ASSESSMENT OF DATA QUALITY USED IN DIRECT ESTIMATION OF INFANT AND CHILD MORTALITY, KDHS 1998

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Declaration

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

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24/7/2002

ABSTRACT

This study attempts to assess the quality of data used indirect estimation of infant and child mortality. The quality of data evaluated mainly focus on non-sampling errors, which are inherent in Kenya Demographic and Health Survey of 1998. The errors are usually difficult to evaluate statistically and at times difficult to identify and therefore bias any mortality estimate thus derived.

The broader study hypothesis derived from the literature reviewed is that errors exist in Kenya Demographic Health Survey 1998 from various causes and have impact on estimates of both infant and child mortality. The specific hypotheses were formulated based on literature reviewed and the factors related to each kind of error. Some of the factors include socio-economic, demographic and cultural. Computing various indicators of flaws in data quality and checking for variations in those parameters tested the formulated study hypotheses.

There are a number of methods used in data analysis, which includes the Myers' blended index, birth ratios, and life table analysis. The 1998 Kenya Demographic and Health Survey data restricted to 23351 children born since 1960 regardless of their survival status. For life table probabilities of death, analysis was restricted to 5778 children born five years prior to the survey. All the 7881 women in the survey are used in analysis of age reporting.

Results for analysis of date of birth data indicates that there is usually marked displacement of birth dates by survival status of the child. It is usually more severe for dead than living children. This varies by region, education level, and place of residence, ethnicity and age of the mother. For accuracy of the age at death and the completeness of information on date of birth, variations also exist and these vary with socio-economic, demographic and cultural factors of the mother.

The study has also important findings on the non-sampling errors in direct estimation of infant and child mortality For instance, misreporting of date of birth and age at death have implications on mortality estimation and any imputation procedure used could either bias the estimates either upward or downward.

The findings of this study have a number of implications for policy and further research. The study shows that there is need to redesign the current format of Demographic and Health Survey questionnaire particularly where births and deaths of children are concerned. This may include having more probing questions on those issues. To cater for the children, who have lost their mother, it is important to include paternal questions so that the fathers could respond to fertility questions in cases where the mother is dead.

The study calls for training of interviewers in psychology so that they can make good judgment of responses provided by respondents.The results of the study call for further research on the plausibility of KDHS data based on external sources like the World Fertility Survey, the census and any other baseline studies. The study calls for future efforts to be directed at investigating peoples' perception to fertility and mortality questions as are asked the respondents. This will indicate peoples' fears and joys in discussing birth and death.

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Dedication

This project is dedicated to my wife Teresia and my two sons Mwoca and Ngure.

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CHAPTER 1

1.1 Introduction

Past experience has indicated that retrospective survey data of the DHS type are often particularly prone to errors that may arise from the respondent, from the questionnaire, from the execution of the field work or from the nature of the data collection process, the form, extent, sources and effects of these errors are the concern not only of survey design but also of survey analysis.

The high standards set by DHS for the data collection operations are expected to result. In better quality data than typically obtained in the past but this expectation in no way obviates the need for a detailed assessment of the quality of the data. Such an evaluation will not only alert analysts by identifying any defects in the data, but also throw light in the shortcomings of the DHS approach, which can be taken into account in the design of future demographic and health surveys.

No data are free from error and the identification and examination of these errors can be undertaken for a variety of purposes and with considerable variation in applicability. Once a survey (or census or any data collection operation) has been carried out the data set, as it stands, is the raw material with which the analyst has to work, and any modification of it must be justified by some explicit knowledge, belief or assumption recorded observation.

Data assessment at its most powerful may in influence 'correction' of experts in the data for particular individuals. This usually occurs at a stage, which precedes the formal analysis and includes editing, pre-processing and imputation. To the extent that these operations take place before data is produced, they must be treated as part of data collection process.

The assessment and evaluation of data constitutes a hurdle, which must be negotiated by the data before certain types of analysis are sanctioned as permissible or justified. Much of the demographic data evaluation includes checking the plausibility of the data against – demographic axioms and substantive models and comparing the results with external sources of data.

