childhood deaths. The study of such rare events requires extremely large sample sizes and accurate reporting by the respondents. Furthermore, most surveys on family formation patterns involve interviews with living mothers on health status and survival histories of their children, and information on maternal deaths obviously can not be collected in this

manner. However, interviews with family members may yield some information, but is likely to be inadequate. Vital registration in developing countries are also likely to underestimate the magnitude of the problem, since registration is usually incomplete and since cause-of-death information is generally inaccurate. For instance in a study in rural Kenya covering more than 20,000 inhabitants, only 4 maternal deaths were registered in 7 years of fortnightly household visits. From this sample no firm conclusion could be drawn about the level of maternal mortality except that it was "extremely high". The data collection methodology, though logical was inadequate for a rural set up where adult illiteracy is still prevalent. As Daniel Holness of UNFPA observed, "the incidence of maternal mortality is still widely underrated and not widely reported because the victims die in isolated circumstances far from health centres". A hospital based survey would otherwise assist in more accurate estimation (Studies in Family Planning No.18, April/May 1989).

An explanatory survey was undertaken in KNH by Makokha A.E 1980. The study on maternal deaths covered the period of 5 years from 1972-1977 during which of 20,510 deliveries 99 hospital maternal deaths were registered. This gives an average maternal mortality rate of 4.8 per 1,000 deliveries. Infection and haemorrhage have been shown to play the leading role in the maternal deaths. Other factors like age, parity, social status and type of antenatal care were shown to have relationship with the overall maternal mortality rate.

A retrospective study of maternal deaths at Pumwani maternity hospital (PMH) for the period of 9 years from 1975-1984 was carried out by Ngoka and Bansal. During this period, there were 223,111 births and 150 maternal deaths giving an incidence of maternal mortality of 67.2 per 100,000 births. Eclampsia and severe pre-eclampsia, puerperal sepsis, ruptured uterus and postpartum haemorrhage were among the leading causes of maternal deaths. In all the 3 above mentioned studies qualitative relationship between non-medical factors and the maternal mortality is lacking.

Among the non-medical factors that lead to maternal deaths, two of the most important are parity and age. Variation in maternal mortality is more prevalent than variation in any other cause of death for female death rates in the age interval 15-24 and 35+ years. Another important factor is partly where high maternal mortality risk is found among the nulliparous, primigravida, and grandmultiparas[1]

The demographic, social, economic and environmental factors therefore need detailed analysis to improve upon the previous studies done in major hospitals in Kenya where maternal and reproductive health care are undertaken.

Nakuru town was selected for study because of its central geographical location and fairly high density

[1] Nulliparous - No child (confinement)/Has never been Pregnant
Primigravida - Her first child (confinement)/Pregnant for the first time
Grandmultiparas - Several Children (confinements)/Has been pregnant before

population. The area has of recent been experiencing high population growth due to migration. This phenomena is attributed to the increasing Agro-industrial growth and upcoming of large settlement schemes after the country's independence, job search, attractive urban infrastructure e.t.c. Many people from different ethnic and cultural background have made the area unique for survey. Different results of social and cultural factors are expected due to the effect of not only the urban set up but also the conflicting cultural values.

Abortion related deaths are not always included in maternal mortality despite the fact that it is a very important cause having been associated with over 20 per cent of all maternal deaths. Though, the institutional surveys (Aggarwal and Mati, 1982; Makokha, 1980; and Ngoka, 1985) in KNH and PMH have excluded it in the analysis as a cause of maternal death. But according to Aggarwal and Mati 1982, abortion from teenagers constitute a large proportion of all emergency admission to the KNH gynaecological ward. Restricting the study to the definition of maternal mortality as in the International Classification of Diseases version 9 by the World Health Organisation, abortion related deaths will be included.

Major concern of the study is directed to the experience of women who are admitted to a hospital having considered only a select sample of them deliver in hospital and those who are suffering from serious complications. Therefore those women who deliver normally are not included for analysis because their coverage would require both

hospital based and field based data collection which is curtailed by the research financial allocation inadequacy. To avoid extreme underestimation, inclusion of mortuary statistics to account for the death that occur outside hospital is done.

The hospital under study are NGH, MN&MH and NWMH. The NGH is a government assisted hospital while MN&MH are private hospitals. The 3 hospitals cater for all the economic and social classes in the area. Hospital deliveries were done only in the mentioned hospital before the nakuru Nursing home started its operations. The municipal maternity hospitals and Nakuru general hospital Annexe are part of the general hospitals operation. For instance major theatre operations or any emergency cases are referred to the main hospital. Likewise women in childbearing related cause and are of parity 0+0 or 4+ are compulsorily referred to the main hospital.

Most deliveries are in homes, district hospitals (Molo and Naivasha), health centres and missionary hospitals. Though, NGH is a district and provincial referral hospital, most mothers who deliver there are from Nakuru urban or the near rural area. According to the preliminary test undertaken, the maternal referral cases constitute less than 5 per cent of all maternal deaths, thus the results are unlikely to have wide variations due to the aforesaid factor. The hospital data will therefore not be a representative of the municipality or the district but as a study unit of the subject (maternal mortality) due to its accessibility and centralized data.

The period selected is 1981-1985 inclusive. Coding at the hospitals began mid 1980 making previous years unusable for analysis. On the other hand the most recent information is only available in the private institution. Otherwise at the NGH, the problem is coding of government hospital's recent data and not its availability. For this reason, the authority was reluctant to release the uncoded documents.

It is hoped that the study will provide some possible solution to major socio-medical problems that are prevalent among females of childbearing age. The study will be a guide in sex mortality studies. It will facilitate policy making and further research recommendation.

Last but not least, as a student of demography, the study is of interest and it is our hope that it will benefit the researchers in this and other related fields.

1.4 Objectives

Main Objective

To find out the determinants and levels of maternal mortality as compared with non-maternal female mortality in the reproductive age set and to establish its significance using hospital-based data.

Specific Objectives

(1) To find out the major medical causes of maternal mortality and non-maternal female mortality in reproductive age group.

(2) To assess the relationship between the

leading causes of maternal death and the demographic factors.

(3) To analyze the relationship between the demographic factors and abortion.

(4) To establish the relationship between ante natal clinic attendance and maternal mortality.

(5) To examine the relationship between the mode of delivery and maternal mortality.

(6) To find out the relationship between the place of delivery and maternal mortality.

(7) To analyse the relationship between residence and maternal mortality.

(8) To establish the relationship between ethnicity and maternal mortality.

(9) To assess the contribution of abortion to maternal mortality.

(10) To find out the relationship between demographic factors and maternal mortality

1.5 Background of the Study Area

Nakuru District is one of the largest districts in the Rift Valley (See Map 1).

The total population of the district was 290,853 in 1969, 522,333 in 1979 and 846,810 in 1988 (est.). The annual intercensal growth rate is 6.04 being the highest in the republic while the growth rate is 3.4 per cent which is also above the national rate (Nakuru District Development Plan 1989-1993). The population increase can be attributed to migration especially from other districts because of

settlement schemes, land buying companies and employment opportunities. This has made the district to have practically most of the tribes in the country. The rate of urbanization is also high with the largest increase being recorded in Gilgil town.

The district has an infant mortality rate of 120 for every 1000 births (Nakuru District Development Plan 1989-1993). As shown in Table 1.2 and 1.3, the district has a high proportion of young people. For example 62 per cent of population are below the age 20 years, while 36.5 per cent are in the age group 24-50 years. From 1979 census, the sex ratio of the district was 105.8 males to 100 females a sharp contrast to other farming districts where females tend to be the majority. Most of the immigrants into the district are young people who are in search of employment.

According to the Central Bureau of Statistics between 1969 and 1979, the total population of persons born outside the district increased from 159,387 to 263,415 implying that over 100,000 people moved into the district over the decade. Indeed, over half the districts population in 1979, was born elsewhere and could be termed as immigrants.

Females in the reproductive ages of 14-49 were 113,392 in 1979. This figure is estimated to increase by 67 per cent in 1988. Over 49 per cent of the population is made up of children between the ages of 0-14 years and according to statistical analysis this age had the highest increase between 1979 and 1988 indicating a high birth rate in the district.

MAP 1

Location Of District

Source; Nakuru District Development Plan 1989-1993
MPND

Table 1.2 KENYA AGE AND SEX TOTALS, AGE GROUP 15-49

ASSUMING CONSTANT LEVELS OF MORTALITY AND FERTILITY

AGE	1981 MALE	1981 FEMALE	1981 TOTAL	1982 MALE	1982 FEMALE	1982 TOTAL	1983 MALE	1983 FEMALE	1983 TOTAL	1984 MALE	1984 FEMALE	1984 TOTAL	1985 MALE	1985 FEMALE	1985 TOTAL
15-19	896262	895307	1792569	947284	945797	1893081	1000843	997737	1998580	1056151	1051281	2107432	1112395	1105567	2217962
20-24	697090	708512	1405602	725943	735603	1461546	757185	765126	1522311	791393	797655	1589048	829134	833752	1662886
25-29	552270	575694	1127964	575504	597292	1172796	600044	619963	1220007	625846	643767	1269613	652892	668778	1321670
30-34	445242	470509	915751	461418	487489	948907	478577	505202	983779	496830	523701	1020531	516282	543032	1059314
35-39	363710	385138	748488	476268	398897	775165	389365	413197	802559	403054	428060	831114	417411	443506	860917
40-44	295672	314701	610373	306113	325822	631935	316928	337361	654289	328117	349340	677457	339684	361777	701461
45-49	238716	255912	494628	246967	264896	511863	255520	274195	529715	264396	283830	548226	273617	293823	567440
	3488962	3605773	7095375	3739497	3755796	7395293	3798462	3912781	7711240	3965787	4077634	8043421	4141415	4250235	8391650

Table 1.3 NAKURU AGE AND SEX TOTALS, AGE GROUP 15-49

ASSUMING CONSTANT LEVELS OF MORTALITY AND FERTILITY

AGE	1981 MALE	1981 FEMALE	1981 TOTAL	1982 MALE	1982 FEMALE	1982 TOTAL	1983 MALE	1983 FEMALE	1983 TOTAL	1984 MALE	1984 FEMALE	1984 TOTAL	1985 MALE	1985 FEMALE	1985 TOTAL
15-19	29466	29664	59130	31535	31699	63234	33733	33861	67594	36038	36124	72162	38423	38460	76883
20-24	26379	23350	49729	27656	24500	52156	29038	25752	54790	30549	27127	57676	32213	28649	60862
25-29	21511	19460	40971	22609	20408	43017	23767	21409	45176	24976	22467	47443	26240	23586	49826
30-34	17385	15208	32593	18139	15940	34079	18939	16710	35649	19792	17520	37312	20702	18374	39076
35-39	14241	12825	27066	14850	13456	28306	15488	14120	29608	16159	14817	30976	16864	15548	32412
40-44	10804	8882	19686	11282	9327	20609	11782	9794	21576	12301	10285	22586	12843	10800	23643
45-49	8182	6822	15004	8551	7175	15726	8936	7545	16481	9338	7935	17274	9761	8343	18104
	127968	116211	244179	134622	122505	257127	141683	129191	270874	149153	136275	285429	157046	143760	300806

FIGURE 1

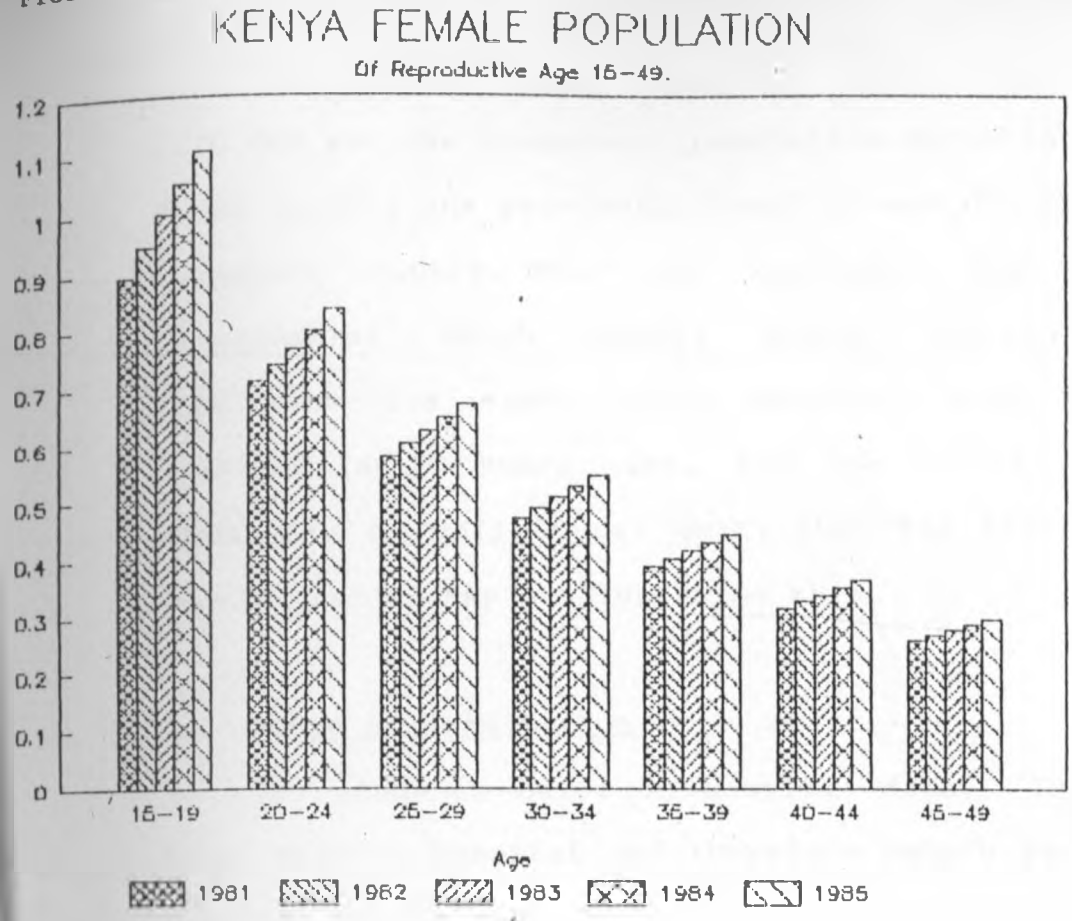
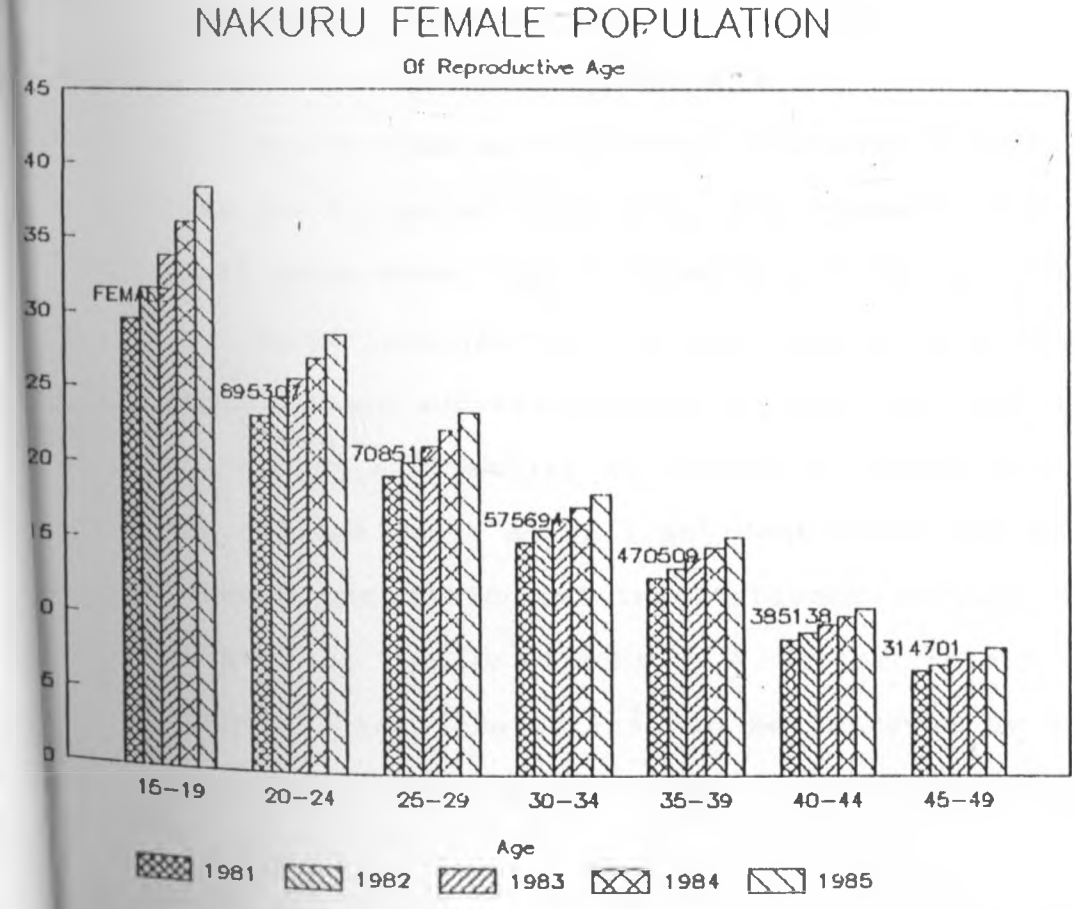


FIGURE 2



The health center facility population ratio is 1:10,000 and the dispensary population ratio is 1:14,000. There is only one provincial hospital and two district hospitals namely Molo and Naivasha. The rest are dispensaries which mostly serve institutionalized population i.e army, youth service. With population doubling in 10 years time, and the health facilities increasing by only 20 per cent, then the facilities are overutilised. Map 2 illustrates this.

1.6 Scope and Limitation

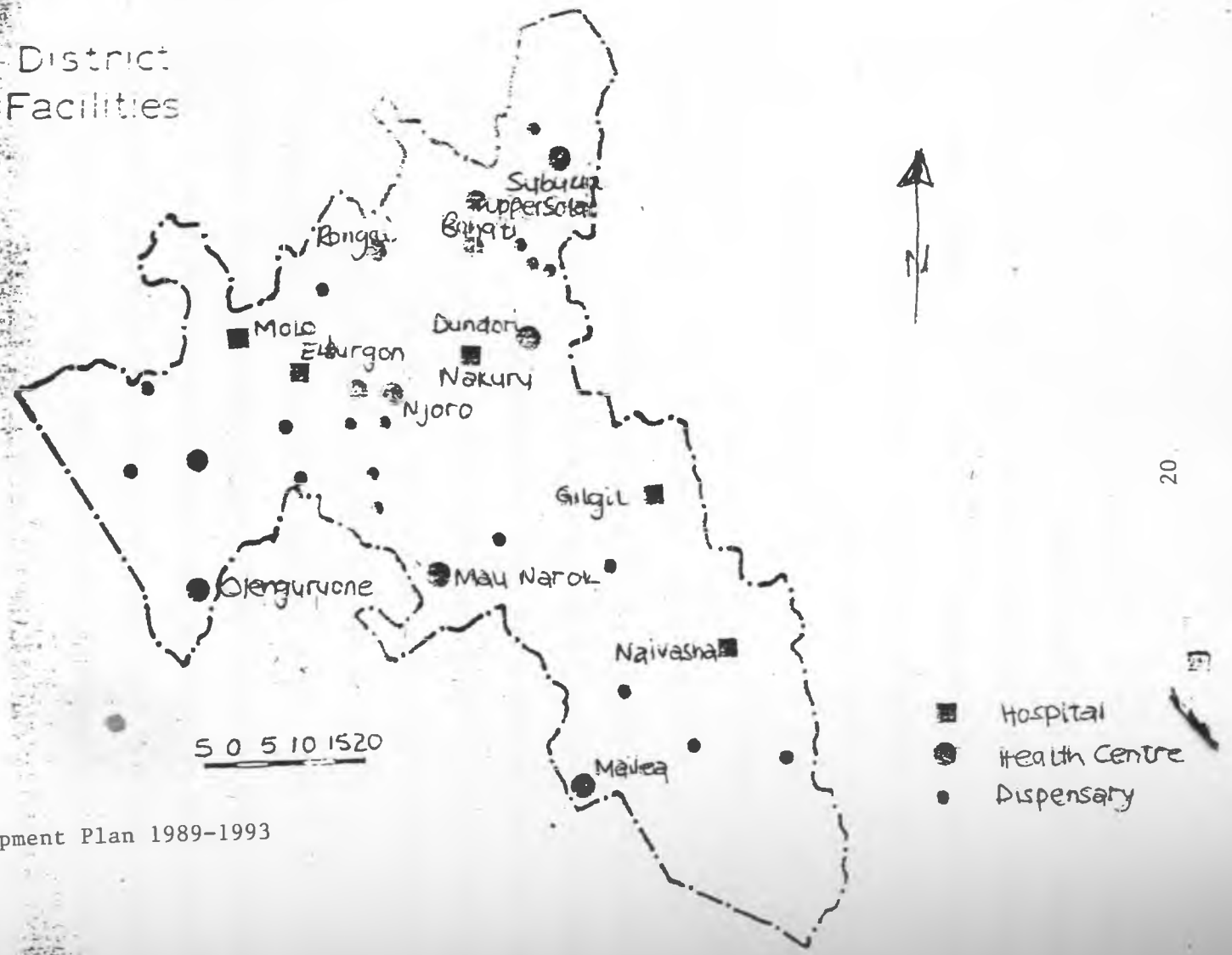
The study is based on hospital data. There is no large private hospital and therefore Nakuru War Memorial Hospital and Menengai Nursing and Maternity Hospital were merged to serve the purpose especially as far as comparison of contextual variables are concerned e.g. income, occupation differentials .

Due to time and financial resources handicaps such as time and financial resources, the research is limited to a small urban area. Rural based hospitals are not included.

No national survey has been done on maternal mortality and the field surveys carried out have not been successful. Our survey will assist in providing backup information to the earlier ones, as well as identifying the missing link between the field and institutional surveys in matters related to female deaths. A better interpretation of hospital based statistics can be improved by taking into account the coverage of births, nutritional standards of

MAP 2

Nakuru District Health Facilities



Source; Nakuru District Development Plan 1989-1993

MPND

the mother, traditional birth practices and beliefs, income and occupation, education, level of awareness and knowledge of maternal health e.t.c. Though the format of the in-patient file allows for this need, the information is not extracted from the patients by the authority. Due consideration is given to the fact that most patients are admitted in critical conditions such that some in-formation would seem irrelevant.

A major problem with cause-of-death statistical interpretation and especially that which pertains to maternal deaths, is that only the proximate cause is recorded and seldom are the underlying causes noted. For instance obstructed labour which may lead to ruptured uterus or sepsis would not be regarded at the expense of the later. Also some report only the underlying cause such as diabetes without the mention of pregnancy. The cause-of-death is not possible because the admission diagnosis might be different from the reported one. For analysis purpose the cause of death is taken to be the one indicated on the disease index card. Unless otherwise.

The coverage of maternal deaths by hospitals is higher than the coverage of births which occur successfully in other localities. Thus the comparative hospital based birth estimates are rendered less reliable.

The few cases received by NGH as referrals, do not contain some information. Follow up of such cases is impossible given the possibility of the expected non-response since the experience is a bitter event. Maternal death is defined here as death that has taken place within

42 days after delivery. Some maternal related deaths are obviously left out because of this arbitrary time limitation.

Abortion cases are always underestimated given that it is an illegal act. Also some abortion complication are substituted with a different cause because of the negative attitude people hold for it. Backstreet abortion incidents are impossible to locate and if located, there is no assurance of finding reliable and satisfactory results. Mortuary statistics have been used to complement this inconsistency.

The authority (administration) prohibited the use of non-maternal files for further analysis because of their large number. Instead, sampling and weighting of the cases in question assisted in analysis.

Having considered the above limitations the study depends on estimates to draw up conclusion.

C H A P T E R T W O

LITERATURE REVIEW

2.1 General Review

"Sex differential in age-specific mortality favours females in most countries at all ages, the exception normally involving the reproduction ages" (Stolnitz).

Today at the global level, attention is again being placed on the health problems of women. However, most studies on the medical impact of childbearing patterns have been carried out in the more developed countries of North America and Europe. Demographers, public health workers and physicians have a long-standing interest in maternal health programmes as an explanation of sex differentials in mortality e.g. Buchanan 1975, El-Badry 1969.

Eckholme et. al. 1977 observes that "since the under nutrition and lack of sanitation prevalent in developing countries multiply hazards of any pregnancy, the findings of the studies in the developed countries almost certainly underrate the dangers faced by the poor from unlimited fertility". They further reiterate that the absolute extent of risks to hazards of pregnancy is primarily determined by social and environmental conditions. For example, a 42 year old Swedish woman faces a far lower hazard from giving birth than does a 24- year old woman in rural Pakistan. Also, childbirth among white women in the United States are only one-third as frequent as those among non-white. But generally, within every society and at

every socio-economic level, mothers give birth too early or too late in their life (Chen et. al. 1974; Omran 1971). Maternal mortality in developing countries has been estimated at 400 per 100,000 live births[1], whereas levels in most of the developed countries are below 25 per 100,000 live births. According to estimates by the World Health Organisation (WHO), at least 500,000 women worldwide die every year from complication of pregnancy, abortion and childbirth. An illustration of the world maternal mortality rate is shown in Map 3.

A Study done by UNDP and the ILO in Rwanda 1983 showed that women worked an estimated 2,490 hours per year, compared to 1,400 for men. This coupled with fertility rate of 2.1 (South Asia), 2.5 (Latin America) and 3.2 (Africa) expose the women to more health risk. In this regard the UN has stated the following

> "In Latin America and in particular East Asia, childbearing is much less frequent than South Asia and Africa, and life expectation are much higher. Maternal causes of death are likely to be less significant, and probably responsible for less than 10 per cent of all deaths among women 15-49 years. In Latin America, the rate would be 0.27 per 1,000 women (Populi vol.18 No.4, 1987)In South Asia, general mortality is equally high but fertility is lower than Africa. The maternal mortality rates is similar to the one in Africa, that is 0.85 and 1.28 per 1,000 if 20 and 30 per cent, respectively, of all deaths among females 15-49 years are related to maternity. The women in S. Asia and Africa account for 90 per cent of all maternal deaths in the world, even though they constitute only 41 per cent of all women 15-49 years. An important part of this unacceptably high death toll is associated with the prevailing high levels of fertiity in these countries (populi vol.18 no.4, 1987).

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[1] Live births are the live born children. They are those births that show evidence of life, such as respiration, movement of voluntary muscles or heartbeat of the child after complete expulsion or extraction.

For Africa as a whole, where high expectancy is low (52.4 years for 1980-1985) and fertility is high, it can be assumed that at least 20 per cent of all deaths among females of reproductive ages are due to maternal causes. This corresponds with a maternal mortality rate of more than 0.88 per 1,000 women 15-49 years and a ratio of more than 436 per 100,000 live births (Populi vol.18 No.4 1987).
Nowhere does maternal mortality take a greater toll than in Sub sahara Africa. Each year in the region an estimated 200 million women become pregnant and give birth to 128 million children. Of these, it has been calculated that half million die during pregnancy, labour or in the port-partum period (Damele Holness; Populi vol.16 No.4, 1989)".

Mtimavalye adds that "Nevertheless during the last decade of the 1970's Africa has began to know problems related to reproductive health as some of these problems have taken a serious turn, which threatens Africa's future". Reproductive health care among women in Africa is increasingly becoming a matter of concern to demographers, public health officials and physicians. In most parts of Africa over 20 per cent of all females are in the reproductive age group of 15-19 years. For example, in Tanzania, 21 per cent of all females are aged between 15-49 years". Some studies on maternal morbidity and mortality have been completed in Africa, but only for specific hospitals and are not considered representative for whole countries or the communities in which the hospitals are situated. Such hospital based studies include the works of Bullough (Central region of Malawi, 1977), Okiosor (Lagos University Teaching Hospital-Nigeria, 1976-1977), Makhokha (Kenyatta National Hospital-Kenya, 1972-1977) and Mtimavalye (Mhumbili Medical Centre-Tanzania, 1974-1977). The maternal death rates derived from these studies varied between 10 to 40 times those of Finland in

MAP 3

A Woman's Lifetime Risk of Maternal Death, by Region

Around the world women's lifetime risk of dying from pregnancy-related causes differs 500-fold—from one in 20 in tropical Africa to 1 in 10,000 in northern Europe. Lifetime risk (R) is calculated using the maternal mortality ratio (MMR) and the total fertility rate (TFR). $R=1-(1-MMR)^{TFR}$

Sources: Haub & Kent (153), Herz & Measham (159), WHO (417)

Source; FEEDBACK Vol xv No.2 April 1989

1973, for the estimates were about only 0-11 per 1000 deliveries Mtimavalye (1982). However, Mtimavalye acknowledges the fact that most maternal deaths are basically preventable. Such preventable cases include post-partum haemorrhage (leading killer of mothers), ruptured uterus, puerperal sepsis, obstructed labour, anaemia of pregnancy and postabortal sepsis. This is where knowledge of how demographic, socio-economic and environmental factors influence maternal deaths and illness may help in their prevention.