1.2 Problem Statement

Results from the 1998 KDHS data makes it clear that childhood mortality conditions have worsened in the early mid 1990s; this is after a period of steadily improving child survival prospects through the mid to late 1980s. For under five mortality, the probability of dying before the fifth birthday stands at 112 deaths per 1000 live births, which represents a 24 percent increase over the last decade. Survival chances during age 1-4 years suffered disproportionately; rising 38 percent over the same period.

Children of women with no education experience an under-five mortality rate that is two times higher than children of women who attended secondary school or higher. Provincial differentials in childhood mortality are striking, under five mortality ranges from a low of 34 deaths per 1000 live births in central province to a high of 199 per 1000 in Nyanza Province.

However, the estimates and variations cited above may be caused by sampling and non-sampling errors. Sampling errors, which can be evaluated statistically, have been addressed in KDHS 1998. Therefore non-sampling errors which results from non-response, misunderstanding of questions, etc calls for assessment as well because it affects any mortality estimation in its unique way.

Generally, differentials in mortality may be distorted especially when mothers are from more disadvantaged groups and therefore likely to have died before the survey. Other factors in non-response, misreporting and misunderstanding questions may include socio-economic, demographic and socio-cultural factors. Some of these include level of education, sex of the child, maternal age and taboos related to birth and death.

1.3 Research questions

1. To what extent do non-sampling errors, which are a threat to reliability of infant and child mortality estimates inherent in KDHS 1998?
2. What is the degree of age heaping in reported infant and child death?
3. To what extent does the completeness on birth history and mortality vary by socio-economic, socio-cultural and demographic factors?

1.4 Objectives

The general objective is to assess the quality of data used in direct estimation of infant and child mortality in Kenya.

Specifically, the study aims to;

1. Identify omission, non-reporting, misreporting that are inherent in the survey, which may indicate problems that need to be addressed in future surveys.
2. To investigate the levels of age heaping at 12 months.
3. To investigate the level of information completeness on births and deaths by social, cultural and demographic socio-economic factors
4. To calculate life table probabilities of death.

1.5 Justification of the study

Demographers all over the world require good quality data for any meaningful demographic analysis. Any error in the data arising from either data collection stage or any other stage before analysis is usually likely to bias or distort any estimates thus derived. As earlier mentioned, many factors have been identified that are likely to bias survey results particularly the non-sapling errors, which are difficult to evaluate statistically and are therefore left to the judgment of the individual analyst. However, these errors, which are manifested in various ways, are never completely taken care of in the survey design, data collection and data processing stage and will therefore always lead to misinterpretation of estimates especially infant and child mortality.

Kenya being a diverse country is likely to pose different non-sampling errors due to its differentials in socio-economic, demographic and socio-cultural factors. Therefore, any information generated from these socio-economic, demographic and socio-cultural groups will vary accordingly and therefore distort any meaningful infant and child mortality estimates and whatever differentials that we get may be masked by data quality itself and not marked variations.

As there are no comprehensive prior efforts to assess the quality of data in mortality estimation the study is therefore justified to guide or caution any future survey on the pitfalls of birth history and mortality data. This will help researchers to take precaution in data collection or processing or try to evaluate qualitatively before any analysis can be done.

1.6 Scope and limitations

The study seeks to cover the KDHS/1998 in assessing the quality of data used in direct estimation of infant and child mortality. The study will involve evaluation of some non-sampling errors inherent in the survey. However, the study will not address all non-sampling errors because some of them are impossible to identify and therefore evaluate. Therefore the assessment that the study aims to conduct will not be conclusive but only open a Pandora's box for further inquiry into quality of mortality and birth history data.

CHAPTER 2
LITERATURE REVIEW

There are a number of different approaches to the collection of data for the estimation of infant and child mortality rates (Hill; United Nation, 1992). For the DHS surveys, a complete maternal or birth history approach is used to collect information for direct estimation of mortality rates In this approach, women of reproductive age are asked the date of birth of every birth they have ever had. They are then asked whether each child is still alive or not, and if it is dead they are asked the age at death.

In a recent review of approaches to the measurement of childhood mortality, Hill (1991) concluded that complete maternal histories generally provide good to excellent information for the level of mortality. Additionally, they can be used to estimate trends and differentials in childhood mortality, provide age patterns of mortality, and be combined with verbal autopsy questions to provide information on cause of death.

The data used to calculate mortality rates for the most recent period prior to the survey include a number of censored observations i.e. Children who have not been exposed to the risk of death for the full period of interest. For example, children who were born within a year of the survey will not have been exposed to the risk of death for the full period of interest. For example, children who were born within a year of the survey will not have been exposed to the risk of death for a full year and hence will only contribute incomplete exposure to the infant mortality rate.

2.1 Structural biases

DHS only collect childbearing information from only surviving women and no information is collected on the child mortality experience of the women who have died. This selection bias is likely to reduce estimates of infant and child mortality. The magnitude of the selection bias will be larger for periods further back in time because mothers will be more likely to have died by the time to the survey hence trends in mortality may be distorted. Differentials in mortality may also be distorted in a similar way because mothers in the most disadvantaged groups (e.g. rural, uneducated) will be more likely to have died by the time of the survey than mothers in more advantaged groups.

Although the magnitude of this bias is believed to be small because adult mortality is low in most countries, the problem could become increasingly important in populations badly affected by the AIDS virus since adult mortality will increase resulting in a more biased sample. In addition, many deaths due to pediatric AIDS will be missed because the mother herself may have died from AIDS before the survey. This is likely to be the case in Kenya today. The other problem involves truncation of data in the past because only women up to a certain age (usually 49) are interviewed. Hence the sample of births becomes increasingly selective towards births to younger women further back in time.

Childhood mortality generally exhibits a U- or J-shaped relationship with the maternal age at the time of birth. Thus, the estimated mortality rate will either be too high or too low depending on the number of years prior to survey to which it refers. The magnitude of this bias will depend on the magnitude and form of relationship between maternal age and childhood mortality in each population. Clearly, trend data will be affected by truncation bias.

The only direct control for truncation bias is to restrict analysis to the mortality of children to women below the maximum age available in the most distant period of interest for example under age 30 for periods up to 19 years preceding the survey. However, this means discarding a lot of information from the most recent period and will not provide estimates of the total level of mortality in any period. Hence this approach tends to be used only for specific types of analysis.

The sampling errors associated with mortality rates are influenced by the sample size in the survey, the sample design, and the level of mortality in the population since at lower levels of mortality a particular sample size will involve fewer deaths than the sample size in high mortality population

2.2 Reporting Errors

Reporting errors include missing information for some questions, particularly date of birth and age at death, inaccurate reporting, such as misreporting of the age at death and omission (or erroneous inclusion) of births and deaths. Missing information on the date of birth and age at death of children is of particular concern for the estimation of childhood mortality rates.

Date of birth data is essential for any analysis of mortality by time period. Ignoring cases with missing information would cause downward biases in childhood mortality rates because typically information on the year and month of birth is more likely to be missing for children who have died than for children who are still alive (Chidambaram and Sather, 1984; Sullivan et al, 1990). Trends and differentials of mortality rates would also be distorted because, in general the date of birth is more likely to be missing for events further back in time and for children in certain subgroups of the population (Chidambaram and Sather, 1984). Missing information on age at death causes problems because it is not possible to determine the allocation of the death and the exposure in the calculations of mortality rates. Simply ignoring cases with missing information would result in the downward bias in the mortality rates; this would be very severe if large numbers of children who died were missing on age at death.

If omission of the age at death is systematically related to the age at death of the child imputation process could induce some distortion in the age pattern of mortality, although the overall under-five mortality is likely to be unaffected. Trends and differentials in age patterns of mortality will be affected if omission of the age at death were more common for deaths that occurred further back in time and in some subgroups of the population.