In East Africa, the picture is much the same. There are no national surveys to ascertain national levels and patterns of maternal mortality and morbidity. However the works of Mtimavalye (1982) and Armon(1978) (Tanzania), Mati(1982), Makokha(1980), Ngoka(1985) and Aggarwal(1982) (Kenya) and Ndugwa(1977) (Uganda) have tried to give an insight into the problem even though only at institutional levels. All these studies single out inadequate health care facilities as the basic problem. Being physicians, they are also more concerned with the immediate medical complications that lead to high maternal mortalities and morbidities in the region.

Most demographers consider age and parity as the main factors related to maternal deaths. Nortman 1974 observed that for any socio-economic groups, obstetrical complications e.g. Toxaemia, Haemorrhage, Sepsis (infection) and prolonged labour (defined as effective contractions for more than 24 hours) increased markedly with maternal age among both whites and blacks.

It is also now well documented that factors of maternal age, parity and birth intervals have a significant impact on maternal health (Buchanan 1975, Koenig 1988, Nortman 1974). To minimize maternal mortality, the frequency and timing of childbearing must be regulated (Omran 1971). Because of the centrality of procreation in the life of African women, early marriages are common with a maximum number of deliveries (Populi vol.16 No.4, 1989). Some demographers also acknowledge the fact that the influence of maternal age and parity are also mediated by economic circumstances, cultural factors and beliefs, genetic predispositions, health and nutritional status, environmental conditions and medical care, but that even under the best conditions differential risks by age and parity persist (Nortman 1974).

For the effects of parity Kitagawa and Hauser note that the number of children per woman, especially past third child, controlling her educational attainment is positively associated with her subsequent mortality from all causes combined. Eckholme et al (1977) point out that practice does not make perfect in childbearing. Quite the contrary it entails danger. But the actual level of risk involved in childbearing depends also on the mother's social milieu. The socio-economic factors are the overwhelming determinants of the level of risks which increases as the number of children born to a woman passes three. The pattern seems to be prevalent among the world's lowest income groups in Africa, Asia and Latin America where women bear more than 5 children each.

Berry (1977) study on the influences of age and parity on maternal mortality in U.S. between 1919-1969 found that these two demographic variables had some influence on maternal mortality rates even during an era of rapid overall decline. It was concluded that the frequency and timing of births must be regulated if maternal mortality is to be brought to an irreducible minimum. She further observes that age and parity distributions in the U.S. for the same period of study 1919-1969 were more favourable to low maternal mortality than the childbearing pattern prevailing in many less developed countries today. If these more favourable distributions of births influenced maternal mortality rates then, as concluded, the distributions with broader age ranges and higher parity births certainly contribute to the high rates of maternal mortality now prevailing in parts of Africa, Asia and Latin America. Research in support of this argument by Jelliffe (1966) found that short birth intervals lead to physical exhaustion and nutritional impairment of mother, the "maternal depletion syndrome". There is also a higher probability of pregnancy loss and low birth weight Winnikoff, 1983)

Parity of mother and nutrition are shown to be correlated in other literature (Gopalakrishnaya 1972). A woman is in greatest danger if she is poorly fed, for pregnancy and lactation both exert a heavy nutritional cost. Poor women are seldom able to offset this by increasing the quantity and quality of the food they eat. When pregnant, a moderately active, well fed woman needs

roughly 300 calories per day more than she would otherwise need. When nursing, she needs an even larger dietary supplement. If she does not get the supplement, her body draws upon its reserves. Both mother and infant suffer as a result. "The maternal mortality is too often the end result of a life diminished by discrimination from the moment of birth to early marriage". (Halfdan Mahler).

Such documentary evidence on the relationship between maternal age and pregnancy outcome establishes that risk of mortality or morbidity to mother or child is minimal when the mother is neither too young nor too old and when the child is of moderate birth order, not exceeding four. Women who become pregnant before or after their prime reproductive years therefore take on added health risk for both themselves and their infants. United States study from 1974 revealed that the incidence of deaths associated with pregnancy and childbirth among American women climbs steeply after the mother pass age 30, rising from a low of 10 maternal deaths per 100,000 births among women in their early 20's to 86 deaths per 100,000 births among women in their early 40's, and then to 234 deaths per 100,000 births among women over 45 years (Berry, 1977).

In the developing countries, maternal risk also climbs dramatically with age. Perkin (1969) in a study of 18,000 deliveries at women's hospital in Bangkok, Thailand in 1964 found the expected J-shaped relationship of age in complicated deliveries. From 13.3% among women aged 15-19 the rate dropped to 11.2% at ages 20-24 and rose to 23.4% and 21.3% among women aged 40-44 and 45+ respectively.

Also in Thailand in 1971, maternal death rates rose from 54 per 100,000 births among women in their twenties to a grim 474 per 100,000 births among women in their forties.

At Matlab, Thana in Bangladesh, between 1968-1970, Koenig observed that maternal death rates rose from 380 to 810 per 100,000 deliveries for women in their twenties and to those in forties respectively. Another study by Koenig in 1988 for the period 1976-1985 found a U-shaped curve with death rates reaching 743 per 100,000 live birth for age group 15-19 which dropped to 426 per 100,000 deliveries for women in their 20's and then rose again to 791 for women in their 40's.

Coyaji points out that poorly performed abortion claims approximately 200,000 women annually. Moreover clandestine abortion are increasing among adolescent school girls because of the repressive legislation against contraception (populi vol.16 no.4, 1989). This would be reduced if family planning were available to the victims. Rosenfield and Maine (1985) point out that abortion is presently prevalent in most less developed countries, where it is illegal.

2.2 Review For Kenya

In Kenya, Malone (1980) observes that it would be reasonable to assume that the quality of antenatal care delivered in hospitals and health centres in Kenya does influence not only maternal but also perinatal morbidity and mortality. Makokha (1980) in his study of maternal deaths at Kenyatta National Hospital between 1972-1977,

analyzed his findings in relation to actual (medical) cause, annual distribution, age, parity, marital status, antenatal care, complications of pregnancy, labour and the puerperium and their management mode and place of delivery (for the referred cases) and the type of attendant (doctor, midwife, nurse, clinical officer or traditional (again for referred cases)). Makokha's finding concerning the relationship between age and parity of mother and the risk of dying rather nullifies the hypothesis that the risk of maternal deaths increases with age and parity. In the 99 deaths in his survey more than 50 per cent of dead mothers were aged between 15-25 years, half of them being 15-20 years old and 27 per cent being 26-35 years of age. Only 3 per cent were aged 36 and over years, the maximum age recorded being 40 years. For parity, he found that 57 per cent of the 99 cases were deaths of low parity between 1-3 children. Nearly half of them were young women pregnant for the first time. But he acknowledges that the majority of deaths were related to abortions especially for single mothers (39.4 per cent). Thus the other factors may explain the cause of such deaths. Makokha's work, therefore went along way in recognizing some of the non-medical factors that operate on women to cause maternal mortalities.

Ngoka (1987) also did a retrospective study of maternal deaths at Pumwani Maternity Hospital for the period 1975-1984 and found an incidence of maternal mortality of 67.2 per 100,000 deliveries/births. Of the 223,111 births during the 10 year period at the hospital,

there were 150 maternal deaths. The analysis confined in deaths in relation to age, parity, gestation time of death and records of antenatal care. From his analysis, he found that high maternal age is a very important predisposing factor in maternal mortality and that deaths occurred mostly among primigravidas and grandmultiparas. Like Makokha, he acknowledges the contribution of social, personal, medical, health care and administrative factors to increased maternal mortalities in Kenyan hospitals.

On abortion, the works of Ngoka(1985), Muraya(1986), Aggarwal and Mati(1982) deserve to be mentioned. At the Kenyatta National Hospital abortions contribute a lot to maternal health problems. Teenage pregnancies accounted for 11.1 per cent of the total pregnancies, Ngoka and Mati (1980). In another study at the same institution, 28 per cent of all abortions were found to occur in teenage mothers and 43 per cent of all procured abortions were in teenagers (Aggarwal and Mati, 1982). These studies therefore recognize that teenage pregnancy has become a common and important obstetric problem, not only in Nairobi but for the whole country, threatening the health of both mother and child.

Aggarawal and Mati (1982) note the fact that maternal mortality is high in abortion cases. Their retrospective study of abortion cases at Kenyatta National Hospital from January to June 1978 found 3 abortion deaths per 1000 abortion admissions.

Apart from immediate complications and risks, physicians also warn of the fact that septic abortion

patients later suffer from pelvic ectopic pregnancy, miscarriage and premature deliveries due to a lacerated cervix. All these factors give rise to high rates of maternal and perinatal deaths and illnesses. Most literature on the problem of abortion therefore recommend countrywide health education programmes with particular emphasis on sex education and family planning. Ensuing that the population is aware of contraceptive measures may go a long way in reducing not only morbidity and mortality from septic induced abortion, but, also the general maternal mortality and morbidity levels among women of reproductive ages.

The study will focus more on maternal and non-maternal causes of death and their age-specific mortality rates. The distribution of maternal mortality to female non-maternal mortality as age-specific mortality rates is also considered. The implication is that high rates of maternal mortality is significantly associated with high death rates in the early and late years of reproductive age. Parity and marital status will be analyzed.

From the foregoing literature, age, parity, abortion and age at first birth have been analyzed in relation to maternal mortality. In these study other variables like ante natal clinic attendance, marital status, ethnicity, residence, place and mode of delivery will be analyzed.

2.3 Theoretical Framework

Mortality in a given population is determined by a complex set of frequently interrelated variables, including

biological, social, economic, environmental and cultural factors. The foregoing literature review demonstrates how some of these variables interact in influencing mortality.

A framework to show the effect of the various factors on maternal mortality is adopted from Makokha's work at KNH 1980 on maternal deaths between 1972-1977. Conceptualization of the linkages between mortality and various factors will therefore be developed for further explanations. The basic analysis of maternal mortality is based on modification of Chen and Mosley framework of child survival 1984. The framework is based on the premise that determinants of child mortality operates through a set of proximate determinants to exert an impact on mortality.

The Chen and Mosley model recognises the fact that the socio-economic determinants operate through some biological mechanism (intermediate variable to produce the levels and patterns of mortality observed in a given population, Mosley (1980). He stressed that while most demographic research relating to mortality and socio-economic variables has ignored the mechanism through which the variables operate, biomedical research on the other hand was focused on the causes of death ignoring the social and economic intervention measures.

Specific medical causes of death are generally not addressed by social scientists and the mechanisms by which socio-economic determinants operate to reduce the observed mortality differentials remain an unexplained factor.

Growth faltering and ultimately mortality in mothers (dependent variable) are a cumulative consequence of

multiple disease processes including their biosocial interactions. Only infrequently is a death the result of a single isolated disease or non-biological episode.

In the study, the model based on Makokha's work will be used to help in formulation of a study model. In Makokha's model, the factors used are environmental, socio-economic, socio-cultural, demographic, medical health care and,administrative and personal. In the research, both biological and non-biological factors will be looked into and analyzed.

A study model will be formulated and drawing on the literature review already discussed, a conceptual model with the following classification of variables will be used.

Demographic factors

Age

Parity

Marital status

Age at first birth

Socio-economic

Residence

Cultural

Ethnicity

Environmental

Place of delivery

Medical and Health care

Ante natal clinic attendance

Mode of delivery

Abortion is an intermediating factor in the forgoing analysis. It has a causation effect on maternal mortality. The subject is affected by all the factors outlined above but in this study biosocial variables will be considered for further analysis.

2.4 Explanation and Definition of Concepts

Cause of Death

" The cause of death to be entered on the medical certificate of cause of death are all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries. The underlying cause of death could be

1: The disease or injury which initiated the train of events leading directly to death.

2: The circumstances of the accident or violence which produced the fatal disease. The definition does not include symptoms and modes of dying,such as heart failure,respiratory arrests etc. The problem of classifying causes of death is simple when only one cause of death is involved. However, two or more morbid conditions contributes to the death. In such cases, it has been the traditional practice in vital statistics to select one of the causes for tabulations. In order to make uniform the terminology, and procedure for selecting the cause of death for primary tabulation, it was agreed by the sixth decennial international revision conference that the cause to be tabulated should be designated the underlying cause

of death" (a conventional definition as in the International Classification of Diseases version 9 by WHO)

Age

Age refers to the number of years lived by the mother until the time of death. The variable measurement is a continuous one. The first years of reproduction 15-24 and 35+ years being a high risk of death from childbearing episode. The risk is related to the female physiology and

Figure 3

CONCEPTUAL MODEL

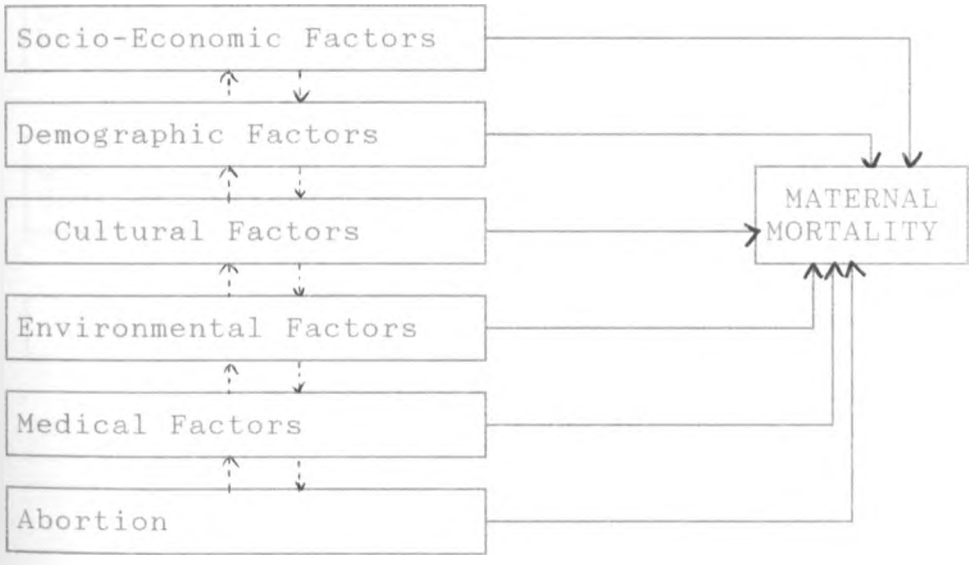
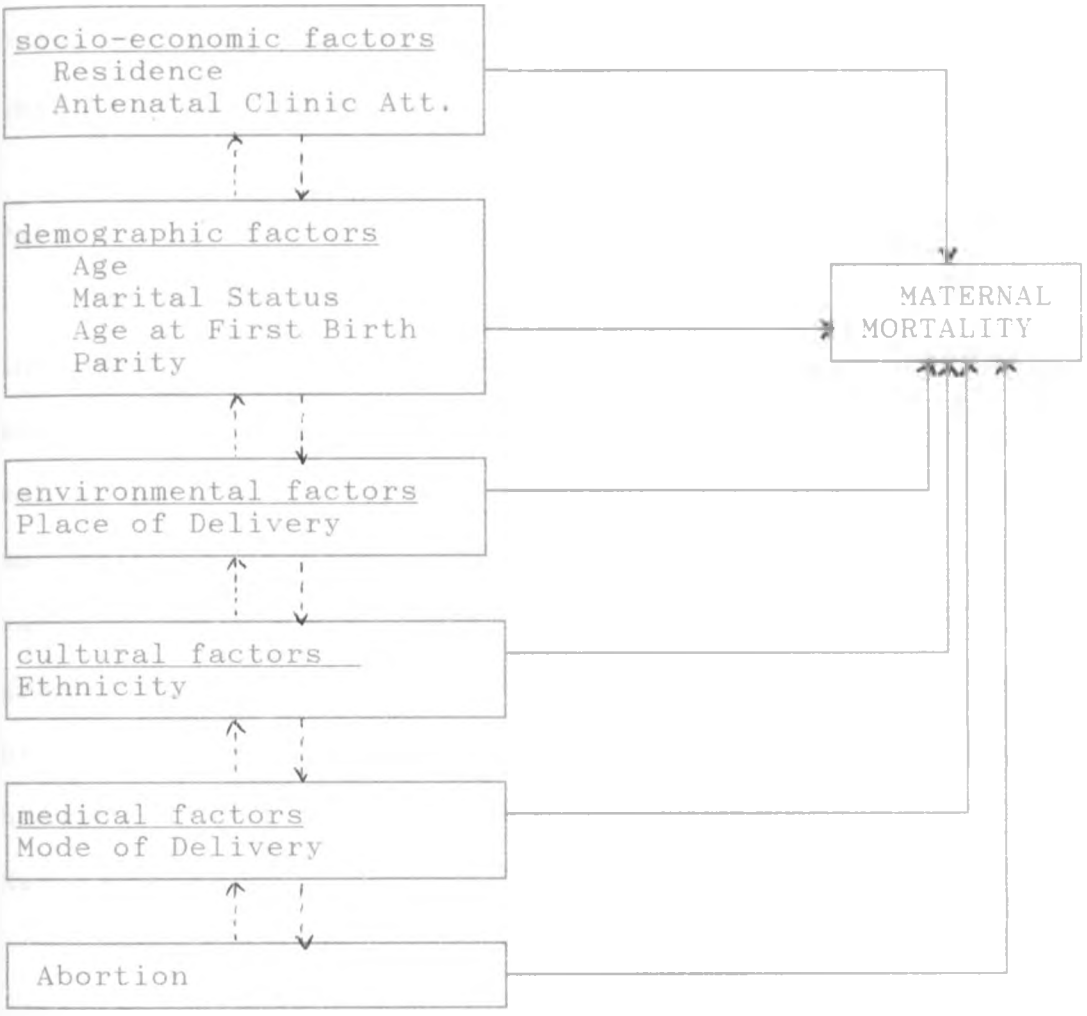


Figure 4

OPERATIONAL MODEL



the maternal related diseases. Though an important demographic variable, it has numerous problems including age misstatement, heaping, shifting and to some extent is just indicated as "A" for adults and "minor" for children. Cross checking was done from the various sources that were used in data collection.

Parity

Parity is measured as the number of children one has including the present live birth or pregnancy which has the same risk exposure to the mother. It is not a continuous variable. It is widely believed that higher maternal mortality is related to higher parity. The parity will be categorised into nulliparous, primigravida and grandmultiparas. Parity involves frequency and timing of births whereby if unregulated poses a risk to maternal health.

Marital Status

This variable is binary distinguishing as married (ever or currently) and not married (not or never). The variable is measured as a dummy variable. The status affect the socio-psychological state of the mother and especially when she is pregnant. It is indirectly related to abortion and therefore a measure of maternal mortality causation.

Age at First Birth

This refers to the age a woman gets the first baby irrespective of marital status. "because of the centrality of procreation in the life of African women, early

marriages are common with a maximum number of deliveries (populi vol.16 No.4, 1989)". Higher parity and tender age are related to high risk of death. It is categorised into three age at first birth groups.

Residence

Place of residence will be used to refer to the victims residence at the time of death. It is a binary variable categorised into urban and rural residence. The general social and economic levels of Nakuru rural and Nakuru urban will be used in interpretation since accessibility in terms of cost, distance and communication are difficult to infer from the records.

Ante-Natal Clinic Attendance

The variable is a binary. Reference is made as to whether one has ever attended clinic or not but the number of times one attended are not crucial in this study. Education on preparation of delivery or any emergency related to human health is delivered in MCH. Therefore this clinic not only reflect the awareness and knowledge of the childbearing risk by mothers but also the expected delivery complication before time of delivery.

Ethnicity

Ethnicity is used to refer to the major ethnic group (tribe) of the victim. It is measured as a categorical variable of nine ethnic groups. The traditional practice and beliefs differ with different ethnic groups especially

those observed by pregnant and weaning mothers. In turn they have impact on maternal health. Therefore, this variable is used as a proxy for this cultural factor.

Mode of Delivery

Four forms of delivery will be distinguished. They are Normal delivery, Caesarian section, Vacuum extraction and Induction. It is measured as a categorical variable.

Place of Delivery

Home or hospital deliveries are distinguished. Operationally, the place of delivery outside a medical institution is categorised as a home delivery. This variable is measured as a binary variable.

Abortion

Abortion is either spontaneous[1] or induced[2]. In Kenyan context of cause of death, there is no clear differentiation between the two terminologies. Therefore the analysis will not venture into the division but analyze the two as one variable.

Diagnosis

The cause of death is classified according to the ICD as recorded in the disease index card.

The survey was initiated with a pilot study conducted in September. Following that, a few rectification were

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[1] refers to abortion or miscarriage following a non-induced intrauterine death.

[2] intentional abortion - opposite of the spontaneous

made where some variables were left out of the study due to their inconsistency and mispresentation.

Names and Variables Used in the Analysis

VARIABLES	NAMES
Matern	Maternal cause
Abort	Abortion victim
Demographic	
Age	Age of the victim
AgeB1	Age at first Birth
Parity	Children ever born to a woman
Marsta	Marital Status
Socio-Economic	
Reside	Place of residence
Environmental	
Place	Place of delivery
Cultural	
Tribe	Major ethnic groups
Medical	
ICD	Cause of death
Mode	Mode of delivery

Most of these factors may be analyzed at micro and macro level especially because infrastructural, maternity homes, trained midwives and education level of the area of study are important. It would also be a reflection of the understanding and the accessibility of the population under study because the above factors are not easily measurable

from the hospital data. Given the inadequacy of available information on macro differentials, further analysis was not presented.

The micro factors that could not be found in the hospital records include income, education, occupation, disease prevalence, administrative and management factors.

2.5 Hypotheses

Conceptual Hypothesis:

Other than medical factors maternal mortality is also determined by non-medical factors such as cultural, social, economic, demographic and environmental.

Operational Hypotheses:

1: Married women are associated with lower maternal deaths compared to non-married ones.

2: Higher age (35 and above) has a positive effect on maternal deaths. Also associated with maternal deaths is lower age (less than 20).

3: Higher parity (4 and above) will have a positive effect on maternal deaths. Also associated with higher maternal deaths is low parity (zero and one).

4: The maternal deaths are likely to be positively related to abnormal deliveries.

5: Ante natal clinic attendance is negatively related to maternal deaths.

6: Mothers residing in urban areas will show lower maternal deaths as compared to those in the rural areas.

7: Mothers delivering in hospital show lower maternal deaths compared to those who deliver at home.

8: Maternal deaths are related to ones ethnic background.

9: Married mothers are less prone to abortion related deaths as compared to those who are not married.

10: Abortion related deaths have a positive relation with the young.

11: The lower parity (zero and one) and higher parity (4 and above) have a positive correlation with the abortion related deaths.

12: Maternal deaths are positively related to specific medical cause

C H A P T E R T H R E E

METHODOLOGY

The data methodology will look into the various data source, data collection and the data analysis procedures.

3.1 Data Source

The data source is primary in that the information was extracted from the inpatient files, disease index card, notification of death, mortuary list and the postmortem results. Further supplement was from the annual reports and returns, Central Bureau of Statistics, statistical abstracts and the Nakuru district development plan.

Disease Index Card

This card contains the information on the in-patient number, age, sex and whether the patient died or not. The cause of death is classified according to World Health Organization (WHO) International Classification of Diseases (ICD). Ethnicity used to be recorded until 1983 after which hospital administration under the Ministry of Health stopped.

Disease codes are used for cause-of-death classification. Though all female deaths of age 15-49 are recorded, of interest are the maternal causes of death. The obstetric code that correspond to abortion and its complication, normal delivery and complication of pregnancy, childbirth and the puerperium are 630-676. The diseases are classified according to codes which range from 001 but of interest are the maternal causes of death which

range from 630-676. The cards do not give details of occupation, parity, residence, marital status or any other variable and this makes the index card an incomplete data source. Nonetheless, it acts as a pointer in our primary objective of whether the mother died or not. Thus we are able to retrieve the in-patient files.

In-patient Files

The files provide information on age, parity, marital status, and residence. Also included is the ante-natal clinic attendance which contains the following: period of gestation, medical history, family medical history and blood transfusion, mode and place of delivery, the person-in-charge during delivery, puerperium report on labour, pregnancy wastage and complications. Unfortunately not all in-patients files contain the clinic attendance document making most of the variable in the clinic attendance be too inconsistent for further consideration. Another limitation of the inpatient files is that some important information was left out by the doctors or the hospital records officer-in-charge. This called for thorough reading of the file to get the hidden or inferred information.

Though the in-patient files have all the above data, the information is highly inconsistent. The socio-economic factors are the worst presented. There is also difficult in the flow of information because the forms for some of the deceased depends on the place of delivery or place of referral. The referral cases and home delivery cases filled

different forms making the information different from the hospital admission patients forms.

Notification of Deaths

The data on patient death would have contained more comprehensive information if the death certificates forms were attached to the notification of death records. The limitation arose from the fact that death certificates form were filled not in correspondence with the time the event took place but with the time of need (late registration).

The information in this form is just the patient's name and personal number, diagnosis, age, marital status and sex. All this can be found in the disease index cards. They are mostly used to prepare death certificates which would help in a better analysis but the follow-up is hard because they are usually taken to the District vital registration to be forwarded to the Attorney General's office.

Postmortem Examination and Mortuary Results

The mortuary records contains the patients diagnosis, age, residence, sex and the personal number. The cause of death was not coded but after identification of the primary cause the WHO-ICD book was used for coding. The mortuary results helped so much because those deaths that occur outside the hospital responsibility and those that take place in the private hospitals are recorded there. Most of the accident, homicide, suicide and poisoning related causes of death are usually traced in this records. It is

in this records that most unknown cases are recorded a phenomena that could be attributed to lack of finance for postmortem, postmortem not being a compulsory procedure, relatives being reluctant, relatives having an assumption that they already knew the cause of death or the cause being practically unidentified. Most of the illegally abortion related cause of death are traced in this records.

Annual report and Returns

This documents contained morbidity and mortality reports on annual basis for hospital activities, admissions, operations, births deaths and the state and quality of patients and recommendations. The time and labour that could have been spent in summarising the data collected was saved by the use of this source save the cross checking part. There were some information that was not available though and that necessitated the practical counting of the variable under study.

Others

Census data, statistical abstracts and the Nakuru district development plan helped in further analysis of data and tabulation. The area's background and the related demographic factors were easily and accurately attainable from those sources. Further information on the vital registration and the projection were spelt out accurately thus making data collection a success.

3.2 Data Collection Procedure

The study is based mainly on data from the hospitals in Nakuru which admits patients for further attention and offers maternity services. Data collection commenced in November 1989 and continued for the next three months. Data cross checks and complementation took most of the time. Consultation on various development was sought constantly from supervisors in Nairobi University. In addition, the study incorporated aggregated data from the secondary sources as mentioned in the proceeding section.

During the year 1981-1985, total patients admission in NGH were 155,575 out of which 38,504 were obstetric admission in maternity and gynaecological wards. Abortion admission accounted for 15.9 per cent of all obstetric admissions while normal delivery accounted for 52.8 per cent.

3.21 Sampling Model

Variables from all maternal deaths were obtained in all institutions where each and every case was considered. The non-maternal deaths were many necessitating sampling technique to be used. Systematic sampling design was employed in all institutions. Of all the 965 cases collected, 803 were non-maternal while 162 were maternal deaths. The non-maternal cases available for sampling were 488 for NGH, 52 for MN&MH and 18 for NWMH. The mortuary cases were not used in sampling.

Starting with the third case of 1981 every fifth case in NGH was sampled for analysis. The sample design

realized 93 cases. In case the selected sample cases' in-patient file was not available, the proceeding or succeeding case replaced it.

The private institutions missed consistency and especially in coverage of years. The expected number of cases with full data were 23 where every third case would be sampled.

Possible Biases in the Data

There is no appropriate survey that can assure complete accuracy and precision. Nevertheless, a number of sampling errors and other shortcomings were revealed during survey.

There were discrepancies discovered especially between the annual reports, the in-patient files and mortality lists. This was corrected by consulting all documents that were used in the process of death certification and registration.

The problem of under coverage of some variables especially the age, marital status and abortion were discovered. The postmortem results showed the age estimation and the cause of death.

The age misstatement and age preference biases were prevalent a fact associated with women. The heaping was prevalent in age ending with zero or five, a factor associated with female in regard to age. The five years and ten years age groups minimized the effect of age bias.

Generally the death of a woman is likely to be reported but most information concerning her is limited by

the emergency that surrounds the circumstances of her admission with an optimum priority of life saving.