2.3 Age reporting among women

Poor reporting of the mother's age affects the results of the analysis of infant and child mortality based on this variable and any other variables computed on the basis of the reported age of the mother. Mothers who misreport their own age are likely to misreport their maternity history.

One common type of age error is age misstatement or misreporting arising from digital preference usuall occurring at ages which end in 0 or 5.This is largely because some respondents do not know their exac ages and so round their ages at preferred digits. Age misreporting may result in a transfer of women int the wrong age group and may distort the expected pattern of the distribution of mean number of childre ever born, mean number of children dead and the proportions of dead children by age of mother. Normall when there are no such errors the mean number of children ever born, and the proportion of the dea children should increase with each succeeding age of mother. This is because older women have had mor time in child bearing, and because children born further back in the past were exposed to the risks o mortality for longer duration and they might have been subject to higher mortality rates in the past. I addition, in the absence of digital preference, there would be an even distribution of women at eac terminal digit: about 10 percent of the women would be in each terminal digit (Shyrock and Siegel 1971:206).

Gross age-misstatement can result in biased estimates based on maternal age groups. Gross age misstatement can occur if, for example, an interviewer systematically over or under estimates age of mothers by five-year age groups.

2.4 Ommission of births

Another error which distorts the expected distribution of children ever born and dead by age group of women is the tendency for older women to under-report their total number of children ever born and dead (Brass, 1980:31). Consequently, older women (35+ years) often appear to have lower mean chidren ever born and dead than younger women.

An associated problem is misplacement of date of birth or death.Ommission of live births may affect not only estimates of infant and child mortality but also distort the effect of factors affecting infant and child mortality.

The tendency for older women to under-report some of their children is often attributed to the inability of older women to recall accurately the number of children who were born or who died in the distant past.

In Kenya as well as in some other developing countries, cultural factors may also contribute to the ommission of certain births and deaths, particularly by older mothers.It is not uncommon for some old people in Kenya to avoid counting their children because counting children is associated with bad luck and may cause some of the children to die.Generally, people are reluctant to talk about the children who have died because no one wants to remember the sad event

2.5 Sex ratios at Birth

Another possible source of error in birth histories is sex selectivity in the recalling of live births.In societies that favour male children, women tend to remember and report their male children better than their female children(Singh,1986:639).The effect of this would be under-reporting of the total number of children ever born as well as a higher proportion of male children dead since more male children ussually die than female children

2.6 Accuracy of Reporting.

From the perspective of calculating mortality rates, inaccurate reporting of birth dates and age at death are of most concern. However, misreporting of background characteristics, such as the mother's age or education, could affect differentials in mortality rates.

Systematic misreporting of the birth dates of children would affect trends in mortality even if it were independent of survival status. If births tended to be moved forward in time in a context of declining childhood mortality, mortality rates would tend to be overestimated for the period into which they are moved. If births tended to be misplaced backwards in time in the same context of declining childhood mortality, mortality rates would tend to be underestimated in the periods into which they were moved. The opposite would happen in a context of increasing childhood mortality, but this is much un common.

A particular example of birth misplacement is the displacement of births from the fifth calendar year prior to the survey to the sixth calendar year, which has been noted in several DHS-1 surveys (Arnold, 1990). This displacement is believed to be linked to the reproduction section of the questionnaire, which includes a number of questions asked of each birth occurring after a cut-off date-usually January 1st of the fifth calendar year before the start of the survey.

Such birth displacement can affect mortality rates if it occurs between reference periods for which the rates are calculated. Displacement of births from the fifth to sixth calendar year moves some births and some deaths (depending on age at death) out of the most recent five-year period and into the earlier period. The potential for bias in mortality rates depends on the level of displacement and whether or not it is related to the survival status of the birth.

If dead children are displaced more frequently, as occurred in several DHS– 1 surveys (Sullivan et al 1990), infant and child mortality will be underestimated for the recent period and overestimated for the earlier period. The opposite will accrue if surviving children are displaced more frequently.

Sullivan et al (1990) used a simulation model to estimate the effect on mortality rates of excess displacement of dead children compared to surviving children in DHS-1 surveys. They concluded that in the surveys, in which this was identified as an important problem, infant mortality was under estimated by between 2.5 and 4 percent in the most recent period and overestimated by a similar amount in the earlier period. The impact was even greater in Trinidad and Tobago where the differential displacement of dead children was particularly pronounced.

Age specific mortality rates can be biased if misreporting of age death results in net transfer of deaths from one age group to another one. In retrospective surveys, heaping at 12 months is common. If heaping at 12 months is due to due rounding down the age of children who died shortly after their first birthday, infant and child mortality will be unaffected. If heaping is due to rounding up the age at death of children who died before their first birthday, infant mortality rates will be biased downwards and child mortality will be overestimated. Using a model that redistributed 25 percent of excess deaths of 12 months to infancy, Sullivan et al (1990) concluded that adjusting the infant mortality rate for hearing at 12 months increased the rate by about five percent in DHS-1 surveys in sub-Saharan Africa and by about two percent in other regions. The child mortality rate correspondingly decreased by a slightly larger amount in most surveys.

. The potential for bias in mortality rates depends on the level of displacement and whether or not it is related to the survival status of the birth. If surviving and dead children are displaced equally there will be little effect on mortality rates in either period and hence little effect on mortality trends.

2.7 Event Omission

Probably the most serious form of response error for the calculation of childhood mortality rates is omitting children who have died from the birth history. Such omission may be deliberate, because the respondent does not wish to talk about death or it may be due to recall errors or misunderstanding of the question, and can lead to severe under- estimates of infant and child mortality rates.

Omissions of child deaths is believed to be more common for children who died shortly after birth, which could result in distortion of age patterns of mortality, particularly in underestimation of neonatal mortality, underreporting of deaths is also believed to be more common for events that occurred further back in time, which would distort trends in mortality. Omission may be related to sex of the child and to other background characteristics of the child and mother, which could distort differentials in mortality. The degree of distortion that occurs will depend on the extent of omission and how strongly omission of deaths is related to the particular factor. Omission of surviving children could also occur; but it is believed to rare. Similarly, erroneous inclusion of both surviving and dead for example adopted or foster children could occur but this he is thought to be uncommon.

When examining the extent of missing information on date of birth by survival statistics, Sudan (DHS-1) and Yemen present high percentages of births with incomplete information on date of birth. Excluding Sudan and Yemen, the percentage of living children missing any information on date of birth (month at year) ranges from 37 percent and 35 percent in Niger and Senegal, respectively, to zero percent in Paraguay.

As expected, the percentage of births missing information on date of birth is consistently higher for dead children than surviving children. Displacement of births is more severe for dead children than for surviving ones. The difference in birth ratios for surviving and dead children ranges from 1.9 in Zambia and Bolivia to over 30 in Tanzania, Egypt (DHS-1) and Jordan.

Based on calendar year periods, at this highest level of differential displacement the mortality rates for the most recent five-year period are likely to be underestimated by about four percent; and the mortality rates for the preceding five-year period to be overestimated by a similar amount (Sullivan et al, 1990). Pakistan stands out with the extremely high levels of displacement.

2.8 Age at Death (Completeness of the Data)

For the majority of DHS1 and DHS11 birth ratios reported for both surviving and dead children are below 100 which implies fewer births than expected in the fifth calendar year before the survey except Namibia, Morocco and Yemen and the birth ratio is lower for dead children than surviving children. The problem of birth displacement in general and differential displacement by survival status in particular persists in many DHS-II surveys.

Indeed, the pattern of differential displacement by survival status is more consistent across DHS-I surveys, and the DHS-II survey in Indonesia demonstrates higher levels of displacement of dead children than the DHS-I survey. In fact, the DHS-I survey in Indonesia included only a very brief Health section containing just 15 questions so the increase in the incentive to displace births was partially pronounced. Although the increased length of the reproduction section probably explains the persistence of the birth displacement problem in DHS-II surveys, it does not fully explain why dead children are displaced more frequently. Several of the questions in the reproduction section are skipped for dead children so the burden of the reproduction section is actually less for dead children than for surviving children. One explanation for the higher level of displacement of dead children could be that respondents are less able to provide a year of birth for a dead child, at least in part because they do not have a current age to work from. Hence, interviewers are more likely to have to estimate the year of birth for dead children, making it easier for them to displace a dead child to before the period covered by the reproduction section .