The biases are not an excuse of failure of analysis. The available data were used to find the association and relationship of variables and maternal mortality.

3.3 Data Analysis Procedures

A convenient starting point for studying the cause structure of mortality at various level is a scatter diagram of the relationship between death rate from specific cause (maternal mortality) and the death rate from all causes combined (non-maternal). Demographic techniques of analysis will also be used in population estimations.

In some analysis rough estimates are used and this explains why data analysis for this thesis will rely more than any other method on descriptive statistics.

We shall also apply chi-square method and the regression analysis. The relationship can be found by regression model, the correlation coefficient and the chi-square to measure the degree of association. While the slope of regression line measures the average change in a cause specific rate per unit change in the rate from all causes, the correlation coefficient or chi-square measures the degree of association using frequencies.

The cause of death making the largest contribution to declines in mortality at a particular age can be directly inferred by comparing population at lowest and highest levels of mortality. For maternal mortality, lowest level

is expected to be 20-30 years while the highest level is 15-20 and 30+ years.

3.31 Demographic Techniques

Estimations and Projections

The mortality data used was obtained from the analytical report of the 1979 census published by Central Bureau of Statistics. Adult mortality estimates were derived from questions asking respondents about survivorship of their parents. Alternatively Sisterhood method would be an essential demographic technique in estimating maternal mortality. But, given that the data was institutionalised based, it is not applicable.

From the basic data it is possible to calculate estimates of average levels of mortality for children and adults. These are calculated using Brass 1-parameter logit life-table system, making use of Brass African standard population. From age 15 and above, survivors are calculated using the estimate of mortality level for adults. Once the number of survivors at each age has been calculated which are the l(x) values of the life-table functions can be easily calculated and age-specific death rates found. To calculate the number of expected deaths in each age group, the age-specific death rates are multiplied by the projected population in each age group for 1981.

The following notation will be used in the calculation of the crude rates.

= probability of dying between ages x and x+n.

= proportion of survivors at each age x.

= proportion of deaths between ages x and x+n.

= "person-years" lived between ages and x+n.

= life-table age-specific death rate in the age group x to x+n.

The basic equation for Brass' logit life-table system is

$$Y(x) = A + BYs(x)$$

where Y(x) is the logit of l(x) values

Ys(x) is the logit of l(x) values of a standard population; here Brass' African standard is used.

A = alpha which measures the overall level of mortality.

B = beta which measures the relationship between adult and child mortality. In this method it is set equal to 1.

Formula for calculation of logit:

$$Y(x) = 1/2(1-lx)/1-lx$$

Formula for calculation of 'anti-logit'.

Ratios, Rates and Proportions

"Mortality can not be expressed as a single number or index. This is because most types of death rate are specified which means they pertain to some specified portion of population. Therefore a specific death rate refer to this part of the population but not to the mortality of the entire population.

Maternal mortality ratio is the number of women who die as a result of childbearing in a given year per 100,000 births. It is the number of maternity associated deaths to the number of live births. This ratio is an indicator of the obstetric risk in a population. It is suitable for comparison of mortality risks related to pregnancy between female population with different levels of fertility. The Maternal mortality ratio (Maternal Mortality Ratio) is thus calculated as

$$\frac{\text{Number of maternal deaths} * 100{,}000}{\text{Total live births}}$$

Maternal mortality rates is the number of maternity associated deaths to the number of women of reproductive age i.e. 15-49 years in a given year per 100,000 female deaths. The rate indicates the risk of dying from maternity-related cases for females therefore can be used to denote the relative importance of maternal deaths compared with all deaths among women aged 15-49 years.

The rate is calculated by

$$\frac{\text{Maternal deaths per year} * 100{,}000}{\text{Number of women aged 15-49}}$$

Alternatively the rate can be calculated by getting the product of general fertility rate and maternal mortality ratio. The general fertility rate is the number of live births per 1,000 women aged 15-49 years

Maternal Mortality rate (Maternal Mortality Rate) = D/W

$$D/W = (B/W)(D/B)$$

where, D = deaths (maternal)

W = females (15-49 years of age)

B = live births annually

General fertility rate multiplied by maternal mortality ratio will therefore be,

B/W = General Fertility Ratio

D/B = Maternal Mortality ratio

Maternal Mortality Rate = (B/W)(D/B)

Therefore the maternal mortality rate measures both the prevalence of pregnancy (B/W) and the risk of dying as a result of pregnancy (D/B).

Every death has a cause, at least for statistical purposes, even if that cause is unknown. Basic cause-specific death rates are usually expressed in deaths per 100,000 because for most causes, the deaths rates of occurrence are so low. Thus the cause specific death rate is calculated by

$$\frac{\text{Number of deaths from a specific cause} * 100{,}000}{\text{Total Population under study}}$$

Another measure is the proportion dying of a specific cause. This can be expressed as a percentage of all deaths. This is expressed as

$$\frac{\text{Number of deaths from a specific cause} * 100}{\text{Total deaths}}$$

The case rate is the number of reported cases of a specific disease or illnesses per 100,000 population during a given year. It therefore depends on rough estimate i.e the number reported only.

3.32 Statistical Techniques

Descriptive Statistics

The primary purpose of statistics is to make an inference from a sample for the whole population. As a preliminary step, the sample must be simplified and reduced to a few descriptive statistics. The statistics computed are frequency, mean, standard deviation, the minimum and maximum values of each variable.

Mean

Ungrouped $X = 1/n \sum xi$

Grouped $X = 1/n \sum xi.f$

Standard Deviation

Ungrouped $S = \sqrt{1/n-1 \sum (x-\bar{x})^2}$

Grouped $S = \sqrt{(x-\bar{x})^2 N-1} = \sqrt{x^2/N-1}$

Use and Limitation

The mean gives a general level of magnitude of the variable under study. Irrespective of whether or not the central values can in certain cases be used as representative values, they always indicate important characteristic of the distribution.

The limitation of mean as a descriptive statistical analytic tool is that it is affected by the extreme values. Again in case of reversed J-shaped distributions, the mean and the median can not be representative values.

The standard deviation is a fundamental measure of statistical theory. But, it is also affected by extreme values.

Chi-Square

The chi square test is a very general test that can be used whenever we wish to evaluate whether or not frequencies which have been empirically obtained differ significantly from those which would be expected under a certain theoretical assumptions. The chi-square test requires a relatively large N (sample or population size) because of the fact that the sampling distribution of the test statistics approximates the sampling distribution given in the chi-square table only when N is large. The size of N depends on the number of cells and the marginal totals.

The chi-square has a probability distribution of the form $\chi^2 = Cx^{(v-2)/2} \cdot e^{-x^2/2}$

But the chi-square approximation that we shall use throughout is given by the formulae

$$= \sum \frac{(fo-fe)}{fe}$$

where $x>0$ and

where, f_0 = observed frequencies

f_e = expected frequencies

Chi-square is obtained by first taking the square of the difference between the observed and the expected

frequencies in each cell. The division of the square of the difference by the expected frequency is in order to standardize it so that the biggest contribution does not always come from the cell with the largest figure. The sum of these non-negative quantities for all cells is the value of chi-square.

The chi-square involves a comparison of frequencies rather than percentages. The main use of chi-square in this study is to find out whether there is any association between dependent variable and each of independent variable. Weights for non-maternal cases are used to enable a comparative analysis to be meaningful.

Decision making will be determined by hypothesis testing. The chi-square table will be used though it is insensitive to the direction of relationship. In this case the degrees of freedom are determined depending on the number of cells in the table.

Degrees of freedom= (column-1)(row-1)

The Z-test normal table is substitutable here by taking half the significant level and the square root of the chi-square results. Unfortunately it will only be employed in 2 by 2 contingency table where it is applicable.

Regression Analysis

In statistical analysis a univariate or bivariate analysis is not adequate to make true generalization in any social problem. This is so because there is no single variable that can be said to be the 'cause'.

The social universe is in itself multivariate and many variables are involved in a particular situation (Herzon and Hooper, 1976). This requires assessing the degree to which the dependent variable are related to the independent variable and determining which independent variable is most strongly related to the dependent variable. In order to find the significant predictors of multivariate regression analysis. Multiple regression will be used.

For simple regression, the variability in a dependent variable is accounted partly by a single explanatory variable and partly by a disturbance term that might result from the unconsidered variables or from data itself. It is usually used to predict the dependent (maternal mortality from only one independent variable while the rest are held constant). Likewise it can be used to iron out the multicollinearity problem of regression.

The simple regression is given as

$$y=a+bx+e$$

where,

y = Dependent variable (maternal deaths)

a = y-intercept (maternal death that is not explained by the variable)

b = The slope of the relationship

x = Independent variable e.g age, parity etc.

e = Disturbance or Error term

This basic regression model can be extended to situation where two or more independent variables are used to predict the scores of one dependent variable. The

expanded basic regression is called multiple regression which can be stepwise or logistic regression analysis.

Logit Regression

When a variable is thought to depend on the others, a special class of log-linear models called logit models can be used to examine the relations between dichotomous dependent variables and independent variables.

The dependent variable used here is a binary response variable of maternal or non-maternal cause of death. It takes the value of one if the woman died of maternal cause of death and a value zero if not. An individuals cause of death depend on various factors which can be socio-economic, cultural, demographic or environmental. This can be expressed as

$$P(a) = f(x_i)$$

where

P(a) = a binary variable reflecting the woman's cause of death given her possible determining factors.

x_i = a vector of i = 1 to i = n explanatory variables

The Equation can be expressed as

$$P(A) = a + b_1x_1 + b_2x_2 \ldots\ldots\ldots\ldots\ldots b_nx_n.$$

Since P(A) is a dichotomous variable it can be estimated using non-linear estimation method. Ordinary Least Square (OLS) is the most common linear estimation method. In this type of model OLS would give an unbiased but inefficient estimator and the variance would be heteroscedastic. The problem of heteroscedasticity can be

solved using Maximum Likelihood Estimation for individual data. Another expected problem of OLS is that the estimated conditional probabilities may not lie within the logical limits of 1 and 0. This can be overcome through truncation method. That is, if the estimated P(a) is less than zero, P(a) is assumed to be zero. If it is greater than one, it is assumed to be one.

Also the application of the ordinary least squares regression could have been used in its original form, that is, as regards the dependent variables which could have been either a maternal mortality rate or any other conventional rate, the use of logit analysis required the reformatting of the data in order to create the categorical dependent variable which focused on whether the woman survived the childbearing age or not due to her exposure to the childbearing risk. But if the dependent variable is a rate, the appropriate regression is poisson.

Since the focus is on whether the woman survived or not, the dependent variable will be binary. Furthermore, most of variables under study are categorical, a factor which calls for due care in the interpretation of the results especially in relation to the case of the suppressed categories.

One major assumption of logit regression analysis concerns the independence of the individual explanatory variable, i.e the absence of multicollinearity. The presence of multicollinearity affects the regression coefficients by raising the standard error of the estimates (Blalock, 1963; Asher, 1976)

To solve this problems is to use the probit or logit technique which will guarantee that the estimated conditional probabilities be between zero and one. (Gujarati, D. 1978).

The need for use of logit regression is prompted by a number of factors.

First, some of the mortality determinants in our model are related to general public health condition that affect mortality risk of most females subjected to the influences. Logit analysis is appropriate for the factors because it is a multivariate method for estimating relative risk. The logit coefficients are the natural logarithms of the relative odds by which the determinants of mortality are different for the risk of dying.

Moreover, the use of a dichotomous dependent variable refocuses the analysis from examining the determinants of maternal mortality in general to the examination of the determinants of other female deaths in the same age group.

Furthermore, the combination of both individual as well as contextual variable in a simple ordinary regression model raises some doubts as regards the interaction effects of these factors on maternal mortality as in our first suggested application. This is so because variables are measured in different units i.e some are categorical, continuous, aggregate e.t.c.

Basically logit analysis is a probability regression models which expresses the dichotomous Yi as a non-linear function of the explanatory variable Xi. The models assume that the conditional expectations of the given Xi can be

interpreted as the probability that a mother will survive or die given the variable in our model. However, in logit analysis the dependent variable is defined by logarithm odds also known as the logit transformation of P(x). The model takes the following form $\ln(P(x)/(1-P(X))$

where,

$a + b$ is the logit transformation of P(x) commonly denoted by (P). The logit here is the odds whose variation is to be explained. An odd is the ratio of then frequency of being in one category to the frequency of not being in that category and is interpreted as the chance that an individual randomly selected will be observed to fall into the category of interest (Hanushek and Jackson, 1977).

The odds ratio here is marginal odds applying to the total frequencies while holding the effect of the other variables constant. In logit analysis, 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 $+ a$ thereby eliminating the problem that $a + bx$ will be outside the unit range (Hall).

Logit analysis is based on the same assumptions as the general log-linear probability models. For example, it is assumed that the population under study has a multinominal distribution structure and that the sample under study is large enough, drawn randomly and independently from the population. However both the enumeration and coverage errors which could in a way affect the pattern of results can not be ruled out.

Given the above assumptions, a selected model based on some theoretical understanding for the underlying interrelationships among the variables in the population can be accepted or rejected based on the goodness of fit of the chi square.

The parameters in the logit model may be interpreted as ordinary regression coefficients. Positive values indicate that the independent variables or their interactions raise the log odds of the dependent variable, while negative coefficients show lower log odds (Pindyck and Rubinfield, 1976). For example, in a regression that controls for other mortality correlates the logit coefficient of living in a house with a toilet is -.425. This means, the presence of a toilet reduces the logarithm of the odds by 42 per cent and that a baby living in a house with a toilet is about 2/3 (anti-log -.425=.65) as likely to die in infancy as one living in a house without a toilet, other things being equal.

To test whether the hypothesized model fits the data, we first estimate the expected frequencies under the hypothesized model and compare them to the observed frequencies using the chi-square goodness of fit test statistic or the chi square based on the maximum likelihood ratio statistic.

The maximum likelihood (ML) criterion is frequently used in statistics because it is known usually to be an asymptotically efficient estimator, but it is also an intuitively appealing criterion. Basically the criterion addresses the question, "what underlying parameters would

be most likely to have produced the observed data?" The mathematics of maximizing the likelihood function as given by Hanushek and Johnson 1977 gives a better explanation.

Limitations of Log-Linear Analysis.

As noted earlier, the major assumption underlying the logit analysis is that of a sufficient sample size. This is important because the test statistics used in the selection of the model depends on and is affected by the sample size. For example, the magnitude of the chi square is proportionally related to the sample size, which in turn implies that significant effects will always be found in moderate to large size samples. But large sample size may sometime magnify what was to be the minor differences thereby leading to erroneous conclusions.

This question becomes even more important when viewed in terms of categorical sample size. Most researchers usually collapse categories of given variables in an effort to maximize the utility of time and cost. But in so doing, important information unique to particular categories is usually lost and the conclusions drawn about the relationships may be inconsistent with those in the underlying population. This problem is minimized in this study by utilizing as many categories as data could allow.

Indeed, as has been argued elsewhere (Hanushek and Jackson, 1976), the best solution to small sample size is to categorize the data such that you increase the number of observations in each category. As the size of each of the

categories increases, the observed frequency becomes a better estimate of the true probability.

Finally, the log-linear approach assumes that all the observed frequencies for cells of the cross-classification are greater than zero, otherwise estimation is impossible. To overcome this problem, it has been suggested replacing each sample zero by 1/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 cells (Goodman, 1972). However none of these suggestions has proved to be perfect solutions. All these factors, however, will be taken into consideration in the analysis and interpretation of our data in the next chapter.

CHAPTER FOUR

RESULTS

This chapter deals mainly with the results that were found from the research. The Methods of analysis are described in chapter 3.

The first section entirely describes the data collected and its general characteristics in relation to the period and institutions of study. The second section is on the age patterns of female deaths whereby a clear distinction is made between non-maternal and maternal mortality. A comparative analysis is drawn especially in regard to age because reproduction is related to females age. Also to be analyzed is the different variables behaviours with regard to age. Leading causes of maternal mortality are analyzed in section 3. Section 4 deals with cross tabulations of dependent and independent variables where the demographic, socio-economic and cultural factors of maternal mortality are looked into.

Section five outlines the bivariate analysis where the chi-square technique is used. A subsection on abortion related analysis is explained. This will help in determining the variables to be used in section six where multivariate analysis using logistic regression has been used.

4.1 Data Description

Different hospitals under study show considerable differential due to the variations in historical background, and the social economic background of the patients who get treatment in the respective hospitals. For instance the Nakuru War Memorial Hospital (NWMH) caters for those patients who are of higher income status, Menengai Nursing and Maternity Home (MN&MH) caters for those of middle status and maternal related cases while the Nakuru General Hospital (NGH) has a greater proportion of poor as well as those with major complications and referral cases. The Nakuru General Hospital handles the most cases. To demonstrate this, NGH recorded 59.9 per cent female deaths while MNMH and NWMH recorded 8.0 and 2.5 per cent respectively. Of female deaths in the sample 83.2 per cent are non-maternal and 16.8 per cent maternal deaths. Further illustration in Table 4.1.1 indicate that NGH recorded the largest proportion of maternal deaths of 54.9 per cent followed by mortuary with 25.9 per cent. MNMH and NWMH recorded 15.4 per cent and 3.7 percent respectively. There is a positive relationship between maternal and non-maternal deaths registered at each point at a time. The mortuary deaths include home deaths and those from private medical institutions within the municipality.

Though NGH has a high proportion of patients from poor status, the hospital is recognised as a referral health institution especially for patients with

TABLE 4.1.1 Percent of Female Deaths, According to the Institutions Under Study

Hospital	NGH	MNMH	MORT	NWMH	TOTAL
NONMATERNAL CAUSE	84.6	67.5	85.4	75	83.2
	(60.8)	(6.5)	(30.5)	(2.2)	(100)
MATERNAL CAUSE	15.4	32.5	14.6	25	16.8
	(54.9)	(15.4)	(25.9)	(3.7)	(100)
TOTAL	(59.8)	(8.0)	(29.7)	(2.5)	(100)
	100	100	100	100	100

Note: In Parenthesis are the Row Percentages

complications beyond private hospitals capabilities.

Primarily, the hospital during the study period had a mean annual admission estimated at 25,000 patients including the annexe. Of this, the hospital has an average of 2,500 patients admission in gynaecological and obstetric wards while 6,500 are admissions in maternity wing of the hospital and the annexe.

As observed from Table 4.1.2, there is inconsistency of data in the annual returns. This proves how hard it is to make firm conclusion using hospital data. Though, rough estimates could be arrived at.

Though most data is missing, the percentage of death to admissions, discharge and delivery show that death has a low probability of occurrence and therefore is the female in the reproductive age. The records show that in the five year period, the total admission was 115,752. With a total death of 2,949 only 577 are recorded from NGH. It is well understood that infant mortality is still high in comparison with adult mortality thus most death could have been recorded in those categories. The maternity ward accounted for 22.9

TABLE 4.1.2 Estimated Total, Gynaecological and Obstetric Admissions in Nakuru General Hospital

EVENTS	1981	1982	1983	1984	1985
Total Admissions	19367	22547	27922	21975	23941
Total Discharge	17084	22370	26052	20062	22641
Total Deliveries	4768	NA	NA	NA	NA
Total Deaths	507	532	552	547	811
Monthly deaths	42	45	46	129	NA
Gynae & Obs. Admissions	NA	2579	3090	2723	NA
Gynae & Obs. Discharge	NA	1817	3010	2543	NA
Gynae & Obs. Deaths	NA	78	99	21	NA
Maternity Admissions	NA	5082	5560	6987	6929
Maternity Discharge	NA	5116	5555	6284	6923
Maternity Deaths	17	4	6	25	54
Foetal Deaths	159	NA	NA	NA	NA
Annexe Admissions	1703	1808	1636	1279	NA
Annexe Discharge	1689	1731	1577	1258	NA
Annexe Deaths	13	11	5	11	NA
Annexe Deliveries	NA	707	835	NA	NA
Annexe Foetal Deaths	NA	NA	15	NA	NA

TABLE 4.1.3 Annual Maternal and Non-maternal Deaths

	1981	1982	1983	1984	1985	Total
Nonmaternal	83.2	81.5	77.8	88.7	83.8	83.2
Maternal	16.8	18.5	22.2	11.3	16.2	16.2
Total	100	100	100	100	100	100

per cent of all admissions with 31,581 cases for three years 1982-1984 inclusive.

The maternal cause of death was lowest in 1984 with 11.2 per cent and highest in 1983 with 25.3 per cent. The female deaths in 1984 is quite different from other years of study. This could be due to incorrect coding of the maternal cause leading to overestimation of non-maternal causes and underestimation of maternal causes.

4.2 Age Patterns of Female Deaths

Age is a demographic primary factor in childbirth. Due to the specification of age in childbirth, a look at the relationship between age and other variables as it concerns the female mortality is necessary. Therefore, the maternal and non-maternal cause of death as related to age will be sought.

In precedent to age patterns, a correlation between age and other variables will be analyzed. The correlation coefficient based on the frequencies of the age and related variables are reported in this section. The determinants of separate covariance between maternal age and each index of parity, marital status, age at first birth, place of delivery, place of residence, ante-natal clinic attendance, abortion and ethnicity is given in the form of matrix of zero-order, first order up to sixth order partial correlation coefficients.

The first column of the Table 4.2.1 contains the individual coefficients between the probability of death a female aged 15-49 and each of the related variable x2, x3, x4.....x10. The significance of the zero-order correlation coefficients can be appreciated by use of the summary as indicated in Table 4.2.2.

Generally the pattern of maternal and non-maternal mortality are the same especially after age 29. Between age 15 and 19, a difference in the pattern is noticeable. Low maternal deaths are recorded at age 15 and 16. A tremendous maternal death increase is observed at age 16-24 contrary to

TABLE 4.2.1 Matrix of Zero-Order Coefficient Correlation (r).

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10
x1=age	1.00									
	**									
x2=pa.	.872	1.00								
	*	*								
x3=ms	-.31	-.33	1.00							
	*									
x4=agb1	.306	.004	-.06	1.00						
x5=plce	.086	-.09	-.01	.204	1.00					
x6=mode	.025	-.06	.029	.193	-.18	1.00				
x7=res.	.075	.053	-.09	.039	.092	.088	1.00			
x8=clin	-.04	-.13	.182	.172	.096	.213	.033	1.00		
						*				
x9=abor	-.14	-.04	-.16	-.12	-.01	-.42	-.02	-.12	1.00	
						*				
x10=tri.	-.06	-.05	.037	.027	.074	.265	.017	.216	-.12	1.00

Source: Survey Data

note: number of cases = 79
: ** 1-tailed significance at - 0.01
: * 1-tailed significance at - 0.001
INDEPENDENT VARIABLE: X2,X3.....X10.
DEPENDENT VARIABLE: PROBABILITY OF A WOMAN DYING GIVEN THAT SHE IS OF AGE 15-49.

TABLE 4.2.2 Intercorrelation Analysis Zero-Order Coefficients (r), Determination (r^2), and Corresponding "t" Value

Independent Variables	r	r^2	"t"value
x1 = age			
x2 = parity	0.8724	0.7611	32.044
x3 = marital status	-0.3100	0.0961	-3.001
x4 = age at first birth	0.3058	0.0935	2.9602
x5 = place of delivery	0.0860	0.0074	0.7603
x6 = mode of delivery	0.0245	0.0006	0.2151
x7 = place of residence	0.0752	0.0057	0.6637
x8 = ante natal clinic att	-0.0371	0.0014	-0.3260
x9 = abortion	-0.1268	0.0161	-1.131
x10= ethnicity	-0.0622	0.0039	-0.5479

low non-maternal deaths. This could be due to low age at first marriage, low age at first birth and abortion. Though the low non-maternal deaths follow almost the same pattern. Non-maternal deaths are specifically high at age

31, 35, 40, 45 and 49. Although there is the problem of age heaping, the Non-maternal female death would still be high. Figure six illustrates this.

The average age at first birth being 18.6 then it would be fair to say that most mothers deliver their first babies then. It is therefore observed that most zero parity mothers die of maternal related cause when they are still young. An average of 4 per cent is recorded especially to women of age below 23.

Parity one follows with the highest percentage recorded at age 20 with 20 percent of maternal deaths. The trend of mothers dying during the primigravida shows a downward trend.

Parity 2-4 rises at the first few years of reproduction followed by a constant up to age 40. Thereafter a drop is indicated as shown in Figure 7 and 8.

Fairly enough the number of children are directly related to the reproductive age. Therefore the trends are quite consistent with the expected results.

The non-maternal related cause of death has an undefined pattern. High peaks are recorded in the first few years of reproduction with parity one having the highest percentage followed by parity zero. This shows that most mothers who have not given birth have a low probability of dying from non-maternal related cause of death. At parity 2-4 and 5 and above mothers have a fairly constant pattern from this specific cause.

VARIATION OF FEMALE DEATHS BY

AGE: maternal & non-maternal.