The combination of an increased reproduction section and poorer reporting of the date of birth of dead children appears to have resulted in consistently higher displacement of dead children than surviving children in DHS-II surveys despite additional emphasis placed on this issue in training and field procedures.

Yemen stands out as having the highest percentage of deaths missing information on age at death. For the period 0-24 years before the survey, such percent of all deaths in Yemen have all uncompleted age at death.

A similarly high level of completeness was found in DHS-I surveys (Sullivan et al, 1990) and suggests that either respondents are able to provide this information or the interviewers are willing to estimate an age at death after probing. However, it must be stressed that complete information is not necessarily accurate information. It is often suggested that respondents are less able to provide information about events in the more distant past than about recent events. Indeed, in Cameroon, Madagascar, Namibia, Bolivia(DHS-I),and Colombia, there are more incomplete ages at death in the period 0-4 years before the survey than the periods 5-9 and 10-14 years before the survey. The reason for this is unclear but it is possible that interviewers were reluctant to probe deeply for an age at death for recent deaths which the respondent may have found more distressing. Sullivan et al,(1990) also failed to find any support in DHS-I surveys for the hypothesis that completeness of age at death reporting deteriorates further back in time. Of course, there is no information on the amount of probing required to obtain an age at death and it is possible that more probing and estimation were required from interviewers to obtain information for deaths that occurred in the distant past than for more recent events.

One of the most significant forms inaccurate reporting of ages at death is heaping at 12 months, which results in under estimation of the infant mortality rate and over estimate of the child mortality rate. The level of heaping at 12 months is also indicative of the general accuracy of age at death information; populations that exhibit very high levels of heaping at 12 months are unlikely to report accurately at other ages of death either.

In the DHS-1 surveys, the index of heaping for the period 0-24 years before the survey ranges from below 2 in Paraguay and Zambia to 15 in Yemen (Curtis, 1995). However, there is no certain way of determining how many of the deaths heaped at 12 months actually occurred before the child's first birthday and how many occurred after. At one extreme, some analysts argue that heaping of death at 12 months primarily represents rounding down of the age at death and consequently do not adjust for the heaping (Rutstein, 1985). At the other extreme, some analysts argue that as much as half of the deaths reported at 12 months are late infant deaths and adjust the infant mortality rate accordingly (Goldman et al, 1979); Thapa and Retherford, 1982).

Child mortality tends to be much lower than infant mortality and therefore shifting even a small number of deaths has a relatively large impact on the rate. However, in the surveys in sub-Saharan African Africa than in other regions. Indeed, in Niger, Nigeria, and Senegal, the recent increase in the IMR actually exceeds the percent decrease in the CMR because the CMR is higher than the IMR.

Kenya also shows marked effect on infant and child mortality when age heaping at 12 months is adjusted. For example in DHS-1 IMR increased by 4.4 percent which CMR decreased by 8.4 percent. Thus it is clear that the implication of heaping of deaths at 12 months of age are more serious but estimates of child mortality than for estimates of infant mortality, especially in settings in which child mortality is low. As expected, heaping at 12 months has a negligence effect on the under-five mortality rate. Omission from the birth history of children who have died is one of the most serious forms of reporting ever affecting direct estimates of infant and child mortality rates; it is also one of the most difficult to detect.

Kenya (DHS-1) showed an unusually low ratio of neonatal to infant mortality, particularly in the periods 5-9 and 10-14 years before the survey. In addition, infant mortality rate in Kenya increased in the most recent period prior to the survey, yet the percentage of infant deaths that occurred in the neonatal period also increased,, contrary to expectation.

These features of the data suggest there may have been some omission of neonatal deaths in the earlier periods in Kenya. Under reporting of early infant deaths can also be investigated by examining the age distribution of neonatal deaths.

Variations in mortality risk between male and female children are expected for a number of reasons. In particular, biological factors predispose boys to higher risk of death, especially during infancy. However, behavioral factors may operate in the opposite direction in societies with strong preferences for male children and where childcare practices differ by sex. If female children who have died are omitted more frequently than male children who have died, the sex ratio will be biased upwards. If male deaths are omitted more frequently, the sex ratio will be biased downwards.

For instance, Columbia, Malawi and Niger have relatively low IMR sex ratios but in these surveys the sex risk ratio is low in both the neonatal and post-neonatal periods. In the case of Malawi; it is particularly low in the neonatal period. These findings are not readily explained and may indicate under reporting of male deaths in both periods, and particularly in the neonatal period in Malawi (Curtis, 1995).

In the Dominican Republic, the high IMR sex ratio is primarily due to the high sex risk ratio in the neonatal period, suggesting that if this is due to omission of female deaths; such omission was concentrated in the neonatal period. In the case of Kenya, Brass and Jelly (1993) found evidence of under reporting of deaths in the DHS-1 survey.

2.9 Operational hypothesis

From the literature reviewed above, it is clear that errors exist in KDHS 1998 from various causes. However, the study aims at evaluating some non-sampling errors. Thus, the operational hypotheses are stated;

There exist a variety of non-sampling errors that are likely to affect direct infant and child mortality estimates in KDHS 1998.

There exists marked age heaping at 12 months depending on the survival status of the child.

There exist marked variations in missing information on birth history and death by education level of the mother.

There exist marked variations in missing information on birth history and death by age of the mother.

There exist marked variations in missing information on birth history and death by sex of the child.

There exist marked variations in mission information on birth history and death by ethnicity of the mother.

2.10 Variables

The information required for the study is collected in the reproduction section in the individual questionnaire. The respondent is asked to report all line births, including birth of children who have died, first in terms of the aggregate number of children ever born (CEB), then in terms of specific question about each live birth (birth history). Some of the variables to be used includes

Month and year of birth of the child

Age at death of the child; (number of months and years)

Level of education of the mother; (number of years completed)

Ethnicity; Kikuyu, Kamba, Luo, Kalenjin, Mijikenda, Taita

Sex of the child; Male or Female.

Age of the mother; (number of years completed since birth)

Place of residence of the mother; Urban and rural

Region of the mother; Central, Nairobi, Eastern, Western, Riftvalley, Nyanza and Coast

CHAPTER 3

METHODOLOGY

3.1 Data Sources

The study intends to utilize data from the 1998 Kenya Demographic and Health Survey. The National Council conducted the KDHS for Population and Development (NCPD) and the Central Bureau of Statistics (CBS) of the Government of Kenya. It was designed to provide information on levels and trends of fertility, infant and child mortality, family planning knowledge and use, maternal and child health, and knowledge of AIDS.

3.2 Data Analysis

3.2.1 Accuracy of the age-at-death data

To investigate the accuracy of the age at death data, the Index of heaping used by Rutstein (1985) and by Sullivan et al (1990) will be used.

The index is calculated as the number of deaths at 12 months of age divided by the average number of deaths at months 10, 11, 13 and 14. The assumption here us that the actual number of deaths changes nearly between 10 and 14 months, a value of greater than one indicate the heaping at 12 months.

3.2.2 Calculation of displacement of births

To investigate displacement of births by survival status, the birth year ratios will be used.

The birth year ratio is defined as

$$\text{Birth year ratio} = ((2*B_x)/(B_{x-1}+B_{x+1}))*100$$

Where; B_x is the number of births in year x;

B_{x-1} is the number of births in the year x-1;

B_{x+1} is the number of births in the year x+1.

In absence of displacement the birth year ratio will approximate to 100

If there is displacement of births from year x to x+1 then the birth year ratio centered on the year x+1 will be greater than 100 while the birth year ratio centered on the year x will be less than 100.