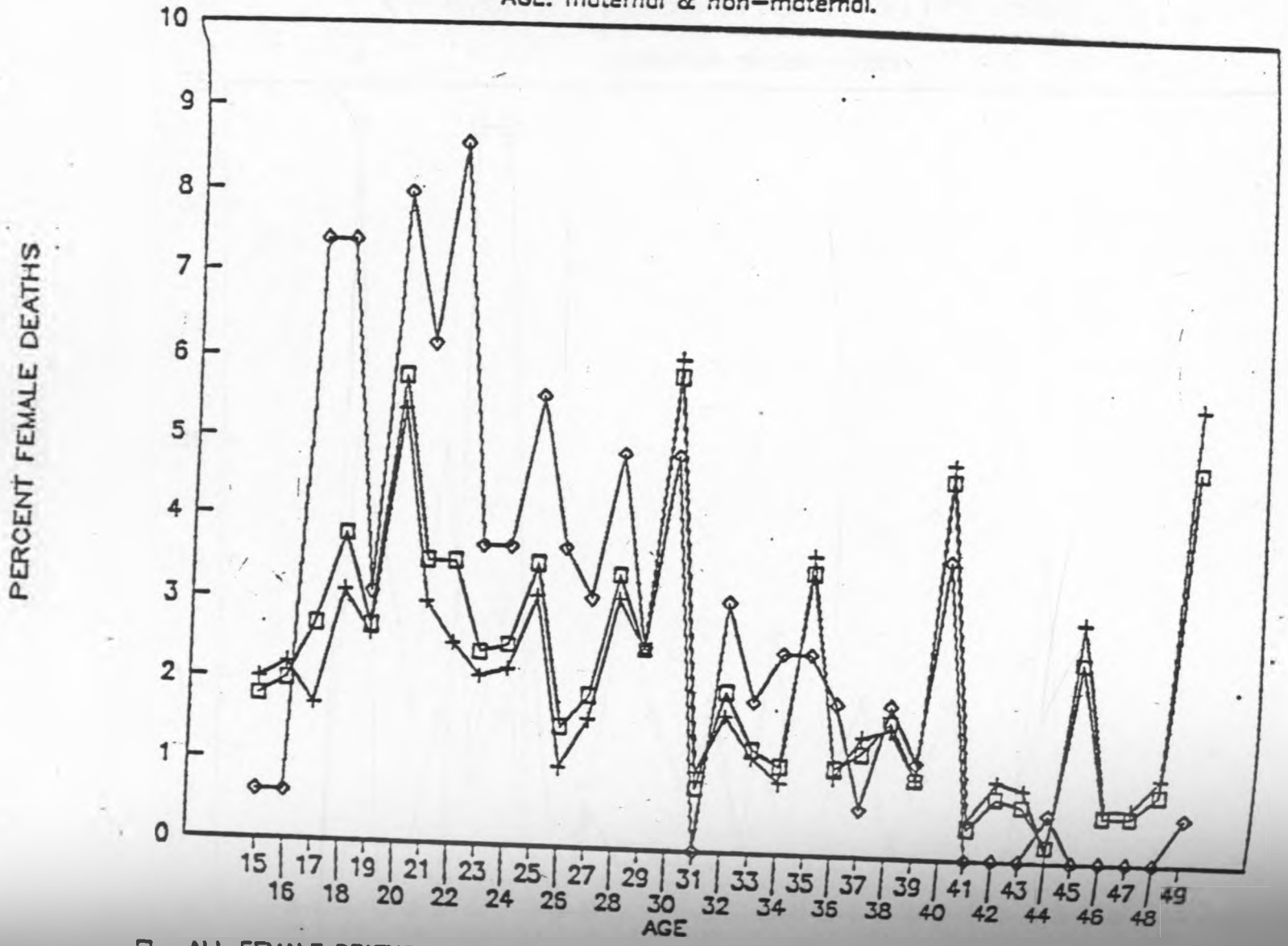


Figure 6

PARITY VARIATION WITH AGE

maternal related cases

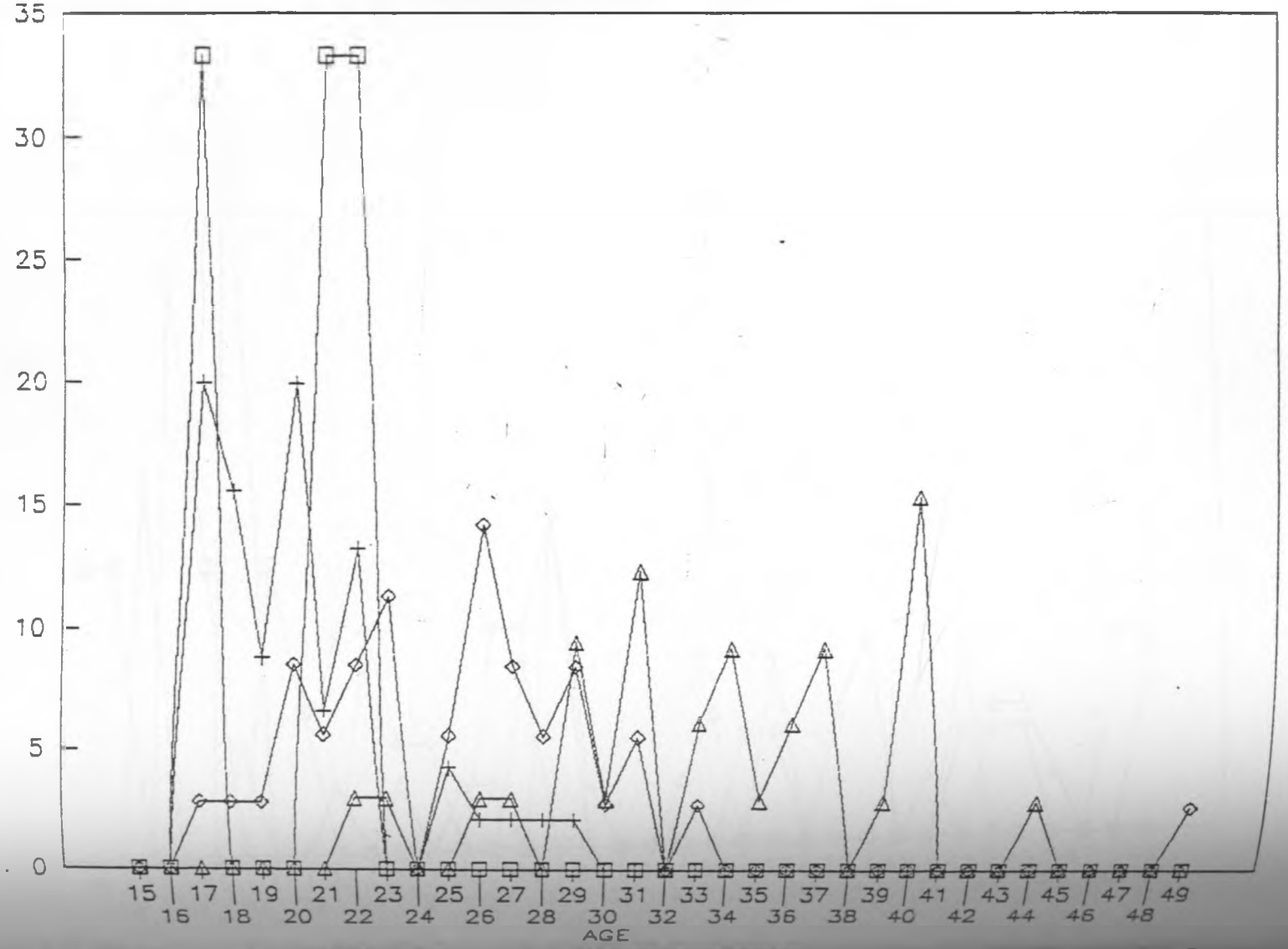
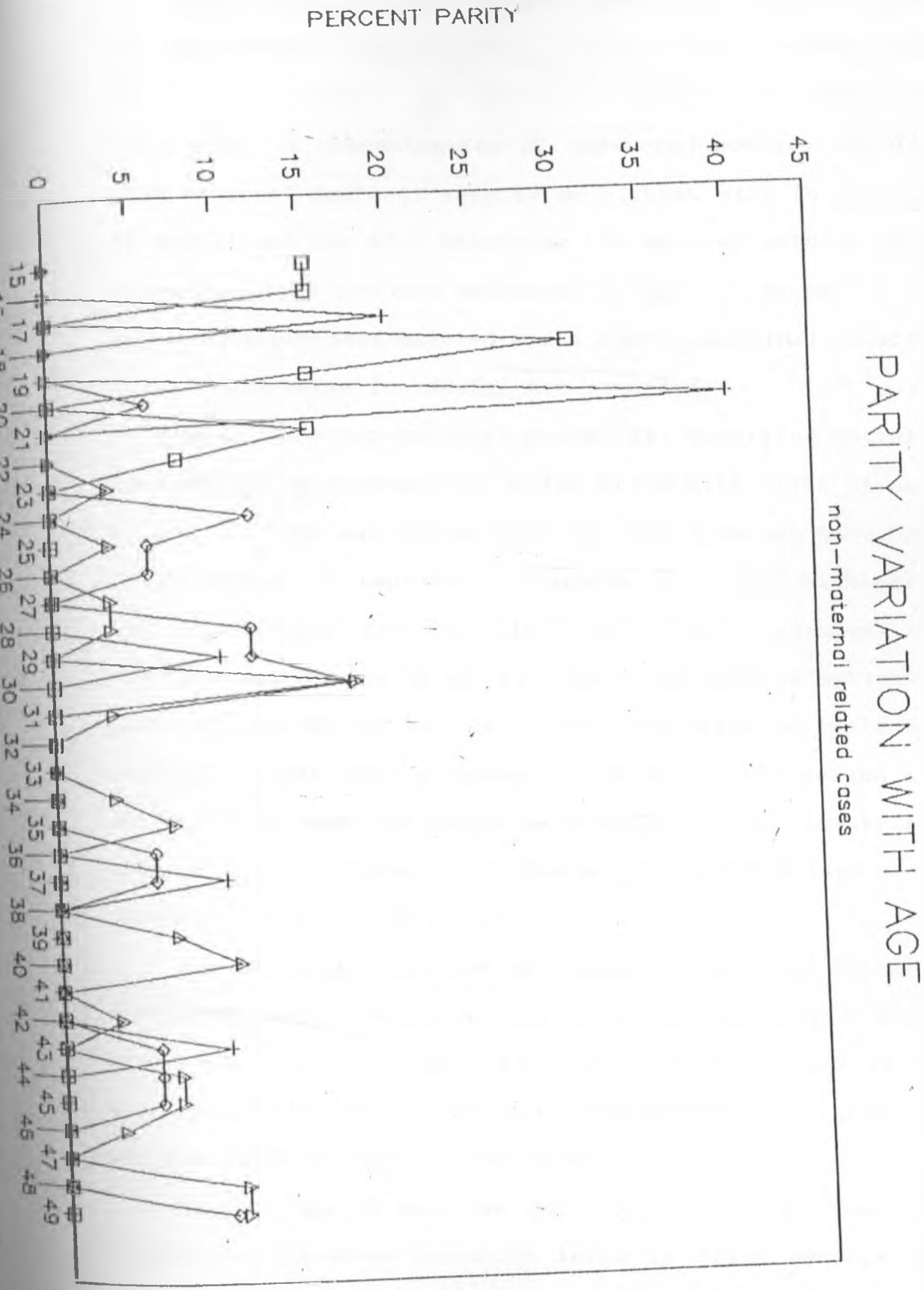


FIGURE 7

FIGURE 8


PERCENT PARITY
PARITY VARIATION WITH AGE
non-maternal related cases
0
5
10
15
20
25
30
35
40
45
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
PARITY ZERO
PARITY ONE
PARITY TWO-FOUR
PARITY FIVE & ABOVE

The marital status variable has been analyzed using the age patterns of mortality. A sharp decline is observed for single mothers as far as maternal mortality is concerned. A concentration of unmarried mothers who die from maternal death is seen to be highest with 18 percent at age 17 and age 21. Otherwise the married mothers show a constant of 8 per cent maternal deaths. An exception is at age 40 where most married women died of maternal related death. Otherwise low deaths are recorded.

As for the non-maternal mortality, unmarried mothers are constantly represented in the graph with peaks at age 19 and 31. The married mothers who die from non-maternal female deaths in reproduction age seem to rise with age. Low percentages are recorded where zero response is prevalent especially in age 21. The trend show exceptional peaks at age 20, 30 and 48. Again age heaping could be responsible for this occurrence. A major interaction is indicated at age 37 where both married and unmarried mothers die of non-maternal deaths with a percentage of 6 percent . See Figure 9 and 10.

A significant increase of maternal death for mothers who had the first child at age 15-19 is indicated with a percentage of 20. There is a decline at age 21 of 4 percent. Thereafter a constant is maintained up to age 36 where a sharp decline is recorded.

Between age 25 and age 34 a peak of 22 percent is observed. Otherwise constant level is noted especially after age 34. The decline is not significant at any point of reproduction.

A unique observation is made for mothers who died from non-maternal mortality cause as regards the age at first birth. Females who had 20-24 as their first age at birth had a constant percentage of 15. otherwise all other ages show a zero response.

Females with age at first birth 15-19 show an increase of maternal related cause of death as 5 percent to 25 percent in that age range. Otherwise a marked decline of up to 8 percent is recorded. After age 27 notable peaks of 8 percent are indicated at age 27, 28 and 38. Figure 11 and 12 illustrates this trend.

Abortion trend shows an increasing sequence up to age 20. Thereafter a decline is observed. An upshot is noticed at age 32 and 35 then a fair decline.

Otherwise, non-abortion cases are also in the teenage group. A constant of 7 percent is maintained between age 24 and 31. Abortion cases decline with age for the rest of reproduction age although an increase at age 40 is indicated.

At age 19, abortion related deaths and non-abortion related cases have a common percent of death at 6 per cent. another area of interaction is at age 21 and 23.

The non-maternal abortion related cause of death cases show that less than 10 percent of females were victims. A very high percent of approximately 50 is indicated for non-abortion non-maternal related cause of death. See Figure 13 and 14 for further illustrations.

Most rural residents indicate a high percentage of death from maternal related cause for young mothers of age

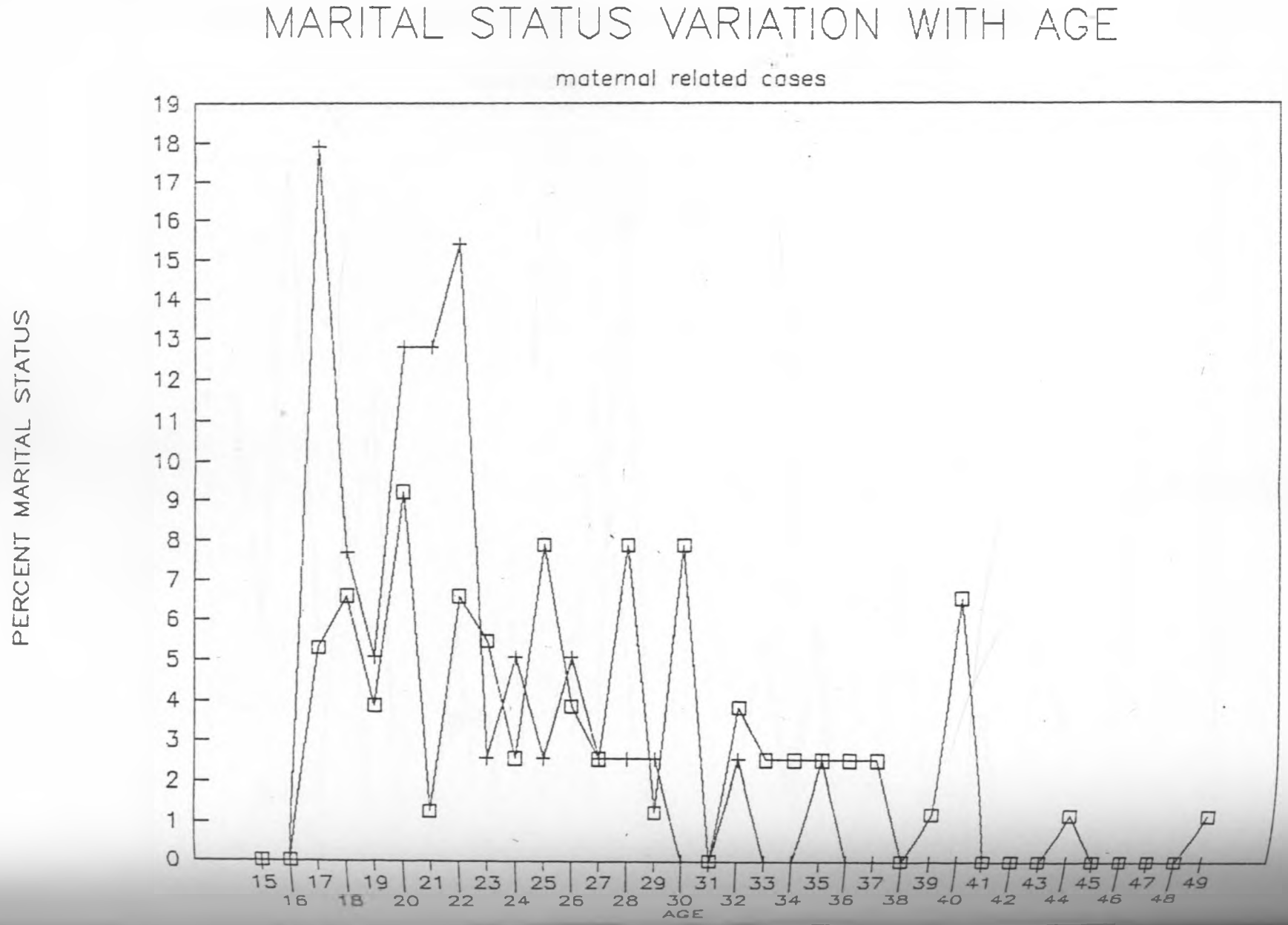
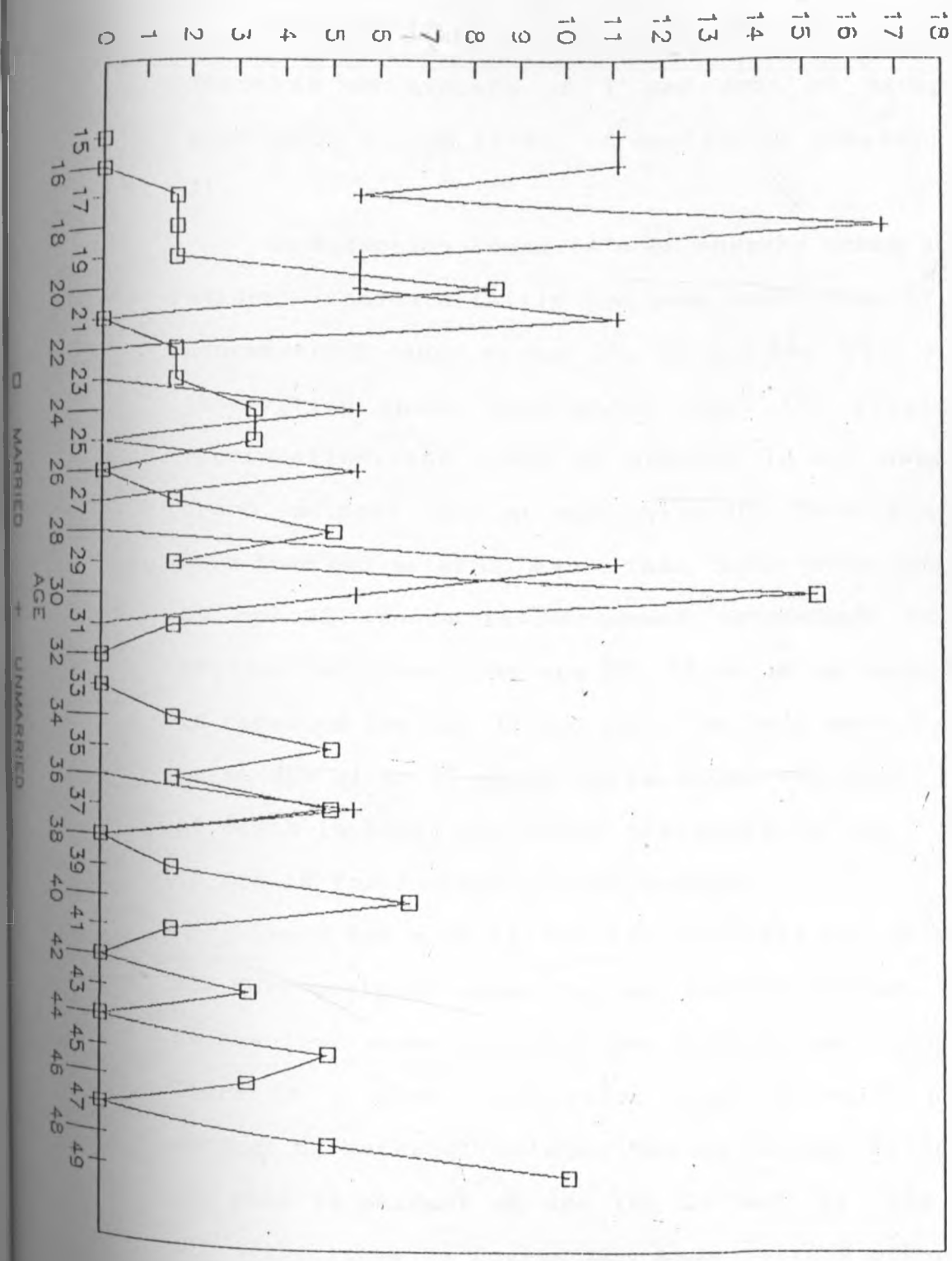

MARITAL STATUS VARIATION WITH AGE
maternal related cases
PERCENT MARITAL STATUS
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE

FIGURE 9

PERCENT MARITAL STATUS



MARITAL STATUS VARIATION WITH AGE

non-maternal related cases

18-22. The pattern show a marked drop at age 22 with 5 percent. Thereafter a constant of 4 per cent is maintained and then a decline.

The same pattern is observed for the urban residents. There is an average of 7 per cent of maternal death especially at age 15-31. A decline is observed after age 31.

An exception trend is seen whereby urban and rural residents indicate fairly the same percentage of death from non-maternal cause at age 21, 40 and 49. This conspicuous observation shows that other than the first years of reproduction, the trend is similar in all aspects. The trend indicate that at age below 20, rural residents die more from non-maternal cause than their urban counterparts. At age 22, there is low death percentage for the two residential areas. At age 25, there is an increase. This is repeated for age 37 and 49. The only marked difference is at age 31 to 37 where while rural residents percentage of death is high, the urban residents is low. See Figure 15 and 16 for further illustrations.

There are nine tribes for analysis but only three of the were analyzed using the age pattern method. The major tribes that were analyzed are Kikuyu, Kalenjin and Luo. There is a clear indication that Kalenjin portray 20 percent of maternal related deaths at age 22 followed by Luo with 13 percent at age 18, 25 and 29. The trend for all tribes seem to follow the same pattern otherwise.

VARIATION OF FEMALE DEATHS BY

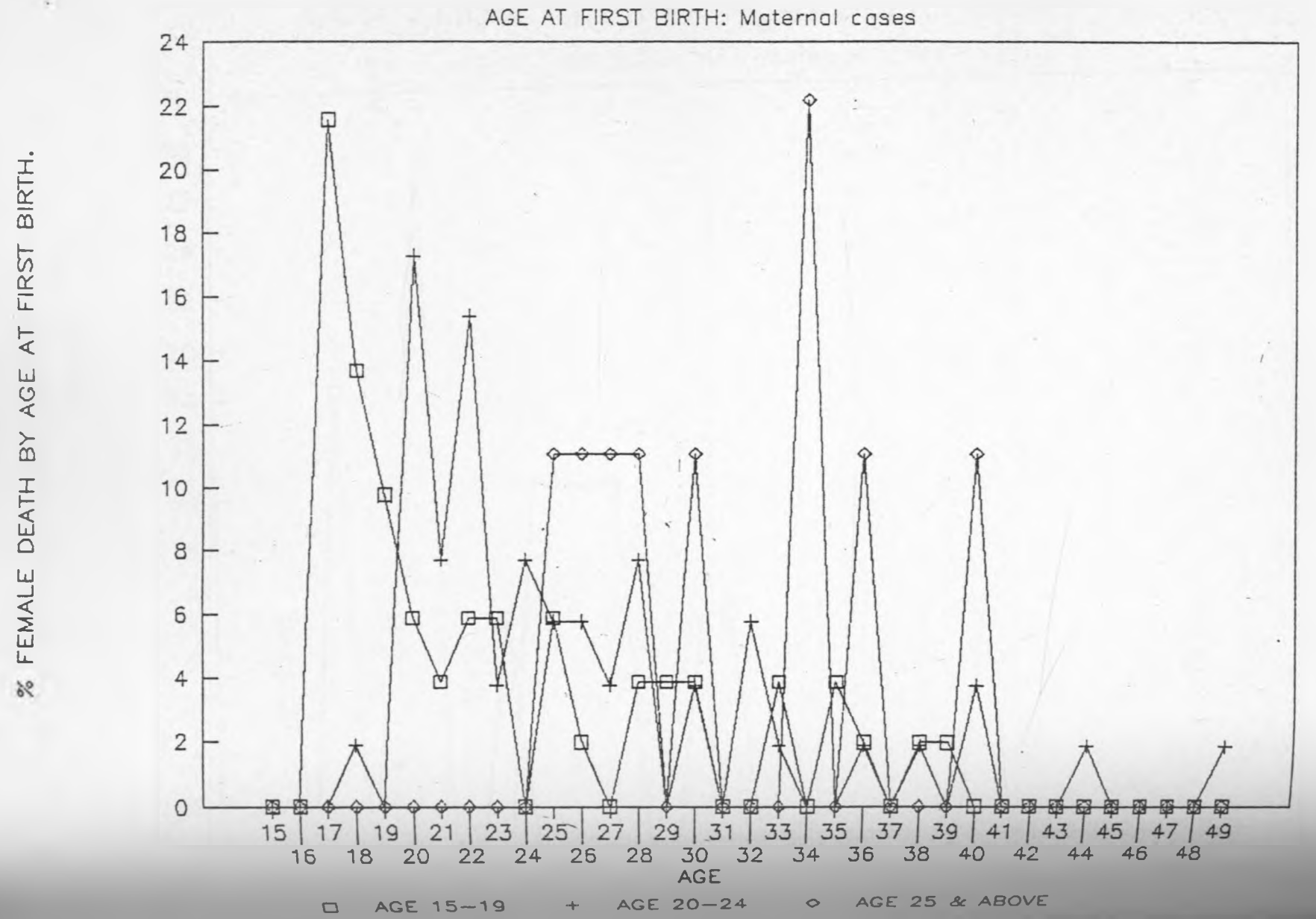


FIGURE 11

VARIATION OF FEMALE DEATHS BY

AGE AT FIRST BIRTH: Non—maternal cases

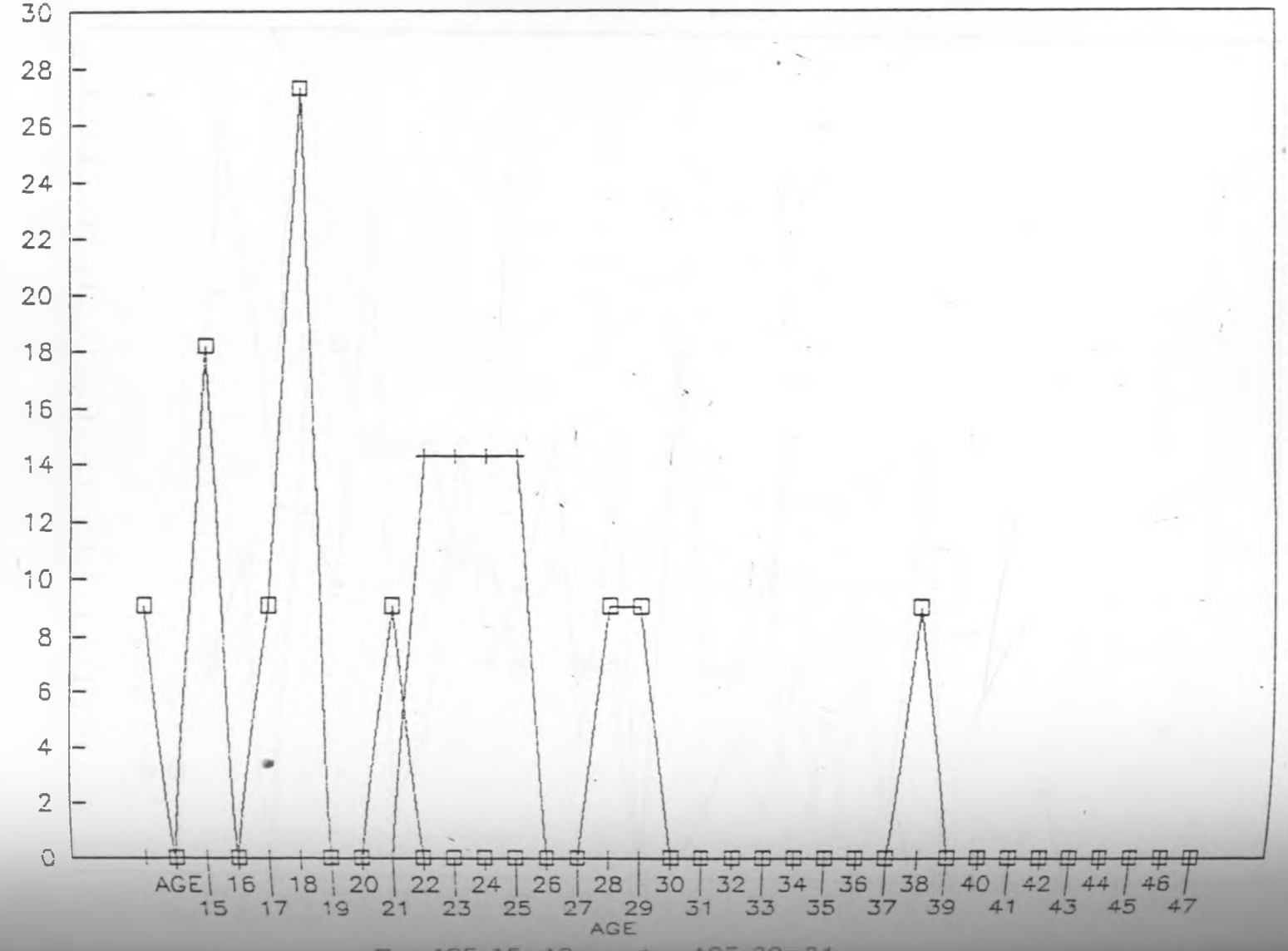


FIGURE 12

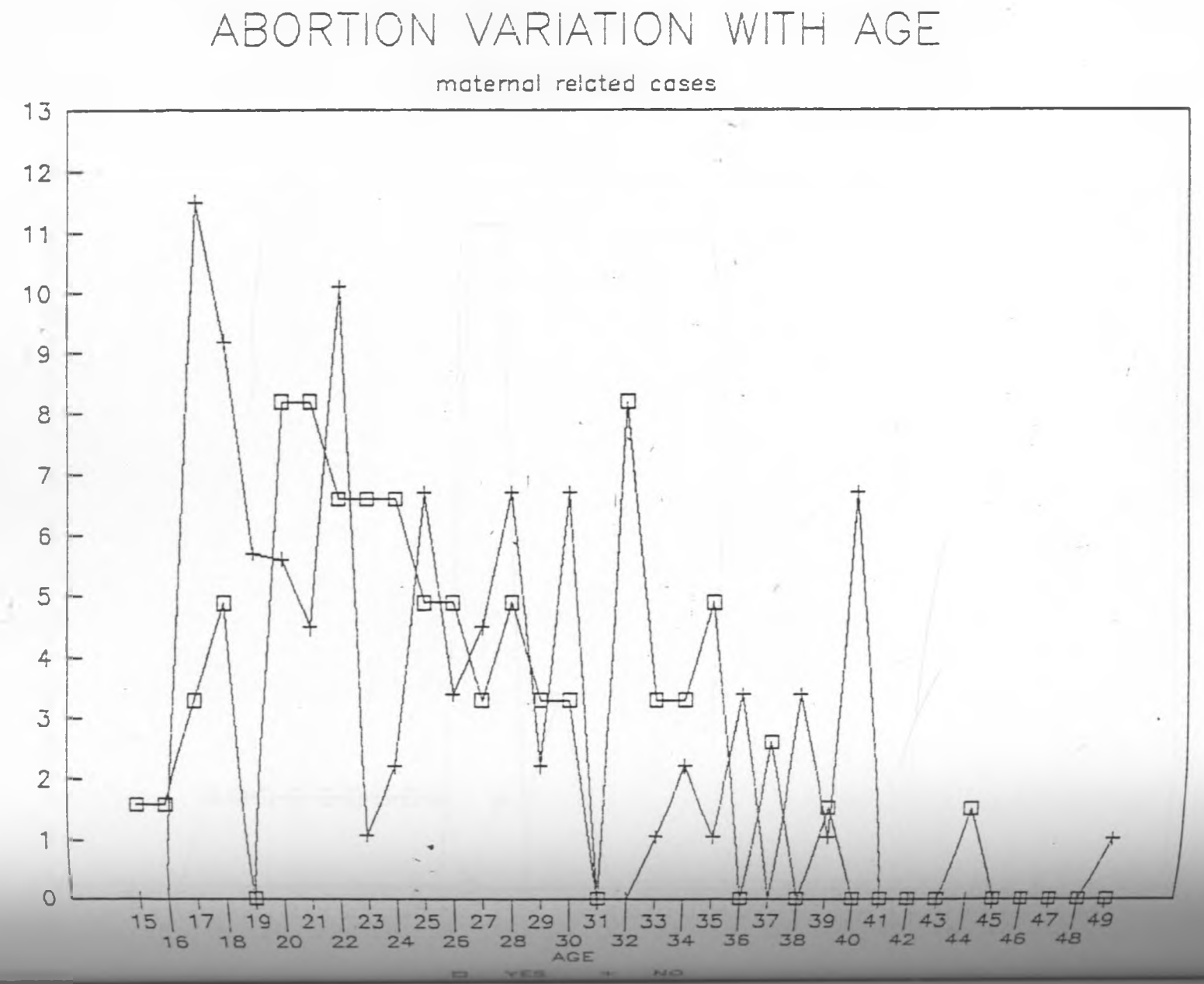

ABORTION VARIATION WITH AGE
maternal relcted cases
PERCENT ABORTION CASES
13
12
11
10
9
8
7
6
5
4
3
2
1
0
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
□ YES + NO

FIGURE 13

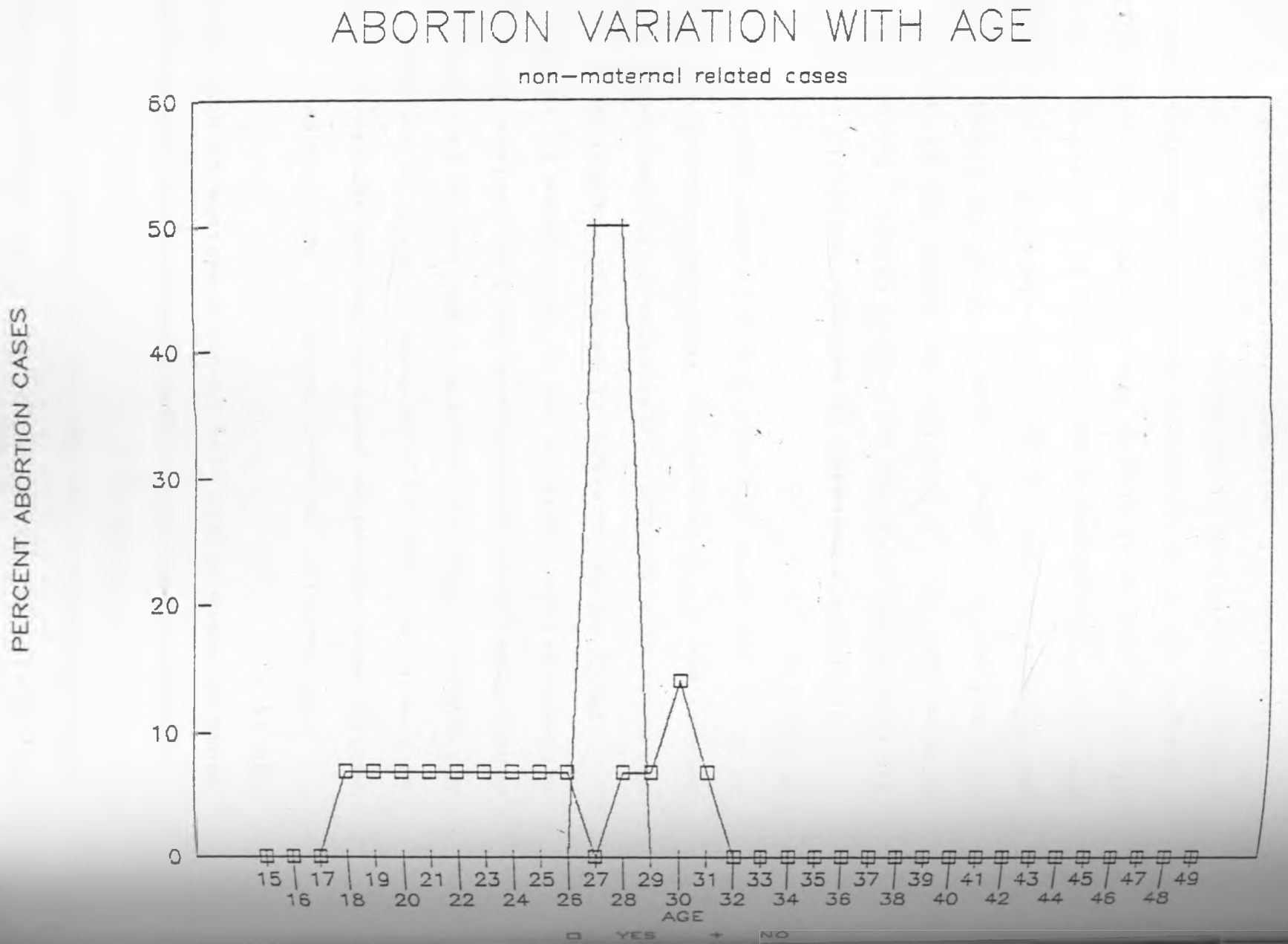

ABORTION VARIATION WITH AGE
non—maternal related cases
PERCENT ABORTION CASES
60
50
40
30
20
10
0
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
YES
NO

FIGURE 14

At age 21, all tribes have a high maternal related death percentage. This observation is repeated for age 31-41 but minor exceptions.

Kikuyu indicate a fairly constant maternal related cause of death at all ages though a maximum is observed at age 21.

Non-maternal related cause of death show a clear pattern whereby similar peaks at the same age are depicted. At some points similar magnitude of death is recorded but not always. That is whereas a maximum is recorded, all other tribes have an increased death percentage from non-maternal related cause as well. See Figure 17 and 18.

There is an increase of maternal deaths for females who never attended ante-natal clinic. Fifteen percent for mothers age 17-23 is marked. Increased maternal mortality of those who never attended clinic is also recorded at age 28 and 40.

Otherwise a decrease in maternal mortality is noticed for females who attended ante-natal clinic. Ten percent of females age 17, 8 percent for those age 24 and 30 is recorded as the highest. Due to decreased births at late age of reproduction, low maternal related death percentages are observed especially as from age 41 and above. At age 19, 22,27,33 and 39 female who attended ante-natal clinic and those who never attended, share the same percentages of maternal related cause of death.

The place of delivery indicates that the highest percentage of hospital delivery related maternal deaths recorded was 12 percent. Otherwise, there was fairly low

percentage of death as related to this factor. The home deliveries related maternal deaths show a low percentage also throughout the reproductive age. A percentage of 11 is observed at age between 15 and 26. Thereafter a marked decline of 7 percent is shown especially between age 27 and 32.

The consistently low hospital death percentages are an indication that maternal cause of death is almost equal from all ages. Maternal related deaths are not directly related to mode of delivery. Though, most young mothers die from vacuum extraction and caesarian. After age 22 a good comparison is maintained especially between induction and normal delivery. Normal delivery cases have an average of 10 percent. Low percentages of death from normal mode of delivery is observed.

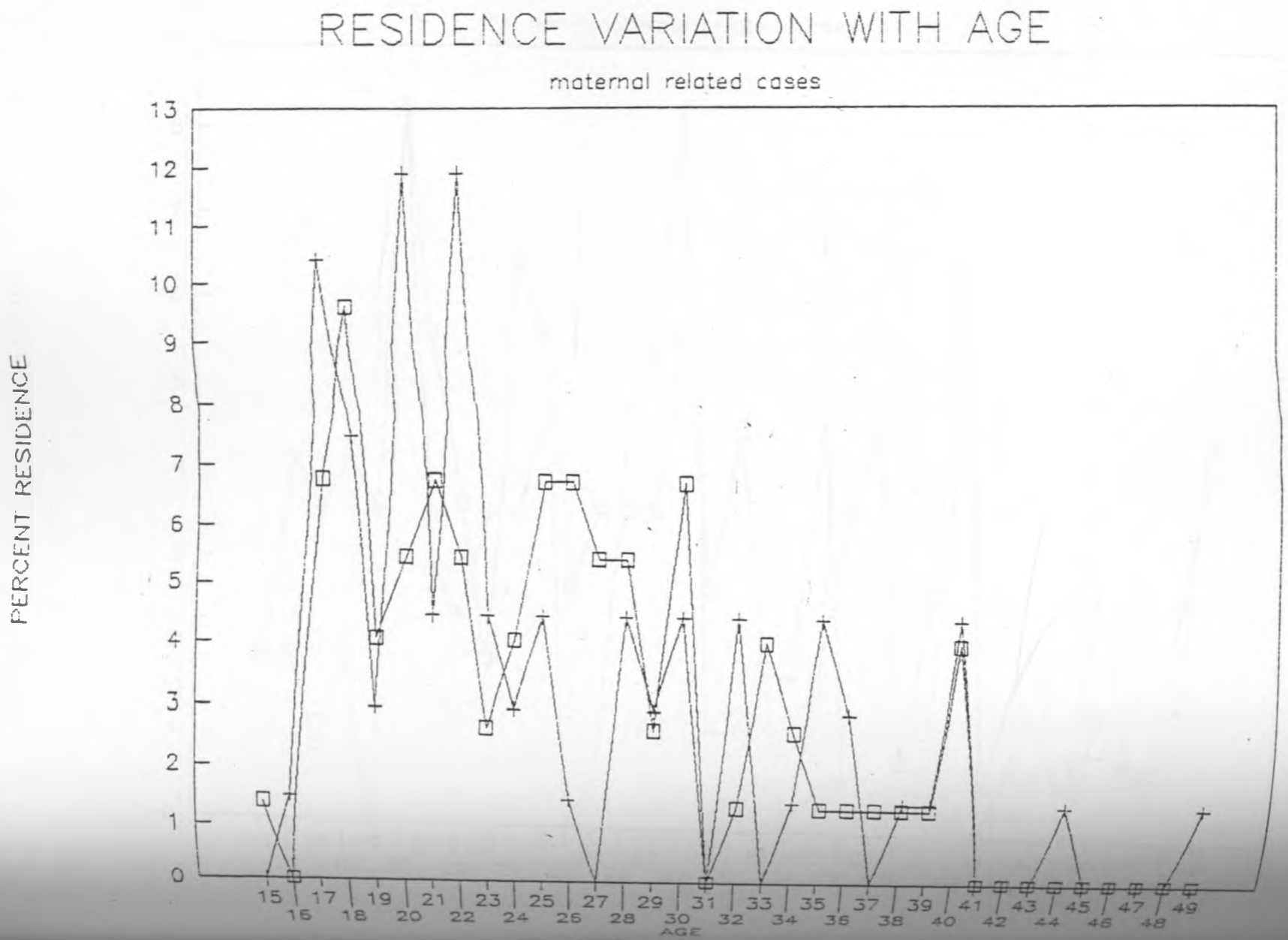

RESIDENCE VARIATION WITH AGE
maternal related cases
PERCENT RESIDENCE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE

FIGURE 15

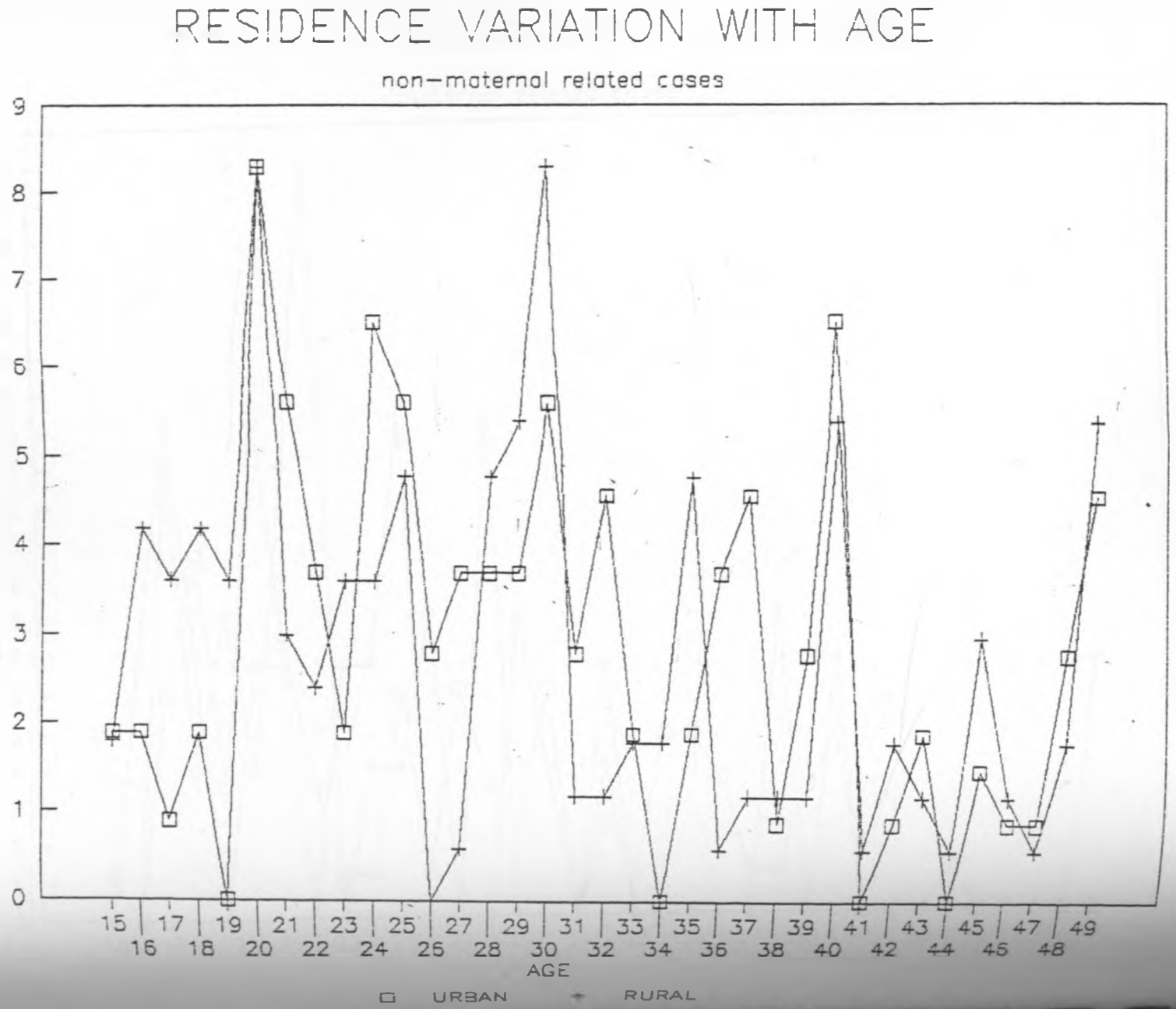

RESIDENCE VARIATION WITH AGE
non-maternal related cases
PERCENT RESIDENCE
0
1
2
3
4
5
6
7
8
9
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
URBAN
RURAL

FIGURE 16

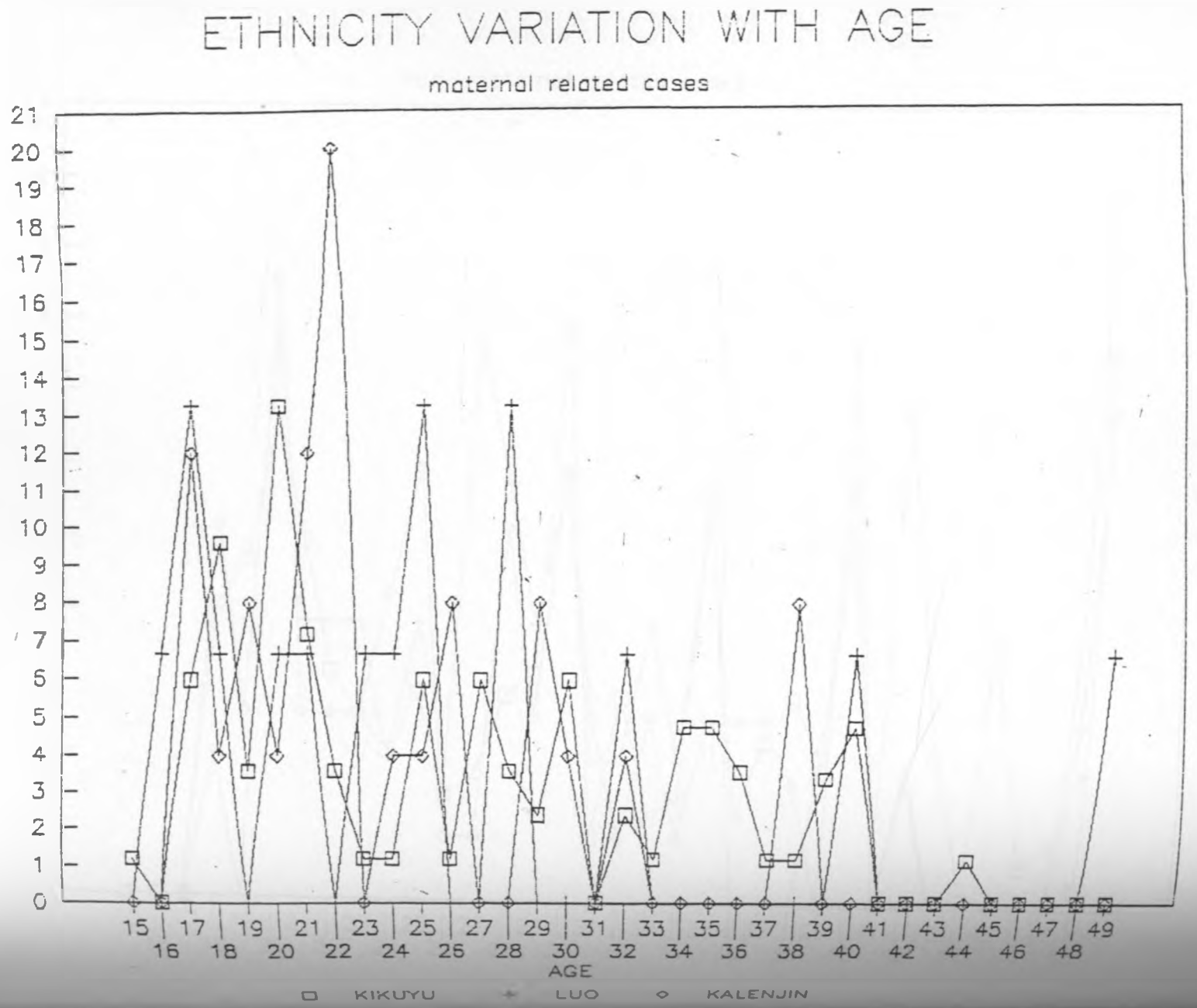
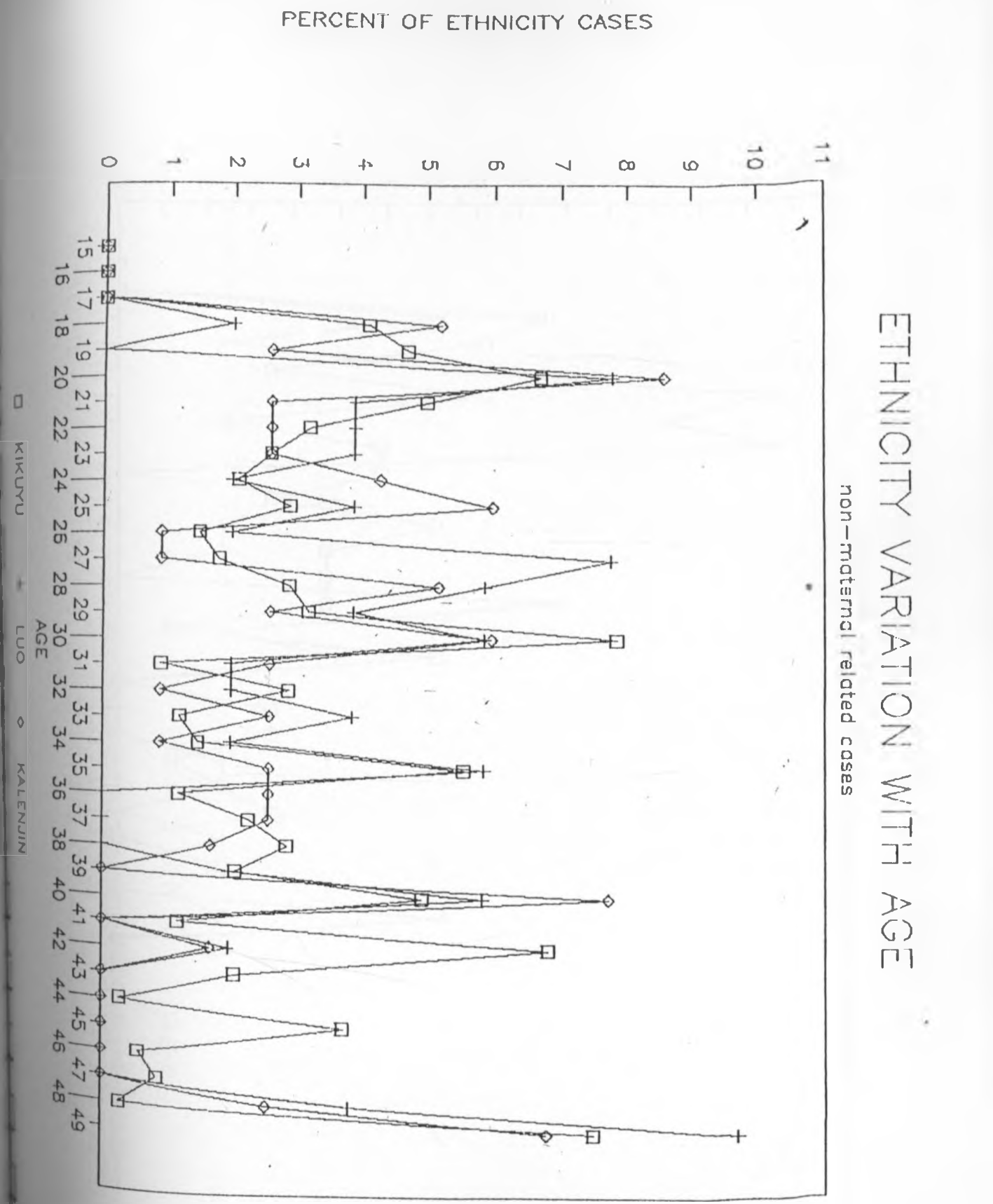

ETHNICITY VARIATION WITH AGE
maternal related cases
PERCENT OF ETHNICITY CASES
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
KIKUYU
LUO
KALENJIN

FIGURE 17

FIGURE 18


PERCENT OF ETHNICITY CASES
0 1 2 3 4 5 6 7 8 9 10 11
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
KIKUYU
LUO
KALENJIN
ETHNICITY VARIATION WITH AGE
non-maternal related cases

CLINIC ATTENDANCE VARIATION WITH AGE

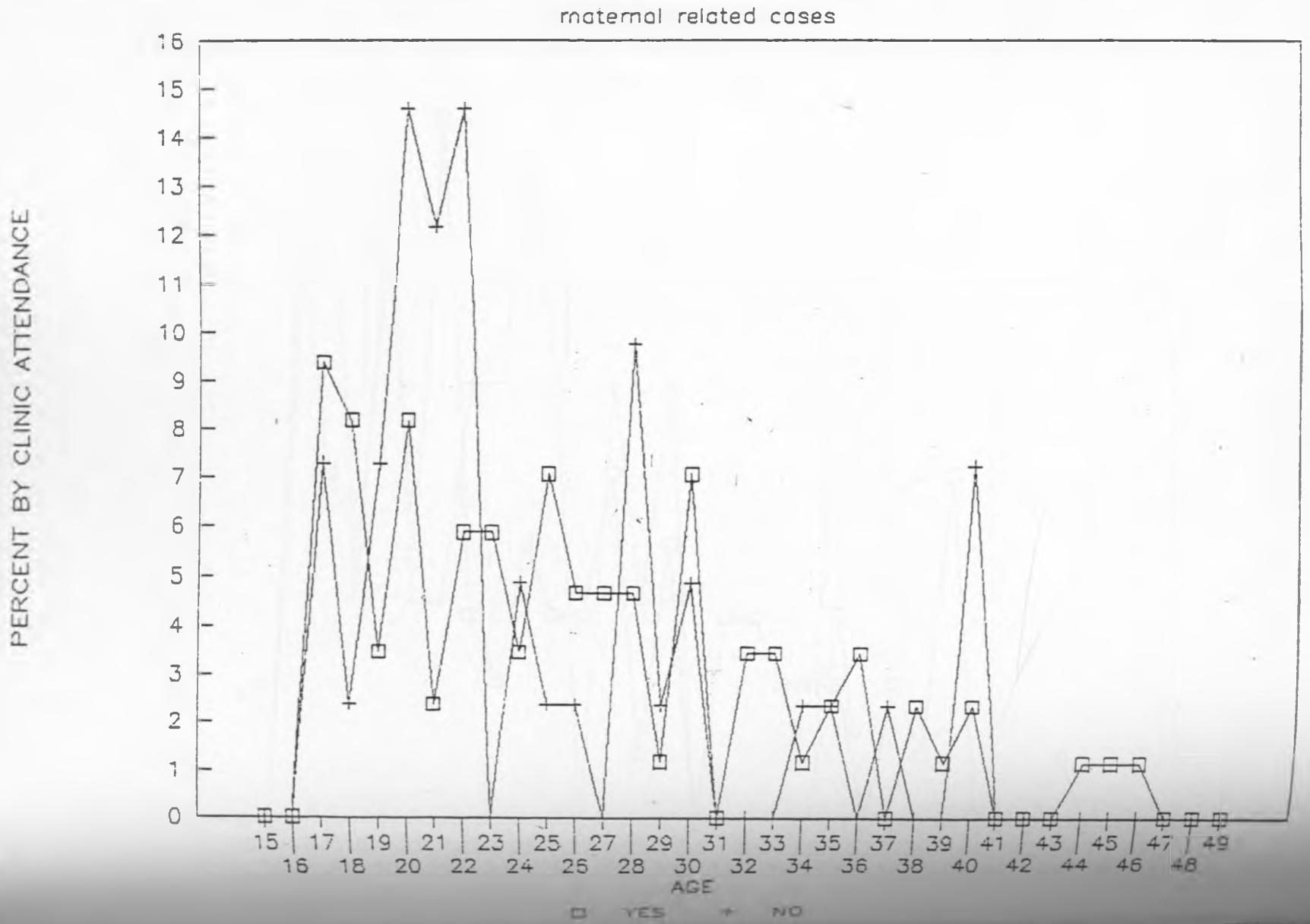


FIGURE 19

PLACE OF DELIVERY VARIATION WITH AGE

maternal related cases

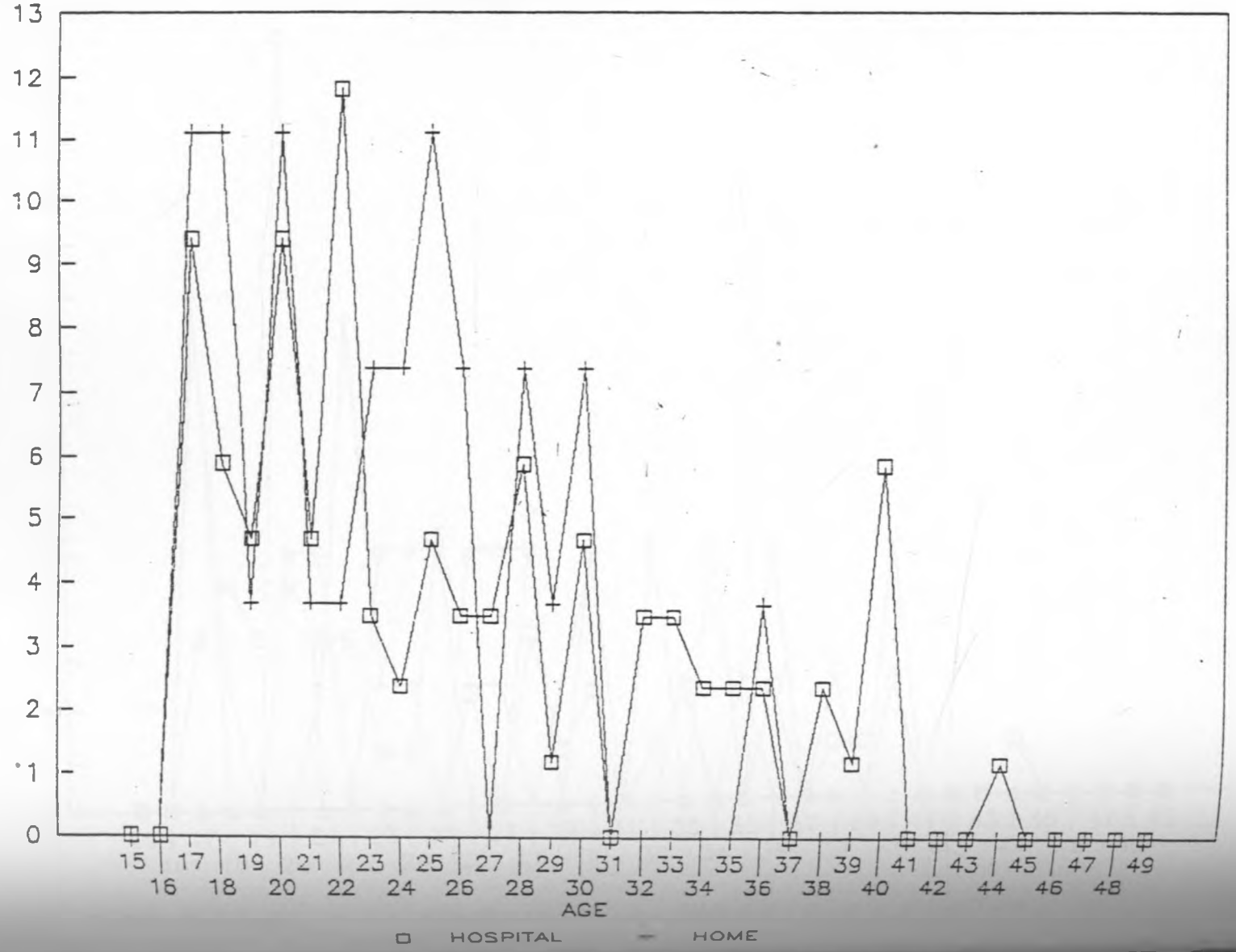


FIGURE 20.

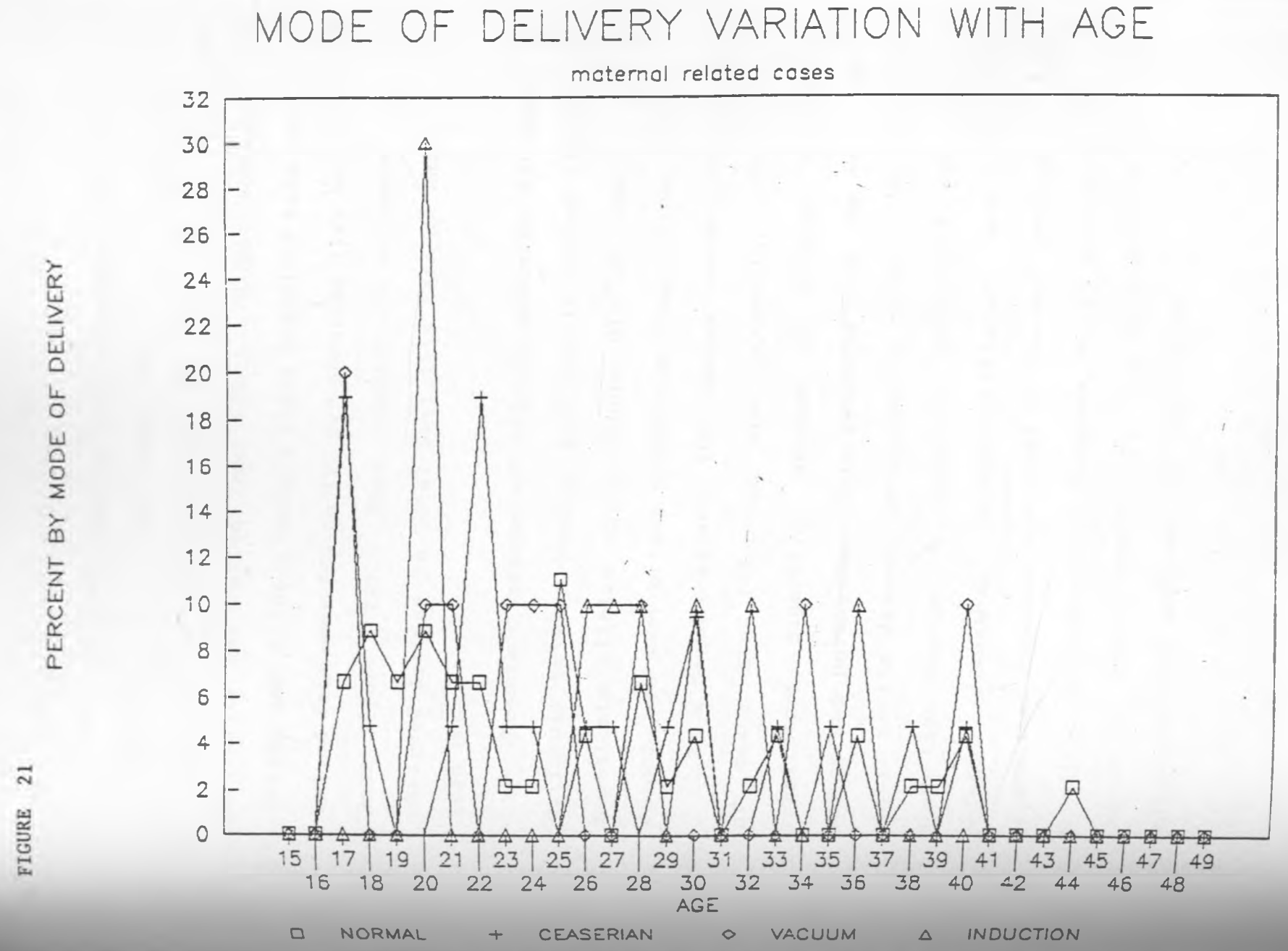

MODE OF DELIVERY VARIATION WITH AGE
maternal related cases
PERCENT BY MODE OF DELIVERY
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
AGE
NORMAL
CEASERIAN
VACUUM
INDUCTION

FIGURE 21

4.3 Leading Causes of Death

"Since Independence, life expectancy at birth has risen from 42 to 58 years, the crude death rate has declined from 20 to 11 per thousand, while the infant mortality has fallen from 120 to 70 per thousand live births,and children under 5 years mortality rate has almost halved from over 200 to 110 per thousand live births" World Bank Report 1990. More support is evidenced by the observed decline in Total Fertility Rate as shown in the 1989 KDHS.

The exact nature of disease patterns in Kenya is difficult to know because most people attend traditional herbalists clinics while others die at home where no records are kept or any postmortem examinations done.

To a certain extent, the leading non-maternal causes of death are infection and parasitic, circulatory, respiratory, digestive systems and external causes of injury and poisoning. This conforms with the World Bank report on the disease prevalence in Kenya. The research shows that respiratory, parasitic, infectious, sanitation-related diseases, maternity-related and sexually transmitted diseases are cited as the most prevalent. The parasitic and infectious diseases though leading could be linked to the accessibility and availability of the infrastructural services and facilities.

TABLE 4.3.1 Recorded Frequency and Percent Distribution of Causes of Death According to International Classification of Death*

Disease code	cases	%	Disease code	cases	%
001-139	91	9.4	630-676	162	16.7
140-239	57	5.9	680-709	08	0.8
240-279	20	2.1	710-739	03	0.3
280-289	38	2.3	740-759	08	0.8
290-319	10	1.0	760-779	08	0.8
320-389	31	3.2	780-799	68	7.0
390-459	88	9.1	800-999	43	4.5
460-519	61	6.3	E800-E999	82	8.5
520-579	66	6.8	V01-V82	50	5.2
580-629	33	3.4	NA	38	3.9
			T O T A L	965	100

* see appendix for explanation of disease codes.

The low level of medical knowhow could have contributed to the determination of circulatory disease being a second female killer disease in Nakuru.

While diseases of digestive, respiratory and neoplasms show high prevalence, the external causes of injury and poisoning, and the ill defined condition of death have higher death rates for females.

As far as data analysis is concerned, maternal related cause of death is comparatively a leading cause for female deaths. Also, the mortuary statistics data showed that almost 50 per cent of the recorded female deaths are maternal related. Likewise the MNH which specialises in maternity and nursing services had its records portray the same results. It could be, as shown in the mortuary statistics, the unknown cases and the ill-defined diseases would contribute immensely to the leading non-maternal diseases.

On the same note some causes of death are rare. For instance, the mental disorder, skin diseases and subcutaneous tissue, congenital anomalies and diseases originating in the perinatal period. Emphasis is made where only 0.3 per cent of diseases of the musculoskeletal system and connective tissues are reported as indicated in Table 4.3.2. As uncommon as this diseases could be, some of them are related to other leading diseases and their isolation as the main cause of

TABLE 4.3.2 Recorded Frequency and Percent Distribution of Maternal Mortality According to International Classification of Death

codes	630	632	633	634	635	637
No.(%)	1(0.6)	4(2.5)	4(2.5)	6(3.7)	4(2.5)	14(8.6)
	639	640	641	642	643	644
	8(4.9)	2(1.2)	5(3.1)	8(4.9)	3(1.9)	7(4.3)
	645	646	647	648	650	651
	6(3.7)	2(1.2)	6(3.7)	2(1.2)	9(5.6)	1(0.6)
	652	653	654	656	658	659
	6(3.7)	10(6.2)	5(3.1)	6(3.7)	5(3.1)	3(1.9)
	660	661	663	665	666	667
	1(0.6)	2(1.2)	4(2.5)	1(0.6)	6(3.7)	2(1.2)
	669	670	671	674	676	TOTAL
	4(2.5)	9(5.6)	0(0)	1(0.6)	5(3.1)	162(100)

* see appendix for explanation of disease codes.

death would be difficult. Though, the contribution of this diseases as a cause of death is still low.

The supplementary classification of the external causes of injury and poisoning and of the factors influencing health status and contact with health services see Appendix contribute 13.7 per cent of overall deaths in the hospitals. Such a high percentage shows that most causes of death are clearly stated. It is also evident

that most accidents and poisoning are taken as the causes without further investigation thus underestimating some causes of death like diarrhoea, internal organ damage, vomiting, abortion, haemorrhage. Maternal Causes of Death

The maternal causes of death according to the World Health Organization has codes 630-676. This includes complications of pregnancy, childbirth and the

TABLE 4.3.3 Frequency and Percent Distribution of the Leading Causes of Death

Cause of Death	Cases	%
Haemorrhage	15	17.0
Infection	15	17.0
Abortion	14	15.9
Disproportion	10	11.4
Puerperal Infection	9	10.2
SVD	9	10.2
Complication following Abortion and Ectopic and Molar pregnancy	8	9.1
Hypertension complicating pregnancy, childbirth and the Puerperium	8	9.1

puerperium. Each of this codes refers to a certain disease but which is directly on reproduction. From this study, the statistics show that the leading cause of maternal deaths are Haemorrhage, Infection, Abortion and Disproportion. Other diseases which increases the maternity related deaths are complications following abortion ectopic and molar pregnancies, and hypertension complicating pregnancy, childbirth and the puerperium.

Apart from abortion which has been dealt with in another section, the leading causes of death are discussed below. These causes of death are seen to contribute about 54.3 per cent of all maternal-related deaths. Table 4.3.3 shows the leading causes of maternal related deaths.

Haemorrhage

Of concern is how this cause of death influenced the level of maternal mortality. Being a leading cause of death it would be imperative to find out its relationship with among others both demographic and non-demographic variables.

As shown in Table 4.3.4, about 90 per cent of all haemorrhage cases were of mothers below 34 years. Very few though, were recorded in age 15-19 with a high percentage in age 25-29. There is an inverted-U relationship of pregnancy related haemorrhage and the age.

Parity statistics especially in the mortuary data were not specified, thus increasing the number of the unknowns. Therefore parity as a variable is difficult to be determined by the low figures recorded in the analysis.

The married women who died of haemorrhage were almost twice those who were unmarried. This not only supports that most married women die of haemorrhage but also shows that this cause of death is directly related to reproduction event. Since most married women are involved in childbearing, majority of them are prone to this disease than their unmarried counterparts. See Table 4.3.5

In consideration of residence and place of delivery, the issue would be more addressed to the availability and accessibility of preventive services and measures i.e medically or any other appropriate means. Both variables show a bias against urban and hospital as having more cases than the rural or home categories. An explanation would mainly be directed to the law of large numbers and

availability of recorded cases. As cited elsewhere most pregnant mothers reside in urban areas when they are almost due for delivery. Almost all mothers who die of haemorrhage are known to have at least attended ante-natal-clinic. It would therefore be possible that the problem can not be foreseen during clinics or there is a failure of communication or medical examination. Another possibility is that the disease could be an emergency one which needs prompt attention and treatment.

Most mothers attend clinics in urban areas and therefore the relationship between clinic attendance and haemorrhage is as expected. This implies that their delivery place is expected to be in hospitals and which are mostly situated in urban areas. This does not rule out deaths from haemorrhage in rural areas especially given the high possibility of deaths that go unrecorded. A point in case is whereby death is just reported after burial. This rules out any postmortem or medical examination.

As indicated in Table 4.3.6, comparatively most females who died of haemorrhage are those who had delivered normally or by vacuum and induction as mode of delivery. The caesarian section though a leading mode as a factor of cause of death is less cited in this specific cause.

Infection

This disease occurs mainly after delivery although it occurrence before delivery is not ruled out. In this study all forms of infection are incorporated. Those includes puerperal sepsis, infection as result of caesarian section,

contraction of disease after normal delivery. Infection before delivery is not explained in this section.

Infection contributes about 10 per cent of all maternal deaths in Nakuru. This shows that the cause of death is one of the major killer disease in the reproductive event.

According to age groups, most females who die of infectious diseases are aged 20-24. As mentioned in the case of haemorrhage with regard to the marital status, the same case applies here. Most married women die of infectious diseases than the unmarried ones. As regards the mode of delivery, most mothers who give birth through normal delivery and caesarian section die most.

TABLE 4.3.4 Frequency Distribution of Leading Causes of Maternal Related Death According to the Age of the Mother

	age					
Cause of Death	15-19	20-24	25-29	30-39	40	NA
Haemorrhage	1	4	6	4	0	0
Infection	1	7	1	3	3	2

TABLE 4.3.5 Frequency Distribution of Leading Causes of Maternal Related Death According to the Marital Status of the Mother

	marital status		
Cause of Death	Married	Unmarried	NA
Haemorrhage	8	4	3
Infection	6	3	6

TABLE 4.3.6 Frequency Distribution of Leading Causes of Maternal Related Death According to the Mode of Delivery

	mode of delivery				
Cause of Death	Normal	Caesarian	Vacuum	Induction	NA
Haemorrhage	5	4	1	0	5
Infection	4	2	1	0	8

Comparatively, abortion cases are three times a killer disease than other forms of infection. Meanwhile infection and haemorrhage claim the same proportion as far as cause of death is concerned.

4.4 The Demographic, Socio-economic and Cultural Factors of Maternal Mortality

4.41 Demographic Factors

The females deaths distribution changes with age. This characteristic is evident from all years of study. An average of approximately 23 per cent is recorded in age 20-24. A marked decline is seen in age 25-29 and 35-39 as shown in Table 4.4.1.

Heaping has effect on the age especially with age ending with zero (O) and five (5) e.g 20, 25, 30, 35, 40. The heaping is evident because most patients round their age to the nearest ten especially if one is one year old or less. The Table 4.4.2 demonstrates this occurrence

Due to the dominance of heaping, the five year age group are used. The categorical groups make the information conform with the hypothesized relationship. The births among the teenage group contributed only 6.16 per cent of the total female death of reproductive age. The increasing

death rate in the age 20-39 is not unusual because that is the age at which most women are involved in childbearing event. The non-maternal deaths are high in age 30-40. This could be due to the deteriorating health in females with a bearing in child birth risk.

The vital registration in Kenya is still very incomplete and inaccurate. This is evidently supported by Table 4.4.3 where registered data is used. Though the data is incomplete it would be a true observation that the maternal mortality is not high. A good comparison of the vital registration data and the collected data

TABLE 4.4.1 Percent Distribution of Age Groups According to Year of Death

	1981	1982	1983	1984	1985	TOTAL
15-19	13.5	14.6	9.9	11.1	13	12.5
20-24	24.0	18.1	25.3	22.7	23.2	22.6
25-29	9.6	13.1	12.6	13.4	9.6	11.7
30-34	24.5	18.6	18.1	16.7	16.9	19.1
35-39	6.6	8.5	9.3	7.9	10.2	8.3
40-44	16.6	19.1	15.4	16.2	16.4	16.7
45-49	5.2	8	9.3	12	10.7	9.4
TOTAL	100	100	100	100	100	100

TABLE 4.4.2 Heaping Effect on Age

Age	years 1981	1982	1983	1984	1985	total
19	7	7	6	2	4	26
20	14	9	9	12	12	56
21	11	3	8	5	7	34
29	5	6	2	8	3	24
30	20	12	9	10	6	57
31	4	0	1	1	2	8
39	2	1	0	2	5	10
40	9	13	6	11	6	45
41	0	0	1	1	2	4

reflects this fact.

The Table 4.4.3 shows that age distribution of maternal deaths is high at early ages of reproduction. From Table 4.4.4, the non-maternal cause of death contributes 80.1 per cent to the overall female death in reproductive age while maternal cause contribute 19.9 per cent. According to age distribution, the non-maternal cause is high among women in their prime reproductive age of 20-24 of those age 30 and above. The least affected by both maternal and non-maternal deaths are the females in the age 25-30. There is a minimum in this age category.

TABLE 4.4.3 Comparative Frequency Analysis of Maternal and Nonmaternal Death, and Births in Nakuru

age		1982	1983	1984	Total
	1*	4	7	3	14
	2*	22	12	19	56
15-19	3*	1151	949	1363	3463
	1*	6	18	6	30
	2*	19	18	17	66
20-24	3*	2240	1997	2898	7135
	1*	11	6	4	21
	2*	13	12	12	50
25-29	3*	1380	1160	1668	4208
	1*	8	9	7	24
	2*	29	19	18	78
30-39	3*	1242	1001	1301	3544
	1*	4	0	2	6
	2*	25	17	29	79
40+	3*	146	144	191	481

* only registered births are used
1 Maternal deaths
2 Nonmaternal deaths
3 District births.

Source: Civil Registration Statistics

Note : see footnote.[5]

The relationship of age and maternal mortality is U-SHAPED. The low percentage in the age category 15-19 could be due to the few cases used in the analysis

Overall Maternal mortality is estimated to be 19.9 per cent in this sample. A higher percentage is recorded in age 20-24 with a decline in other age categories. But looking at the overall reproductive age, female death rate of 148.9 per 100,000 females and maternal mortality

TABLE 4.4.4 Percent and Frequency Distribution of Maternal and Nonmaternal Death According to Age Group

	15-19	20-24	25-29	30-39	40 +	TOTAL
NON MATERNAL	94	122	91	159	150	616(80.1)
MATERNAL	31	49	32	33	8	153(19.9)
% of mat. to Dσ(age)	24.8	28.6	26.0	17.2	5.1	100
% of mat. to DΣ(all)	4.0	6.4	4.2	4.3	1.04	19.9

Note: σ percentage of maternal death according to age
Σ percentage of maternal death according to all deaths

rate of 25 per 100,000 females are recorded. This gives a ratio of 2.6 per 1,000 live births. See Table 4.4.5

Maternal mortality in developing countries has been estimated at 400 per 100,000 live births whereas levels in most of the developed countries are below 25 per 100,000 live births[6]. The situation in Nakuru according to the survey is relatively good in comparison to other developing

[5] Due to unavailability of categorised data on age for the years 1981 and 1985, only 1982,1983 and 1985 were used for comparative analysis of age maternal deaths and the district births.

[6] See WHO, 1987.

countries. The maternal mortality rate is 260 per 100,000 live births. The study shows that the situation is not as alarming though the situation needs attention Being a developing country, a percentage of maternal mortality 19.9 is not unexpected. A comparison with world mortality rates assuming different percentages of female deaths due to maternal causes as shown in Table 4.4.6 and 4.4.7 indicates that Nakuru situation is not worse off.

Most women who die are shown to be those of parity

TABLE 4.4.5 Adult Female Death Rate and Maternal Mortality Rate, Nakuru, 1981-1985.

Var.	1981	1982	1983	1984	1985	total
a	597,149	628,852	662,199	697,306	734,364	3,319870
b	116,211	122,505	129,191	136,275	143,760	647,942
c	9,367	12,690	11,004	16,212	12,318	61591
d	154	159	144	196	150	965
e	31	36	41	25	29	162
1	132.5	129.4	111.5	143.8	104.3	148.9
2	26.7	29.4	31.7	18.3	20.1	25.0
3	3.3	2.8	3.7	1.5	2.4	2.6

Source: *1 Civil registration, Nakuru
*2 Kenya Population Projections CBS, MPND.

Variable.....Var.
Population (est.).....a
Females aged 15-49 (est.).....b *2

Live births.....c *1
Total Female Death (15-49).....d

Maternal Deaths.....e

Death rate to females aged 15-49 years per 100,000 women.....1

Maternal mortality rate per 100,000 women.....2

Maternal mortality ratio per 1,000 live births.....3

one. While the highest percentage is registered between parity 0 to parity 2. Low death rates are recorded as parity increases to 11 although only a few cases are recorded for high parity. Table 4.4.8 illustrates this.

This could be due to the fact that most young mothers go to hospital for medical attention more than the old mothers. Another reason could be that the family planning programme has taken effect in reducing the number from ten and above to about 8 children. This is as reflected in the census report of 1979 whereby Total Fertility Rate is 8.1.

TABLE 4.4.6 Percentage of Deaths Among Women Aged 15-49 Years due to Maternal Causes, Maternal Mortality, and Crude Birth Rate, by Country.

Country	Area	Year	Maternal Mortality Ratio	Percent Maternal Causes	Crude Birth Rate
Gambia	Manduar,Keneba	1951-75	1,025	29	55
Sweden	National	1751	900	10	-
Bangladesh	Jamalpur	1982-83	623	46	39
Bangladesh	Matlaba	1968-70	570	27	45
Bangladesh	Tangali	1982-83	566	30	39
Indonesia	Bali	1980-82	357	23	25
Chili	Santiago	1962-64	316	19	-
Mauritius	National	1952	306	17	46
Egypt	Monufia	1981-83	269	23	37
Colombia	Cali	1962-64	218	15	-
Mauritius	National	1972	176	13	26
Mexico	Mexico City	1962-64	171	15	-
Guatemala	Guatemala City	1962-64	159	14	-
Peru	Lima	1962-64	156	12	-
Peru	National	1978-81	153	12	38
Mauritius	National	1962	150	13	39
Colombia	Bogota	1962-64	126	11	-
Jamaica	National	1981-83	108	8	27
Mauritius	National	1980	108	8	27
Venezuela	Caracas	1962-64	97	13	-
Brazil	Sao Paulo	1962-64	87	7	-
Sri Lanka	National	1980	80	5	28
Panama	National	1981	70	8	29
Cuba	National	1981	48	2	17
Japan	National	1983	18	1	13

Source: Studies in Family planning, Vol.18 No.4 July/August 1984.

is 8.1.

On annual basis it is evident that with time the parity decreases to 7.7 and 6.4 as reported in the KCPS 1984 and KDHS 1989 respectively.

Majority of women who died from the maternal cause were primigravida with a percentage of 30.6. Death rate from other parity i.e 2-6 declined and rose at parity 8 and above. This trend is observed in all institutions.

TABLE 4.4.7 Maternal mortality rates calculated from demographic statistics for 1980-85, assuming that 5,10,20, and 30 percent, respectively, of all deaths among females 15-49 years due to maternal causes.

			Value	
Variable	Africa	Latin America	South Asia	East Asia
Life Exp.(females)	52.4			
GFR	202			
Mortality Rate 15-49 (per 1,000 females)	4.41			
Maternal mortality rate at:				
5%	0.22	0.14	0.21	0.10
10%	0.44	0.27	0.42	0.20
20%	0.88	0.54	0.85	0.40
30%	1.32	0.81	1.28	0.60
Maternal mortality ratio at:				
5%	109	101	144	133
10%	218	201	289	267
20%	436	402	578	533
30%	653	603	867	800

Source: Studies in Family planning, Vol.18 No.4 July/August 1984.

TABLE 4.4.8 Frequency and Percent Distribution of Maternal Deaths According to Parity of Mother

PARITY	FREQUENCY	PERCENTAGE
0	17	1.8
1	59	6.1
2	22	2.3
3	17	1.8
4	15	1.6
5	16	1.7
6	11	1.1
7	11	1.1
8	19	2.0
9	2	0.2
10	3	0.3
11	1	0.1
NA	772	80.0
TOTAL	965	

Source: Survey Data

The relationship is reversed-J contrary to the findings from the available literature. The Table 4.4.8 confirms this finding.

Various observation show that, the high death rates from mothers of parity 0, 1 and 4 + are found in NGH. The trend could be as a result of the adopted policy that, the hospital should attend to this group which is regarded as risky in the event of childbirth. Incompleteness of data is serious in that out of 803 non-maternal cases only 74 had the variable of parity completed while only 119 out of 162 were completed in maternal cases. See Table 4.4.9.

Perhaps most expected was a high rate of maternal death to single mothers, but this is not the case. High maternal and non-maternal death rate occur to married women with 65.8 and 74.7 per cent respectively as shown in Table 4.4.10. A point worthy noting is that most unmarried mothers die of maternal cause more than from non-maternal

cause. A record of 66.1 per cent of single mothers died of this female exclusive risk. According to KDHS, the average age at first marriage is 18.6 years. In attainment of reproductive age, most women get married almost immediately, becoming a potential risky group. It is therefore logical to have most women who are married dying of maternal cause. This argument is supported in the Table 4.4.10 where more than half of the maternal cause are married women.

Most unmarried mothers are young and unemployed. To

TABLE 4.4.9 Percent Distribution of Maternal and Non-maternal Cause of Death According to Categorised Parity

parity	0	1	2-4	5 +	TOTAL
Non Maternal	82.3	22.0	31.5	47.6	38.3
Maternal	17.6	78.0	68.5	52.4	61.7
Total	100	100	100	100	100

explain the reason why most single die at age below 24, the demographic and social status should be considered. For instance, demographic and economic factor that hasten the problem are age, level of literacy, level of knowledge and awareness of reproductive health and the financial status of the mother. These are the characteristic of the young mothers we have today. The societal reaction to pre-marital pregnancy contribute to increased failure of ante natal clinic attendance and increased rate of abortion. As Table 4.4.11 shows, 45 per cent of female deaths occur to female under age 24, of which 22.9 are single and 22.1 are married. Most women who die of maternal cause had their first birth at the age of 15-24. The study showed that 92

per cent of all maternal death cases start reproduction before they attain 25 years of age. This is a universal fact which befits Kenya. See Table 4.4.12.

TABLE 4.4.10 Characteristic of Marital Status as Maternal Cause of Death

	Married	Unmarried	Total
Non-maternal	43.9	33.9	40.9
	(74.9)	(25.3)	(100)
Maternal	56.0	66.1	59.1
	(65.8)	(34.2)	(100)
Total	100	100	100
	(69.5)	(30.5)	(100)

In Parenthesis are the Row Percentage

TABLE 4.4.11 Percent Distribution of Age According to Marital Status of the Mother

	Married	Single	Total
15-19	11.1	36.8	18.8
20-24	20.7	40.4	26.6
25-29	18.5	15.8	22.4
30-39	28.9	7.0	22.4
40-49	20.7	0	14.6
Total	100	100	100

TABLE 4.4.12 Percent Distribution of Maternal and Non-maternal Deaths According to the Age at First Birth Observations

Age at 1st birth	15-19	20-24	25	total
Non-maternal	17.5	11.9	0	13.7
Maternal	82.5	88.1	100	86.3
Total	100	100	100	100

The variable of age at first birth was in most cases incomplete. To have a better comparison of the variable between the maternal and non-maternal cases, the weighting approach is used but the difference is still significant. This makes it difficult to use the analyzed estimates to make any constructive conclusion.

4.42 Socio-Economic and Cultural factors.

The study shows that 42.7 per cent of the female deaths cases were from urban while 57.3 per cent were from rural. In general, of the two types of residence, contextual variables are factors that cannot be ignored. This could be responsible for the observed differentials. Unlike a higher percentage of 61.7 non-maternal related cases found being of rural residents, a higher maternal related cases was observed in urban areas.

Given that ante natal clinic attendance is an exclusively maternity oriented, the variable would not be an appropriate comparative parameter of the maternal and non-maternal cause of death. Of importance is to determine the effect of the ante-natal-clinic on the reproductive age group. From the records it was found out that there were patients who died from maternal cause that used to attend the gynaecological clinic as shown in Table 4.4.13. This actually made the number of the dead females who attended clinic to increase. One third of those who died from maternal cause never attended clinic. This does not imply that ante natal clinic does not offer any useful service as long as the alive female who ever attended clinic are not included in the analysis. From the discharge sheet, it is evident that most women go through the childbirth successfully. Therefore the study only indicates that ante natal clinic attendance is popular with pregnant mothers and the cause of death could be childbirth related risk that is beyond their control.

Delivery is absolutely childbearing event. Out of 162 deaths 117 died during or after delivery. The data does not show that hospital delivery are risky than home ones but more so they show that most mothers go to hospital for childbearing attention. Bearing in mind that date of delivery is an approximation, then home delivery can not always be avoided. More evidence is inferred from the fact that the home delivery cases later on go to hospital for further attention.

The maternity admissions, deliveries and discharge records are a clear evidence that most hospital deliveries are successful. This fact is supported by the difference between admissions, deliveries and discharge. Also out of 162 maternal cases half of them are out of hospital deaths which could have been avoided. Mode of delivery is an exclusively maternal related variable. The variable is a secondary factor as a maternal cause of death though statistically, there seem to be a relationship between the maternal mortality and the mode of delivery. Normal delivery cases contributes more followed by the caesarian section delivery. This is not in support of other modes of delivery since comparative analysis show that normal delivery mode has the most successful deliveries.

Most women deliver normally since the childbirth event is considered a normal process unless it is proved

TABLE 4.4.13 Frequency and Percent Distribution of Maternal Cause of Death According to the Place of Delivery

PLACE	FREQUENCY	PERCENT
hospital	88	9.1
home	29	3.0

missing 846 87.9

to be risky. While the cause of death could be caused by other factors such as anaemia, haemorrhage e.t.c, 52.8 per cent of the dead mothers had delivered normally.

Though a correlation is evident, it could be a spurious one. Otherwise taking 1982 as an example, the percentage of successful normal deliveries to deaths is minimal. In that year, 4768 women delivered normally, 128 used vacuum extraction, 206 had breech delivery, 21 had face to pubis/face and none had forceps delivery as shown in Table 4.4.13. On average the percentage of normal delivery related maternal deaths are approximately 0.197 (using all the normal delivery cases of dead women) with an average of 9 women per year. From the estimates done in 1982, it is evident that vacuum extraction and caesarian section mode of delivery contribute substantially to maternal mortality. For instance, in 1982 1.4 per cent and 1.7 per cent of maternal deaths had a bearing on caesarian section and vacuum extraction delivery modes respectively.

It would be of significance to note that maternal mortality was recorded in gynaecological and obstetric ward more than in the maternity ward. This is an evidence to the fact that maternal mortality is more

TABLE 4.4.14 Comparative Analysis of Female Deaths According to the Ward of Admission. NGH 1982

WARD	ADMISSION	DISCHARGE	DEATHS
Gynae. & Obs	2579	2477	78
maternity	5082	5076	4

TABLE 4.4.15 Comparative Analysis of Female Death in Reproductive Age with the Estimated Population in Nakuru

	NONMATERNAL	MATERNAL	TOTAL	POP.,1979
Kikuyu	55.2	52.5	54.7	317,855
Luo	7.8	16.7	9.3	36,217
Kalenjin	19.4	10.5	17.9	81,651
Luhya	6.0	5.6	6.0	36,142
Kisii	3.1	8.6	4.1	12,319
Kamba	1.9	0.6	1.7	7,561
Nomads	4.2	1.9	3.8	3,979*
Coastal tribes	1.5	3.1	1.8	21,696*1
Others	0.8	0.6	0.8	5,389
Total	100	100	100	522,709

note * Ndorobos
*1 Other African tribes

related to reproductive system than to the childbirth process.

Ethnicity parameter which is expected to portray the cultural values observed by weaning and pregnant mothers is not clear in the foregoing mode of analysis. As shown in the Table 4.4.15 and the population pyramid in the literature review, there is a positive relationship between the population size and mortality rate.

4.5 Bivariate Analysis

In this study it is hypothesised that not only the medical factors but demographic factors play some part in determining the mortality observed by females in reproductive age in Nakuru. It is further postulated that they have differing influence on the addressed issue.

In this chapter all except place of delivery and mode of delivery variables are discussed in relation to mortality. Chi square test will be employed in this analytic technique.

4.51 Chi-Square of maternal cause

Age

It is hypothesized that age at childbirth influences significantly the death of a woman from maternal cause. This is assumed to be true in Nakuru. To test this a chi-square test is used to show whether or not maternal age influences the probability of death from maternal death. As shown in Table 4.5.1, the null hypothesis is

H_0: There is no significant relationship between maternal related cause of death and maternal age.

H_1: There is a significant relationship between maternal related cause of death and maternal age

Since the calculated value of X^2 is greater than the tabulated value at 5 per cent significance level and at 1 per cent significance level, the null hypothesis is rejected and the alternative hypothesis H_1 is accepted.

A similar analysis was done for parity as shown in Table 4.5.2. The assumed null hypothesis was that

TABLE 4.5.1 Observed and Expected Frequencies of Maternal Related Cause of Death According to Maternal Age

	Age of the Mother					
	15-19	20-24	25-29	30-39	40-49	TOTAL
Maternal	94 (100.1)	122 (137)	91 (98.5)	159 (153.8)	150 (126.6)	616
Non Maternal	31 (24.9)	49 (34)	32 (24.5)	33 (38.2)	8 (31.4)	162
Total	125	171	123	192	158	769

X^2 computed = 35.704
X^2 tabulated at 5% significance level = 9.488
X^2 tabulated at 1% significance level = 13.277
Note: In Parenthesis are the Expected Observations

TABLE 4.5.2 Observed and Expected Frequencies of Maternal Related Deaths According to Parity

Cause of Death	parity of the mother				
	0	1	2-4	5+	TOTAL
Maternal	14 (6.5)	13 (22.6)	17 (20.7)	30 (24.2)	74
Non-maternal	3 (10.5)	46 (36.4)	37 (33.3)	33 (38.8)	119
TOTAL	17	59	54	63	193

X^2 computed = 23.934
X^2 tabulated at 5% significance level = 7.815
X^2 tabulated at 1% significance level = 11.345
Note: In Parenthesis are the Expected Observations

H_0 : There is no significant relationship between maternal related cause of death and parity.

against the alternative that

H_1 : There is a significant relationship between maternal cause of death and parity.

The calculated chi-square is greater than the tabulated X^2 at 5 per cent and 1 per cent significance level. Since the calculated X^2 is greater than the tabulated one, then

TABLE 4.5.3 Observed and Expected Frequencies of Maternal Related Deaths According to the Age at First Birth

Cause of	Age at First Birth			
Death	15-19	20-24	25+	Total
Maternal	11 (8.7)	7 (8.1)	0 (1.2)	18
Non-maternal	52 (54.3)	52 (50.9)	9 (7.8)	113
Total	63	59	9	131

X^2 computed = 2.344
X^2 tabulated at 5% significance level = 5.991
X^2 tabulated at 1% significance level = 9.210
Note: In Parenthesis are the Expected Observations

we reject the null hypothesis and accept the alternative one.

Another demographic variable that was put to test using X^2 is the age at first birth. The assumed null and alternative hypothesis were

H_0 : There is no relationship between maternal related cause of death and age at first birth.

H_1 : There is a relationship between maternal related cause of death and age at first birth.

The calculated X^2 value is less than the tabulated X^2 value at 5 per cent and 1 per cent significance level. Therefore, the null hypothesis is accepted and the alternative rejected. See Table 4.5.3.

The technique has been used to find the relationship between the marital status and the maternal related cause of death. The formulated hypotheses are

H_0 : There is no significant relationship between the

TABLE 4.5.4 Observed and Expected Frequencies of Maternal Related Deaths According to Marital Status

Cause of Death	Marital Status		
	married	unmarried	Total
Maternal	62 (57.7)	21 (25.3)	83
Non-maternal	79 (83.3)	41 (36.1)	120
Total	141	62	203

X^2 computed = 1.938
X^2 tabulated at 5% significance level = 3.841
X^2 tabulated at 1% significance level = 6.635
Note: In Parenthesis are the Expected Observations

maternal related cause of death and marital status.

H^A : There is a significant relationship between the maternal related cause of death and marital status

Since the calculated value of X^2 is less than the tabulated value one at 1 per cent significance level, the null hypothesis is accepted and the alternative rejected. The null hypothesis is tested with 10 per cent significance level and proves to be less still. See Table 4.5.5

The non-demographic variables which have been considered using this technique of analysis are residence, ante-natal-clinic-attendance, abortion and ethnicity. It is stipulated that residence influences the level of maternal mortality. The null hypothesis (H_0) states that place of residence does not significantly influence the level of maternal related cause of death.

TABLE 4.5.5 Observed and Expected Frequencies of Maternal Related Deaths According to the Place of Residence

Cause of Death	Place of Residence		
	Urban	Rural	Total
Maternal	128 (142.5)	206 (191.5)	334
Non-maternal	78 (63.5)	71 (85.5)	149
Total	206	277	483

X_2^2 computed = 7.723
X_2^2 tabulated at 5% significance level = 3.841
X^2 tabulated at 1% significance level = 6.635
Note: In Parenthesis are the Expected Observations

The calculated X^2 value is greater than the tabulated X^2 value 5 and per cent significance level. Therefore the null hypothesis be rejected and the alternative hypothesis (H_A) which states that place of residence significantly influence the level of maternal related cause of death is accepted. See Table 4.5.5.

A similar analysis is done for the ante-natal-clinic attendance whereby the following hypotheses are formulated.

H_0 : There is no significant relationship between the maternal related cause of death and ante-natal-clinic attendance.

H_A : There is a significant relationship between the maternal related cause of death and ante-natal-clinic attendance.

Since the calculated X^2 value is less than the tabulated X^2 at 5 per cent and 1 per cent significance level, then we accept the null hypothesis and reject the alternative

TABLE 4.5.6 Observed and Expected Frequencies of Maternal Related Deaths According to the Ante-natal-clinic Attendance

Cause of Death	Ante-Natal-Clinic Attendance		
	Att.	Non-att.	Total
Maternal	9 (10.8)	7 (5.2)	16
Non-maternal	81 (79.2)	36 (37.8)	117
Total	90	43	133

X^2_1 computed = 0.572
X^2 tabulated at 5% significance level = 6.635
X^2 tabulated at 1% significance level = 3.841
Note: In Parenthesis are the Expected Observations

TABLE 4.5.7 Observed and Expected Maternal Related Cause of Death According to Ethnicity.

Cause of Death	Ethnicity				
	Kikuyu	Luo	Kalenjin	Luhya	Kisii
Non-matern.	438 (434.4)	62 (73.9)	154 (142)	48 (47.3)	25 (32.4)
Maternal	85 (88.6)	27 (15.1)	17 (29)	9 (9.7)	14 (6.6)
Total	523	89	171	57	39
	Kamba	Nomads	Coastal	Asians	Total
Non-matern.	15 (13.3)	33 (29.9)	12 (14.1)	7 (6.6)	794
Maternal	1 (2.7)	3 (6.1)	5 (2.9)	1 (1.4)	162
Total	16	36	17	8	956

X^2_2 computed = 32.654
X^2 tabulated at 5% significance level = 15.51
X^2 tabulated at 1% significance level = 20.09
Note: In Parenthesis are the Expected Observations

one. See Table 4.5.6

Looking at the Ethnicity which is categorised into tribal groupings, null and alternative hypothesis are formulated thus.

H_0 : There is no significant relationship between the maternal related cause of death and ethnicity

H^A : There is a significant relationship between the maternal related cause of death and ethnicity.

The calculated value of X^2 is greater than the tabulated X^2 thus we reject the null hypothesis at 5 per cent and 1 per cent significance level. See Table 4.5.7

Abortion is both an intermediating variables in this study. But a close look using this technique is employed as shown in Table 4.5.8

H_0 : There is no significant relationship between maternal mortality and abortion.

H^A : There is a significant relationship between maternal mortality and abortion.

Since the calculated X^2 value is greater than the tabulated X^2 at 5 per cent significance level, we reject the null hypothesis. But at 1 per cent significance level, we accept the null hypothesis. It is therefore observed that abortion is not strongly related to maternal mortality as expected.

Abortion just like maternal cause of death has been analyzed using chi-square method of analysis but only demographic socio-economic variables have been considered.

From the various chi-square test of abortion and the variables, only age, parity were significant at 5 and 1 per cent significant level. The marital status, age at

Table 4.5.8 Observed and Expected Frequencies of Maternal Related Cause of Deaths According to Abortion

Cause of Death	Abortion Cases		
	yes	no	Total
Maternal	18 (9.5)	2 (10.5)	20
Non-maternal	66 (74.5)	91 (82.5)	157
Total	84	93	177

X_c^2 computed = 16.332
X_t^2 tabulated at 5% significance level = 3.841
X^2 tabulated at 1% significance level = 6.35
Note: In Parenthesis are the Expected Observations

TABLE 4.5.9 Abortion Chi-square

Variable	Significance Level 1 %	5 %
Age	Rejected	Rejected
Parity	Rejected	Rejected
Marital Status	Accepted	Rejected
Age at First Birth	Accepted	Rejected
Place of Residence	Accepted	Accepted
Ante-natal Clinic Att.	Accepted	Rejected

first birth and ante natal clinic attendance were marginally significant since they were only significant at 5 per cent significant level. The Place of residence was not significant at all. The Table 4.5.9 illustrates this.

4.52 Abortion Analysis

Abortion rate results are not as high as was expected. A comparison of registered births rate and the abortion rate is quite low. Also the chi square result of the maternal related cause of death and the abortion related cause is only significant at a high level otherwise it is not. The proportion of abortion cases to other maternal cause of death is quite small though most

TABLE 4.5.10 Abortion Case Rate

EVENT	NUMBER	Ratio per 1,000 Live birth	Abortion as % of all Maternal death	Death to case rate as a % of Live birth
Live birth	61,591			
Abortion	84	1.4	51.9	0.13
Mat. cause	162	2.6		0.3

* Source: Annual returns and reports

TABLE 4.5.11 Abortion Cases According to the Institutions of Stud

HOSPITAL	FEMALE DEATH	ABORTION
NGH	59.8	57.1
MNMH	7.9	9.5
MORTUARY	29.7	28.6
NWMH	2.5	4.8
TOTAL	100	100

cases can be traced in haemorrhage, poisoning e.t.c. as causes of death.

The majority of women who had an abortion died in NGH where most likely legal abortion was quite frequent. This could be due to the high frequency of pregnancy complication referred there. The mortuary statistic has almost 50 per cent of abortion cases from NGH. Most

abortion cases whereby drugs were used as a means of abortion were recorded as poisoning "cause of death".

The statistics for the mortuary show that out of 48 female maternal deaths in the mortuary, almost half of them died of abortion as shown in Table 4.5.11. M N H portrays a different picture as far as abortion is concerned. The hospital does not have a mortuary and therefore, they use the municipal mortuary. Induced abortion cases as reported in the mortuary records are not reflected in MNH's records making it impossible to determine the real cause of death.

Annual distribution of abortion is quite constant but with a peak in 1983. Otherwise both abortion clients in the annual analysis seem to be the same. As discussed earlier, abortion is hereby categorised into two types: spontaneous and induced. In Kenya, induced abortion is illegal. All unwanted pregnancy ends up either in delivery or abortion therefore in the process of covering abortion it is registered as spontaneous unless medically proved or by the consent of the patient.

According to the ICD, there are three types of abortion which includes spontaneous (code 634), legally induced (code 635), unspecified (code 637). From the records and the annual returns, it is clearly shown that most of the abortion cases are recorded as having been unspecified abortion (see the ICD codes)

From the records, the unspecified abortion category has the most cases while the illegal category has the least. To complete data on the abortion, mortuary data was

used in order to cover backstreet abortion cases. The cause is known through postmortem examination.

Most of the nonmaternal and maternal causes of death had been recorded differently from what the postmortem results show.

TABLE 4.5.12 Percent Distribution of Abortion Observations According to the Maternal and Non-maternal Related Causes of Death

	abortion		
	Yes	No	Total
Non-maternal	21.4	2.2	11.3
	(90)	(10)	(100)
Maternal	78.6	97.8	88.7
	(42)	(58)	(100)
Total	100	100	100
	(47.5)	(52.5)	(100)

Note: In parenthesis are the percentages

carried out. Out of all maternal causes, abortion clients contributed 42 per cent while non abortion clients contributed 58 per cent. This puts abortion as a leading primary cause of death. See Table 4.5.12

A high number of female deaths with a primary cause as abortion are age 20-24. A low death percent in age 15-19 is recorded . From the maternal mortality point of view, the number of cases in this age category is comparatively high. Most young mothers in this age category may opt to deliver rather than to abort. This interpretation is further supported by the high figure of abortion cases being of parity one. The data from vital registration supports the evidence that women have their first pregnancy in age 15-29 with a unique exception of age 20-24 where there is a peak as illustrated in Table 4.5.13 and 4.5.14

While abortion categorisation is inconsistent with a bias in the unspecified and illegal abortion some

TABLE 4.5.13 Abortion Cases According to Age
Abortion

Age	Yes	No	Total
15-19	12(28.1)	25.8(71.9)	19.5(100)
20-24	38.7(58)	23.6(42)	30.5(100)
25-29	22.7(44.7)	23.6(23.6)	23.2(100)
30-34	21.3(61.5)	11.2(38.5)	15.9(100)
35-39	4.0(18.8)	14.6(81.2)	9.8(100)
40-44	1.3(100)	0	0.6(100)
45-49	0	100(0)	0.6(100)
Total	100(45.7)	100(54.3)	100(100)

Note: In parenthesis are row percentage

TABLE 4.5.14 Abortion Case Rate According to Age

Age	No. of Female Deaths	No. of Abort.	Ratio Per 1000 Livebirths	Abortion Mortality Rate
<25	296	38	0.6	128.4
25-39	315	36	0.6	114.3
40+	158	1	0.02	6.3
All ages	769	84	1.4	109.2

inferences can still be made regarding this risky event

Most abortion cases are primigravida and nulliparous. The number of abortion declines with grandmultiparas. The high rate of abortion by mothers in parity one could be because some of the pregnancies are unwanted. Most unmarried mothers opt to abort having had the economic, social and psychological experience of the first baby. The parity zero abortion cases would be hard to predict since most body physiology reactions to first pregnancies are highly unpredicted.

A high percentage of maternal death is recorded for women with parity 2-4 and are married against a high percentage of parity 1 for those who are single.

TABLE 4.5.15 Abortion Case Rate According to Parity

Parity	No. of dead women	Number of Abortion	Ratio per 1,000 LiveB.	Abortion Mort. Rate
0	17	7	0.11	41.18
1	59	15	0.24	25.42
2-4	54	23	0.37	42.59
5+	63	15	0.24	23.81
All pa.	193	60	0.97	31.09

Note: Livebirths = 61591

TABLE 4.5.16 Abortion Cases According to Marital Status

		Abortion		
		Yes	No	Total
Marital Status	Married	35.6	59.1	43.3
		(55.2)	(44.8)	(100)
	Single	64.4	40.9	56.7
		(76.3)	(23.7)	(100)
	Total	100	100	100
		(67.2)	(32.8)	(100)

Note: In Parenthesis are the Row Percentages

See Table 4.5.15.

Among the abortion cases, a higher per cent is recorded for the unmarried women with 55.2 per cent against 44.8 per cent of the non-abortion unmarried cases. Of all unmarried women, 76.3 per cent had an abortion while 23.7 per cent had not. Comparison of the two categories of marital status confirm the hypothesis that unmarried mothers abort more than the married ones. To support, this Table 4.5.16 shows that 64.4 per cent of abortion cases were single while 35.6 were married.

A high percentage of maternal death is recorded for parity 2-4 who are married against a low percentage of parity 1. The unmarried show contrary results whereby 59.1 per cent were abortion related cases while 40.9 are not as

shown in Table 4.5.16. This confirms the hypothesis outlined in the study that most abortion death cases are of the unmarried mothers.

With increasing number of first time mothers there is a high probability of pregnancy wastage as well. Thus abortion has a high probability of occurrence.

Higher abortion cases are recorded in age 25-29 with parity 2-4 and age 30-39 with parity 5+. From the study, as shown in Table 4.5.17, a U-shaped graph is identified with a low in parity 2-4. Also identified is a low in age 25-29. The peaks are recorded in parity 1 and parity 5 for the former, and age 20 and age 40 for the later.
Induced abortion could be the most responsible for increased abortion rate in age 15-24 and parity 1 while spontaneous abortion would be responsible for increased rate in age 30+ and parity 5.

Nearly proportional rate of abortion cases are recorded by both the married and unmarried with a parity one. A U-shaped curve is maintained at parity 2-4 but while there is an increase of abortion victims of married females, there is a marked decrease of unmarried cases.

TABLE 4.5.17 Abortion Cases as Related to Age and Parity

Age	Parity 0	1	2-4	5+	Total
15-19	68.8	40.0	5.9	-	19.7
20-24	31.3	43.6	30.9	5.0	26.7
25-29	-	9.1	36.4	15.0	18.6
30-39	-	3.6	14.5	48.3	21.3
40+	-	3.6	7.6	31.7	13.7
Total	100	100	100	100	100

TABLE 4.5.18 Abortion Cases as Related to Marital Status Parity

Marital Status	Parity 0	1	2-4	5+	total
Married	17.6	46.4	75.9	93.4	67.6
Single	82.4	53.6	24.1	6.6	32.4
Total	100	100	100	100	100

Looking at the totals as shown in Table 4.5.18, married women die of abortion more than the unmarried ones. These unexpected trend could be attributed to various factors. The shift could be due to the high chances of females being married as ones parity increases. Also, due to the stigma attached to abortion, most females give the medical personnel the impression that they are married so that they can get better medical attention. As a result of inconsistency in the marital status, the variable was categorised into two groups only.

As seen in Table 4.5.19, both married and unmarried women die of abortion in age 20-24. There is a recorded constancy in the abortion by married women of all age group with an exception of age 30-39 where there is a peak. More than 80 per cent of unmarried who die from

TABLE 4.5.19 Abortion Cases as Related to Marital Status and Age

Marital Status	Age 15-19	20-24	25-29	30-39	40+	Total
Married	41.7	54.9	73.5	90.7	100	70.3
Single	58.3	45.1	26.5	9.3		29.7
Total	100	100	100	100	100	100

abortion are recorded in age 15-24. Otherwise the trend is similar to that observed in table 27.

Most females who die in hospital are not abortion cases. Almost 84 per cent non abortion cases are recorded in that regard. Most females who died at home due to maternal cause were abortion victims represented 57.1 per cent while the non-abortion represented 42.9 per cent. A cross section on the place of abortion show that 57.1 per cent died while being attended to at a health facility while 38.1 per cent had an abortion at home. This balance is maintained by the fact that all legal abortions and some of the spontaneous ones take place in the hospitals. Therefore if categorisation was properly done, then a firm conclusion would be made.

This study shows that abortion is prevalent in rural areas than in the urban areas. The conclusion would be jeopardized if other factors are not critically looked into. First, the majority of abortion cases die in hospital. Second, abortion cases are rural residents. Therefore there is a high probability that the urban residents abortion goes on successfully than their counterparts.

According to abortion findings, the number of females who die from the abortion related complications is linearly

related to the population of the given tribe. Abortion being a medical event, it is expected to be more related to the physiology than to the cultural events. Likewise the induced abortion in most societies is regarded as immoral in childbirth and therefore would be more related to the extent of exposure of the victim than to ones cultural background.

4.6 Multivariate Analysis

Regression Analysis Results.

Regression has been applied as an analysis tool in this study for purpose of prediction, estimating and smoothing of the data. The multiple correlation coefficient of multiple determination (R^2) defined as the ratio of the variation explained by the knowledge of the independent variables to the total variations present in the dependent variable, and R its positive square root called the coefficient of multiple correlation are used to test the significance of the regression model.

Both Ordinary Least square and Logistic Regression models could be applied in this analysis. However a large sample is a prerequisite for the application of the logistic model otherwise small sample size will bias the coefficient (Dickson 1983).

The regression with full variables has a sample size of 208 cases whereby only 8 variables are used. As indicated in chapter 1, weighting of the 120 non maternal cases has been worked out to facilitate the running of the model.

All variables were treated as categorical and binary variables. The emphasis on categorical is based on the theoretical as well as empirical relationship of these variables as shown by evidence from recent research findings (Meegama, 1980; Koenig et al, 1984).

The logistic regression in this study uses the reference category approach. This is a case whereby the category with maximum cases or which is at the peak as

related to the dependent variable is called reference category. All other cases are regressed with reference to this category. In the analysis, the variable category is

TABLE 4.6.1 Frequency Distribution of Female Deaths According to Age Group

AGE	FREQUENCY	PERCENT %
15-19	36	17.3
20-24	51	24.5
25-29	34	16.3
30-39	44	21.2
40	29	13.9
NA	14	6.7
TOTAL	208	100

TABLE 4.6.2 Age Characteristic as a Factor of Maternal Cause of Death

	15-19	20-24	25-29	30-39	40+	NA	Total
Maternal	22.6	29.7	25.9	12	4.4	5.3	16.8
Non-maternal	77.4	70.2	74.1	88	95.6	94.7	83.2
Total	100	100	100	100	100	100	100

not regressed because it is expected to yield even better results if others could do. The overshadowing effect of the reference category on other categories is thus eliminated. For instance the age category 20-24 is used as reference category for other age categories. See Table 4.6.1 and 4.6.2 for illustration.

According to the results in Table 4.6.3, nearly all the variables in the model are not only significant but also consistent with the hypothesized relationship. For example there are, however, a few exceptions based on logistics coefficients which, while still indicating the expected casual directions are nevertheless not significant.

The logistic package automatically ignores an

observation especially if one of the variable is incomplete. Therefore as indicated in the table of regression analysis, as some variables with incomplete data were dropped, the observation under analysis increases.

All eight variables are used in the regression. The place delivery and mode of delivery were left out because

TABLE 4.6.3 Regression Analysis of Full Variables and Reduc Models

VAR	EQ.1	EQ.2	EQ.3	EQ.4	EQ.5	EQ.6
A1	1.9544	.3560	0.3961	.0477	-0.1055	-.1175
	2.6968)	(0.8413)	(0.3280)	(0.3026)	(0.2746)	(0.2730
A2	ref.	ref.	ref.	ref.	ref.	ref.
	cat.	cat.	cat.	cat.	cat.	cat.
A3	-0.2398	-1.2922*	-0.1149	-0.2196	-0,1416	-0.1166
	(1.9762)	(0.7895)	(0.3204)	(0.2995)	(0.2740)	(0.2722)
A4	2.8306	-1.1921	-0.4308	-0.5626**	-0.62**	-0.60**
	(2.3148)	(0.8272)	(0.3066)	(0.2850)	(0.2629)	(0.2608)
A5	14.3464	-2.3214**	-1.5706**	-1.8523**	-1.995**	-2.02**
	(73.0651)	(0.9805)	(0.4355)	(0.4243)	(0.4044)	(0.4040)
NR	17.9954	-1.1206	omitted	-1.7255**	omitted	-2.12**
	(96.1086)	(1.4003)	category	(0.4074)	cat.	(0.3878
P1	-4.7274**	-4.2176**				
	(2.6397)	(1.4240)				
P2	-0.7942	0.1647				
	(2.2458)	(0.7594)				
P3	ref.	ref.				
	cat.	cat.				
P4	-3.5237	0.7772				
	(2.4275)	(0.7310)				
NR	-5.6322	-.4.2071				
	(146.344)	(2.0094)				
M1	ref.	ref.				
	cat.	cat.				
M2	1.3438	-0.0429				
	(1.7377)	(0.6449)				
NR	-17.3364	no cases				
	(299.896)	for anal.				
B1	-15.8684					
	(95.8744)					
B2	ref.					
	cat.					
NR	-18.7659					
	(95.8909)					
R1	ref.	ref.	0.4004	2.8968		
	cat.	cat.	(0.2286)	(0.3266)		
R2	-1.2904	-1.1075**	ref.	2.4686		
	(-1.3542)	(0.5492)	cat.	(0.3216)		
NR	-2.9032	3.7840*	omitted	ref.		
	(3.4069)	(2.0951)	category	cat.		
C1	-0.1970					

	(1.8543)					
C2	ref.cat.					
NR	-2.7233					
	(3.2385)					
F1	ref.cat.					
F2	-0.3163					
	(1.9219)					
NR	-19.8844					
	(96.0963)					
CT1	ref.cat.	ref.cat		ref.cat.		re.cat.
CT2	1.4007	0.4168		0.4426*		0.5412**
	(1.6237)	(0.7126)		(0.2634)		(0.237)
CT3	-0.1304	-1.6734**		-0.4383		-0.493*
	(2.1267)	(0.7968)		(0.3080)		(0.289)
CT4	6.3977	1.3891		1.3963**		1.3351**
	(5.7179)	(1.1167)		(0.4393)		(0.389)
CT5	2.3216	-0.0429		0.4010		-0.0426
	(3.0986)	(1.0078)		(0.4450)		(0.394)
NR				-3.0651		-3.9110
				(11.8773)		(7.0746)
T1			ref.cat		ref.cat	
T2			0.3739		0.6619**	
			(0.3247)		(0.2833)	
T3			-0.7420**		-0.6316**	
			(0.3606)		(0.3060)	
T4			0.5364		0.0460	
			(0.4907)		(0.4057)	
T5			0.7403		1.0524**	
			(0.5127)		(0.4292)	
T6			-1.0553		-1.2980	
			(1.1344)		(1.0529)	
T7			0.0547		-0.3866	
			(0.8936)		(0.6404)	
T8			0.8079		0.5942	
			(0.6803)		(0.5803)	
T9			0.2961		-0.7040	
			(1.4323)		(1.0911)	
NR			omit.cat.		omit.cat.	
COb	17.4015	1.1223	-0.6391	-3.0459	-0.9575	-1.0274
COσ	95.9016	0.8555	0.2530	0.3446	0.1956	0.1933
	P=8	P=5	P=3	P=3	P=2	P=2
	N=208	N=203	N=416	N=965	N=766	N=965

Note: ** 2-tail significance level at - 0.025
* 2-tail significance level at - 0.05
In parenthesis are the values of S.E. of the respective equations

they are maternal events only, making conclusions unrealistic.

The R^2 of the equation is perfect i.e one (1). Given that R^2 (goodness of fit) is a necessary but not

sufficient condition for equation perfection, then the coefficient of determination with full variables being one does not explain anything. None of the variables is significant though some categories are as shown in Table 4.6.3. The reason could be the number of observations used which is only 208 out of 965 collected cases. This makes the regression of the full variables invalid in the hypothesis testing. False conclusion that there is perfection in variation between the actual and expected parameters is therefore rejected. As a cross section study, the "goodness of fit" is as low as expected. The low standard error constant of equations 2,3,4,5 and 6 show that the model is consistency with the expected results. There is no problem of autocorrelation because the standard error shows that the errors are uncorrelated. However the problem is common with series data and not cross-sectional data which is used in this study.

Another suspected problem with equation one is multicollinearity. It arises when the independent variables are linear functions of each other. The consequences are that the standard errors are infinite or high (Gujarati, 1976). The result is that the population values of the coefficients cannot be estimated precisely. The coefficients should be less than 0.5 and hence low for this problem to be non-existence. Looking at equation 1 the constant standard error is high as well as for the respective categories. The coefficients are all greater than 0.5. From the low coefficient's and standard error's constants, obtained from the regression analysis,

evident that reduced model 3 and model 5 are the best. The models outline below show a low "goodness of fit" of 0.2065 which is acceptable in cross-section studies. Also acceptable are the constants of -0.6391 and -0.9575 for the models 3 and model 5 respectively.

Given that parity and age, parity and marital status, age and age at first birth, abortion and mode of delivery, tribe and mode of delivery are correlated, then the reduced model are adopted for further analysis.

In the essence of getting better results, abortion, ante-natal clinic attendance, and age at first birth were dropped. In that regard, age, parity, marital status, ethnicity (categorised) and residence were analyzed (see equation 2). It is evident from Table 4.6.3 equation 2, that residence and parity are significant. Otherwise, there are categories that which are significant like age 25-29, age 40 and above,parity 0, rural residence and categorised tribe of Kalenjin.

In this analysis, the reference category probability of occurrence is given by the following formula.

$$P = \frac{e^{a+bx}}{1+e^{a+bx}}$$

Where, P= probability of occurrence

e= base of logarithmn

a= constant

b= coefficient of the variable

x= the variable to be regressed.

The probabilities obtained for the two models are analyzed in Table 4.6.4 and Table 4.6.5.

As observed from the Table 4.6.6 above, a comparison between the regressed categories and the reference category is made. It is the obtained difference between the two probabilities that tells whether the category has an increased or decreased risk of dying from maternal mortality. If positive, there is an greater chance of the mother in that category dying from maternal mortality as compared to a mother in the reference category. Likewise a negative sign shows that there is a lesser chance of a mother dying from maternal mortality as compared to the mother in the reference category.

The reference category's probability of occurrence is summarised in the constant. For instance the probability of a mother dying from maternal mortality given that she is 20-24 years old, a rural resident and a Kikuyu is 0.3455 i.e (using model 3). Also, the probability of a female age 20-24 and she is a kikuyu is 0.2774.

Therefore any diversion from the reference category's probability of occurrence will give the relative risk of a female death from maternal mortality caused by the changed category since the rest are assumed constant. e.g. there i

TABLE 4.6.4 Regression Analysis of Equation 3.

VAR	age	coeff.	s.e	t-value	sign.
A1	15-19	0.3961	0.3026	1.3089	0.2272
A2	20-24	ref. cat.	ref. cat.	ref. cat.	ref. cat
A3	25-29	-0.1149	0.3204	0.3586	0.7198
A4	30-39	-0.4308	0.3066	1.4051	0.1599
A5	40-49	-1.5706	0.4355	3.6064	0.0003**
NR	Not Recorded	omitted			
T1	Kikuyu	ref. cat.	ref. cat.	ref. cat.	ref. cat
T2	Luo	0.3739	0.3247	1.1515	0.2496
T3	Kalenjin	-0.7420	0.3606	2.0577	0.0396**
T4	Luhya	0.5364	0.4907	1.0951	0.2743
T5	Kisii	0.7403	0.5127	1.4439	0.1487
T6	Kamba	-1.0553	1.1344	0.9302	0.3522
T7	Nomads	0.0547	0.8936	0.0612	0.9512
T8	Coastal Tribes	0.8079	0.6803	1.1876	0.2350
T9	Others	0.2961	1.4323	0.2067	0.8362
NR	Not Recorded	Omitted			
R1	Urban	0.4004	0.2286	1.7515	0.0798*
R2	Rural ref.cat.	ref. cat.	ref. cat.	ref. cat	
NR	Not rec.	omitted			
COb	constant	for coefficient =		0.6391	
COa	constant	for s.e		0.2530	

Note: ** 2-tail significance level at - 0.025
* 2-tail significance level at - 0.05

a greater risk of a woman dying from maternal mortality if she is age 25-29 with a probability of +0.0275 holding other categories constant. Also there is a lesser risk of -0.1492 of dying from maternal mortality given that the female is a Luo, holding other categories constant.

The regression shows a positive relationship of age category 15-19 though it is insignificant. Otherwise a negative relationship is maintained throughout other age groups. Also worth to be noted is the negative relationship between age and maternal mortality

TABLE 4.6.5 Regression Analysis of Equation 5.

VAR	age	coeff.	s.e	t-value	sign.
A1	15-19	-0.1055	0.2746	0.3842	0.7009
A2	20-24	ref.cat	ref.cat.	ref.cat.	ref. cat
A3	25-29	-0.1416	0.2740	0.5168	0.6053
A4	30-39	-0.6220	0.2629	2.3659	0.0180**
A5	40-49	-1.9954	0.4044	4.9342	0.0000**
NR	Not Recorded	omitted			
T1	Kikuyu	ref. cat.	ref. cat.	ref. cat.	ref.cat.
T2	Luo	0.6619	0.2833	2.3364	0.0195**
T3	Kalenjin	-0.6316	0.3060	2.0641	0.0390**
T4	Luhya	0.0460	0.4057	0.1134	0.9097
T5	Kisii	1.0524	0.4292	2.4520	0.0142**
T6	Kamba	-1.2980	1.0529	1.2328	0.2177
T7	Nomads	-0.3866	0.6404	0.6037	0.5461
T8	Coastal Tribes	0.5942	0.5803	1.0240	0.3058
T9	Others	-0.7040	1.0911	0.6452	0.5188
NR	Not Recorded	omitted			

COa constant of coefficients = -0.9575
COb constant of s.e. = 0.1956

Note: ** 2-tail significance level at - 0.025
* 2-tail significance level at - 0.05

relationship. For instance, 21.8 per cent of maternal mortality cases were age 40+. Of this, 95.5 per centdied of non-maternal causes while 4.5 per cent women died from maternal cause.

In reduced equation the age 15-19 category shows an increasing maternal death. There is decreasing death rate with increasing age especially after age 20-24. This conforms with the expected theoretical relationship.

Generally, parity is marginally significant as a variable. Categorically, there is increasing death with low parity 0, 1 and parity 5 and above. Given that parity 2-4 is the reference category, the relationship portrayed conforms with the expected relationship.

TABLE 4.6.6 Regression Analysis of Reduced Models and Variati
of Different Categories from the Reference Catego

VAR		Equation 3 prob.	Equation 3 variation	Equation 5 prob.	Equation 5 variation
	Age				
A1	15-19	0.4395	0.094	0.2567	-0.0207
A2	20-24	0.3455	ref.cat.	0.2774	ref.cat.
A3	25-29	0.3199	-0.0256	0.2499	-0.0275
A4	30-39	0.2554	-0.0901	0.1709	-0.1065
A5	40-49	0.0989	-0.2466	0.0496	-0.2278
	Tribe				
T1	Kikuyu	0.3455	ref.cat.	0.2774	ref.cat.
T2	Luo	0.4341	0.0886	0.4266	0.1492
T3	Kalenjin	0.2008	-0.1447	0.1695	-0.1079
T4	Luhya	0.4743	0.1288	0.2867	0.0093
T5	Kisii	0.5253	0.1798	0.5237	0.2463
T6	Kamba	0.1552	-0.1903	0.0949	-0.1825
T7	Nomads	0.3579	0.0124	0.2068	-0.0706
T8	Coastal Tribes	0.5421	0.1966	0.4101	-0.1327
T9	Others	0.4151	0.0696	0.1596	-0.1178
	Residence				
R1	Urban	0.3455	ref.cat.	omitted	omitted
R2	Rural	0.4406	0.0951		

TABLE 4.6.7 Percent distribution of Maternal Mortality According to Age And parity

	0	1	2-4	5+	Total
15-19	33.3	44.4	8.6	-	20.9
	(4.2)	(83.3)	(12.5)		(100)
20-24	66.6	44.4	0.4	0.6	33.0
	(5.3)	(52.6)	(36.8)	(5.3)	(100)
25-29	-	8.9	0.4	18.8	20.9
		(16.9)	(58.3)	(25.0)	(100)
30-39	-	0.2	8.6	56.3	19.1
		(4.5)	(13.6)	(81.8)	(100)
40 +	-	-	0.3	18.8	6.1
			(14.3)	(85.7)	(100)
TOTAL	100	100	100	100	100
	(2.6)	(39.1)	(30.4)	(27.8)	(100)

Note: In Parenthesis are the Row Totals.

As shown in Table 4.6.7, low non-maternal deaths were recorded in parity 2-4. The parity 0 and 1 which is not only positive but significant is recorded in the regression analysis. At parity 5 +, women die in almost the same proportion as regards maternal and non-maternal cause of death. The non-maternal records 47.6 per cent while maternal cause records 52.4 per cent.

Residence is significant in the study. Taking urban residence as the reference category, the rural residence is significant and negatively related to the dependent variable. This indicates that most rural females die more from non-maternal cause of death. Childbirth though a risk, is not a disease. In rural areas traditional birth attendants are engaged and successful childbirth is attained unless a complication arises that requires medical attention. The presence of traditional birth attendants and experienced mothers in rural areas despite any complications make the risk less. That does

not rule out death from maternal cause but in comparison with non-maternal cause, the event becomes insignificant. To confirm this, the figures shows that proportionally only 25.6 per cent rural females die of maternal death while 74.4 per cent die of non-maternal cause.

In regression equation 3 where only age, residence and ethnicity are analyzed, the results pertaining to residence still hold. As in the regression equation 2, the relationship between urban residence and maternal cause of death is statistically significant and positive using the rural residence as the reference category and

TABLE 4.6.8 Residence Characteristic as a Factor of Maternal and Non-maternal Mortality

	Residence		
	Urban	Rural	Total
Non-maternal	62.1 (38.3)	74.4 (61.7)	69.2 (100)
Maternal	52.3 (52.3)	25.6 (47.7)	30.8 (100)
Total	100 (42.7)	100 (57.3)	100 (100)

Note: In Parenthesis are the Row Totals.

vice versa holds but with negative relationship. Ideally most rural females go to urban areas when they are due for delivery or for abortion thus increasing the potential risk group.

Ethnicity is a variable that is more related to the cultural value observed pregnant and weaning mothers. The variable is significant in 3 and 5 only.

In regression equation 1 all tribes are insignificant with Kikuyu being the reference category. In regression equation 2 after reduction of some variables, it is only the Kalenjin category which has a negative and significant relationship with maternal mortality. The same observation on Kalenjin category is made in the other equations. In the equation 3, Luo, Luhya and Kisii categories are significant and positively related to maternal mortality. Where as in equation 5, the Luo & Luhya and Kisii categories are still positively significant. Otherwise in uncategorised ethnicity variable, all the ethnicity categories are significant

TABLE 4.6.9 Percent Distribution of Ethnicity as a Cause of Maternal and Non-maternal Mortality

	Kik	Luo	Kalen	Luhya	Kisii	Kamba	Nomad	Ctr *	Ot@	TOT
NM	83.7	69.7	90.0	84.2	64.1	93.8	91.7	70.6	87.5	83.1
MAT	16.3	30.3	10.0	15.8	35.9	6.2	8.3	29.4	12.5	16.9
TOT	100	100	100	100	100	100	100	100	100	100

* coastal tribes @ Other tribes

with an exception of Luhya category which portrays a positive but insignificant relationship.

Other tribes are insignificant and have negative relationship with maternal mortality except the coastal tribe where the relationship is positive. This finding could be due to the fact that the survey has very few cases of these categories in comparison with the reference category. This is also demonstrated in the census proportions as shown in the chapters 2.

It is evident that Kalenjins contribute 17.9 per cent to female deaths after Kikuyus with 54.7 per cent. While Kalenjins rank third in non-maternal cause of death with 10.5 per cent, the Kikuyu and Luo are second and third with 52.5 and 16.7 per cent respectively. On maternal cause of death, Kalenjin rank number two to Kikuyus with 19.4 against 55.2 per cent. Other tribes contribute only 25.4 per cent to maternal deaths.

C H A P T E R F I V E .

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The survey show that what most demographers have found out is not very different from the survey carried out in Nakuru. This shows that a hypothetical conclusion can be drawn from this.

The increasing death rate in the age 20-39 is not unusual since most women are involved in the childbearing event. The non-maternal mortality are high at age 30-40.

Mortality in relation to parity show a reversed J-shaped trend. Most women who die are primigravida followed by the nulliparous. This is a sign that most women physiology is in danger at this stage from childbearing.

Most unmarried mothers are young and unemployed. To understand why this is so , socio-economic and demographic aspects of the characters should be understood. For instance demographic and economic factors that hasten the problem are age, level of literacy, level of knowledge and awareness of reproductive health and the financial status of the mother. These are the general characteristic of young mothers we have today. The societal reaction to pre-marital pregnancy contribute to increased failure of ante-natal clinic attendance and increased rate of abortion.

From the understanding of the two types of residential areas, the infrastructure and medical facilities also plays a role in determining the general health of the population.

More emphasis should be put on ante-natal clinic attendance. Though nothing much can be adduced from the survey, the attendance has proved to be of assistance. This is reflected by the successful hospital deliveries where more assistance is expected. The various abnormal mode of deliveries discussed show that although women die from maternal mortality in relation to this factor, it is still a life saving device given that more of them survive the tragedy. It is therefore encouraging to note that the percentage of mothers who die from maternal mortality having delivered through various modified mode of deliveries are low.

Ethnicity as a variable in this study does not show much. It would have been helpful if the study is purely done on the aspect of culture. This would call for a better understanding of various ethnicity and their cultural values related to this female specific risk. Otherwise the knowledge of the ethnic group does not tell much given the cultural transition and the widening gap between the rural and urban residents due to modernisation.

5.2 Conclusion

The accurate assessment of the magnitude of maternal mortality is extremely difficult. Lack of data on the event has proved difficult for the appropriate interventions and health policies. The professional, international community and the national Government are becoming increasingly aware of the neglected tragedy of maternal mortality and are calling for more and better data in order to be able to

determine its levels, cause and differentials and intervene accordingly and monitor progress.

Maternal deaths are rare and large sample sizes are required for reliable estimates. Even in population with higher level of maternal mortality, maternal deaths are rarely reported, which implies that measurement problems and costs of maternal mortality studies are substantial making information on levels, trends and correlates of maternal mortality quite difficult. Part of the reason is that reproductive complications are only one of the many causes of death among women of reproductive age. Determining the actual cause of maternal death is often difficult even in hospitals as well as determining the level of maternal mortality.

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

From the study, due to many non-medical factors, women who seek admission to, or deliver in hospitals are not likely to comprise an extremely select group, and are unlikely to be representative of the population at large.

From the study, it is inferred that maternal mortality rate in Nakuru is varied between 18.3 (1984) and 29.4 (1982) for the period 1981-1985. Smaller maternity units did not report any maternal deaths, but they refer all complicated cases to the provincial hospital. The overall

maternal mortality ratio is 2.6 per 1,000. The leading cause of death is Haemorrhage and infection with 17 percent of all maternal related deaths.

Demographic Correlates of Maternal Mortality.

Maternal mortality exhibit a classic U-shaped relationship with maternal age. Mortality rates are higher among women aged 15-24 years reach a minimum during ages 24-34, and the climbs again reaching a peak at age 35 and above. The high deaths to young mothers could be attributed to low age at marriage, low age at first birth and abortion.

The relationship between maternal mortality and parity is curvilinear. Regarding the fertility factors, only primigravida and nulliparous women appear to have higher mortality risks and accounted for 41.1 per cent of all maternal deaths. The maternal mortality ratio is substantially lower among the parities 3 through 6. The risk subsequently decreases with increasing parity but it rises again at parity 7 and above.

The results suggests that high parity is associated with increased risk of maternal mortality only at the oldest reproductive ages, when women may be less capable of meeting the psychological demands associated with repeated pregnancy and childbearing. In contrast, at each parity level, higher maternal age appears to result in an increased risk of maternal death. This later finding reflects selectivity bias, particularly among nulliparous women.

There is a noticeable effect of a decline in the married women in the age group 15-24 and nulliparous women. Also young women are subjected to death and especially so if their age at first birth is low.

Percentage of home deliveries and also percentage of deaths to those who abort in mortuary suggests that this risk is still high.

In most cases complications which led to death include haemorrhage, obstructed labour and uterine rapture, infections and abortions. Indirect causes were related to anaemia,diabetes, heart disease and malaria. But between 50 and 85 per cent of maternal deaths during pregnancy or within 40 days of its termination are due to complications which can be avoided.

Though there was no up-to-date data on maternal deaths, most deliveries were carried out in rural areas where complications and diseases were not reported. Otherwise all analysis and findings in this report are based on data available in hospitals.

It would be healthy if those concerned would fasten up mapping out strategies for intervention and statistics made available to help curb maternal deaths so as to join those who have championed and spearheaded help crusade against maternal deaths in the world.

TABLE 5.0.1 Risk Factor for Maternal Death, Nakuru 1981-1985

D E M O G R A P H I C R I S K F A C T O R	Maternal deaths	Total sample women 15-49
Maternal age		
<25	80	296
25-39	65	315
>39	8	158
Parity		
0	14	59
1	13	54
2-4	17	63
>5	30	
place of delivery		
home	29	-
hospital	88	-
Ante natal clinic attendance		
At least once	18	41
Never	14	24

5.3 Recommendation

The analysis and interpretation of maternal mortality data from health facilities and vital registration system can be improved if a variety of other data sources are used especially the coverage of deliveries in hospitals and at home and all causes of death among women of reproductive age. Realization of lowering maternal mortality can only succeed if there is effective participation by administrative system, professionals and the population itself. Measures must be taken at various levels which should include medical and socio-economic infrastructure, hospital administration and personnel, community and their traditional beliefs and practices and more so the family planning programme. These are the critical factors that determine whether the proportion of maternal deaths

detected by health facilities are higher or lower than the coverage of deliveries only.

Obstetric care, extensive antenatal care, maternity services and their utilization should be improved. This includes giving support to the much underutilized maternity units in health centre and perhaps establishing maternity waiting area near hospital. Specific attention should be given to combatting the leading diseases like anaemia, haemorrhage, infection and abortion related diseases. Other related health problems that are a threat to pregnant women like malaria, diabetes, hypertension and infection need extra attention in the antenatal clinic. This calls for medical improvement in the availability of blood transfusion, caesarian section, competent health staff and the availability of transport to a health facility.

The shortage of personnel hinders the promotion of health. Clear description and definition of responsibilities and the roles of all levels will assume more rational use of personnel and especially so in continuity and accumulation of experience in records keeping and completion.

Specific attention should be given to the traditional sector and especially the quality of obstetric care at home. If there are traditional births attendants (TBA'S), then the existence of a network of well-trained TBA'S in hygiene, identification of complicated cases, vaginal examinations and identification of complicated cases and referral systems may be used to reduce the prevalence of the maternal mortality incident. While the relationship

between traditional and modern sectors are essential, the beliefs and practices that can be hazardous to the mental and physical health of women should be identified and extra caution taken. Likewise maternity units are likely to be better utilized if health staff are aware of the cultural taboos that pregnant women have to observe. General health education programmes aimed at community health workers and women should focus on overcoming ignorance and poverty in women, changing beliefs on procreation, and giving accurate biomedical information on pregnancy-related health problems using the traditional concept. There should be respect and trust between patients and health workers.

Transport and communication are not likely to improve dramatically in the next decade. Therefore a well established referral system with specialists and appropriate technical equipment such as radio-communication systems to address to emergency situation are necessary.

Decentralization measures should be a total community involvement. Due to low rural incomes, specific and basic care and drugs should be available in the health centres.

Family planning programmes, sex and family life programmes should continue to be promoted and be given wide coverage. Increased use of contraceptives may lower the risk of the maternal mortality by reducing the proportions of births occurring to the youngest and the oldest women. There would also be reduction in the proportion of births and high parity at the same time lengthening the birth interval. With low fertility increased nutrition standards and healthy women status are expected.

All nulliparous and primigravida should be urged to deliver in hospitals or health centres, given their higher risk of mortality. It is of importance to have all records bearing some important information regarding the patients such as the social and economic factors.

As regards induced abortion, neither the law of the country, cultural codes nor the religious ones permit it in Kenya. Clear open,widely advertised and professionally managed abortion clinic can operate successfully and be self-supporting. When abortion laws are legalised, its patterns and practices will not only change but levels, trends and other relevant information concerning this issue will be relatively accurate and reliable. A high incidence of illegally induced abortion is likely to increase the proportion of maternal deaths outside health facilities where no records would be available. Legalised abortion will help the Government make formal policy in respect of the foreseen trend of event.

In many African societies, a substantial number of beliefs and practices are related to the period of childbirth to ensure the birth of a healthy baby and survival of the mother. The relationship between medical personnel and traditional birth attendants should be positively perceived.

Last but not least, there should be a need to develop medical and socio-anthropological research to provide the tools of analysis, better information gathering and an exchange of information on research and experience in different parts of the world.

APPENDIX

Variable Names Used in Table 4.2.1 of Correlation Matrix

Age	Age
Pa	Parity
Ms	Marital Status
AGBI	Age at First Birth
Mode	Mode of delivery
Resid	Place of Residence
Clinic	Ante-natal Clinic attendance
Abort	Abortion victims
Tri	Tribe
Mat (Maternal)	Maternal care

Variable names as used in Table 4.6.3

Age	A1	Age 15 - 19
	A2	" 20 - 24
	A3	" 25 - 29
	A4	" 30 - 39
	A5	" 40+
Parity	P1	Parity
	P2	Parity 1
	P3	Parity 2 - 4
	P4	Parity 5+
Marital Status	M1	Married
	M2	Single
Abort	B1	Abortion victim
	B2	Non-abortion victim
Residence	R1	Rural resident
	R2	Urban resident
ANCA	C1	Antenatal Clinic attendant
	C2	Non-antenatal Clinic attendant
Age at first birth	F1	Age 15 - 19
	F2	Age 20 - 24
Classified Tribe	CT1	Kikuyu and Kamba
	CT2	Luo and Luhya
	CT3	Kalenjin
	CT4	Kisii
	CT5	Others
Tribes	T1	Kikuyu
	T2	Luo
	T3	Kalenjin
	T4	Luhya
	T5	Kisii
	T6	Kamba
	T7	Nomads
	T8	Coastal tribes
	T9	Others
	NR	Not Recorded
Cob		Constant of bet
Coa		Constant of Standard Error

N ..... No. of observation Variables in analysis

P ..... No. of parameters (variables) in analysis.

LIST OF ABBREVIATED WORDS

1:	Coeff.	Coefficient
2:	Ctribe	Categorised tribe
3:	Kik.	Kikuyu
4:	LiveB.	Live births
5:	Mat.	Maternal cause
6:	Mort.	Mortality
7:	NM	Non-maternal
8:	Nonmatern.	Non-maternal
9:	Pa.	Parity
10:	S.E.	Standard Error
11:	sig.	Significance
12:	sign.	Significance
13:	Tot.	Total
14:	Unmarr.	Unmarried
15:	Val.	Value

630 Hydatidiform mole
632 Missed abortion
633 Ectopic pregnancy
634 Spontaneous abortion
635 Legally induced abortion
637 Unspecified abortion
639 Complications following abortion
and ectopic and molar pregnancies
640 Haemorrhage in early pregnancies
641 Antepartum haemorrhage,abruption
placentae,and placente praeria
642 Hypertension complicating pregnancy,
childbirth and the puerperium
643 Excessive vomiting in pregnancy
644 Early or threatened labour
645 Prolonged pregnancy
646 Other complications of pregnancy
not elsewhere classified
647 Infective and parasitic conditions
in mother classified elsewhere complicated
in pregnancy and childbirth
648 Other current conditionsin the mother
classified elsewhere but complicating
pregnancy, childbirth and puerperium
650 Delivery in a completely normal case
651 Multiple gestation
652 Malposition and malpresentation
653 Disproportion
654 Abnormality of organs and soft tissue
656 Other foetal and placentael problems
affecting management of mother
658 Other problems associated
with amniotic cavity and membranes
659 Other indications for cure and
intervention related to labour and
delivery and not elsewhere classified
660 Obstructed labou666
661 Abnormality of forces of labour
662 Long labour
663 Umblical cord complications
665 Other obstetrical trauma
666 Post-partum haemorrhage
667 Retained plcenta or membranes
without haemorrhage
669 Other complications of labour and
delivery not elsewhere classified
670 Major puerperal infection
671 Venous complications in pregnancy
and the puerperium
674 Other and unspecified complications of
the puerperium not elsewhere classified
676 Other disorders of the breast associated
with childbirth and disorders of lactation

CODE NO.	CHAPTERS
001-139	Infectious and parasitic diseases
140-239	Neoplasms
240-279	Endoctrine Nutritonal and Immunity Disorders
280-289	Diseases of blood and blood forming organs
290-319	Mental Disorders
320-389	Diseases of the nervous system and sense organs
390-459	Diseases of the circulatory system
460-519	Diseases of the respiratory system
520-579	Diseases of digestive system
580-629	Diseases of genetourinary system
630-676	Complications of pregnancy childbirth and the puerperium
680-709	Diseases of the skin and subcutaneous tissue
710-739	Diseases of the Musculoskeletal System and connective tissue
740-759	Congenital Anomalies
760-779	Certain conditions originating in the Perinatal period
780-799	Symptoms, Signs and ill-Defined conditions
800-999	Injury and poisoning
E800-E999	Supplementary Classification of External causes of Injury and poisoning
V01-V82	Supplementary Classification of factors influencing Health Status and contact with Health services

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