Cross-tabulations will be used to determine the level of missing information on birth history and death by age of the mother, sex of child, education level of the mother and ethnicity of the mother. Percentages will be used to show the variations by these covariates.

3.2.3 Calculation of age mis-statement; Age heaping (Myers' index)

This is done by considering the percentage distribution of all women by their current single year by age .It entails determining the proportion of the total population reported at each terminal digit by changing the particular starting age for any 10-year age group.

The procedure calls for the following steps;

Step (1) sum the population ending in each digit over the whole range, Starting with the lower limit of the range(e.g. 10,20,30…….40; 11,21,31,41)

Step (2) Ascertain the sum excluding the first population combined in step(1)

(e.g. 20,30………40; 21,31………41)

Step (3) Weight the sums in steps (1) and (2) and add the results to obtain a blended

Population (e.g. weights 1 and 9 for the 0 digits; weights 2 and 8 for the 1 digit).

Step(4) Convert the distribution in step(3) into percents.

Step(5) Take the deviation of each percent in step(4) from10.0, the expected value for each

Percent

The results in step (5) indicate the extent of concentration on or avoidance of a particular digit. The weights in step (3) represent the number of times the combination of ages in step(1) or (2) is included when the starting age is varied from 10 to 19.

The method provides an index of preference for each terminal digit, representing the deviation from 10 percent of the proportion of the total population reporting on the given digit. The method provides a summary index of preference for all terminal digits. Theoretically, the method provides a summary index that can range from 0, representing no age heaping ,to 90, if all ages were reported at a single digit(Shyrock and Siegel,1971:206-207).

3.2.4 Sex composition (sex ratios)

Sex ratio is usually defined as the number of males per 100 females.

$$Pm/Pf*100$$

Where Pm represents the number of males and Pf the number of females

A sex ratio above 100 denotes an excess of males ; a sex ratio below 100 denotes an excess of females. Accordingly, the greater the excess of males the higher the sex ratio; the greater the excess of females, the lower the sex ratio.

3.2.5 Calculation of lifetable probabilities of death (see table 4.5.2 for illustration)

Method

We start with the total live births in the last five years in col.(2).

Then; col.(2) Number alive at the start of the interval. For each successive interval this is the total entering previous interval-(minus) number interviewed during previous interval(col.3)-(minus) number of deaths during previous interval(col.4).

Col.(3) Number aged x (where x=interval) at the time of interview (alive)

Col. (4) Number of deaths during interval= total number of deaths occurring at age x (dead)

Col. (5) Number exposed to risk=number entering interval (col.(2)-1/2 number Interviewed at age x (col.(3)).

Col. (6) Probability of dying during the interval, nqx =number of deaths during interval (col.(4)/number exposed to risk (col.(5).

Col.(7) Probability of surviving the interval, ${}_np_{x}=1.0-{}_nq_x$ (col.(6)).

Col.(8) l_{x+n},the cumulative probability of surviving to the start of the next interval (age x+n)=${}_np_x$ (l_x) (col.(7)*col

CHAPTER 4
QUALITY OF DATA USED IN DIRECT ESTIMATION OF INFANT AND CHILD MORTALITY.

The KDHS 1998 indicates that there are various errors that require to be assessed in direct estimation of infant and child mortality. The source of these errors includes date of birth, accuracy of the age at death, completeness of reporting by survival status and accuracy of age reporting among women.

4.1 Date-of-birth Data
4.1.1 Displacement of birth dates by the survival status of the child.

Table 4.1.1.1 Birth ratios for the second, third, fourth, fifth and sixth before the start of the survey by survival status for selected regions, KDHS,1998

		Nairobi	Central	Coast	Eastern	Nyanza	Rift valley	Western
Living Children	2nd	82.10	93.00	124.90	101.00	112.90	106.40	103.00
	3rd	112.50	93.90	81.20	102.40	82.10	88.70	93.60
	4th	104.90	120.20	101.50	100.00	104.70	104.60	122.60
	5th	66.70	81.60	99.60	92.00	96.10	97.10	66.00
	6th	153.60	101.80	99.30	108.10	115.00	110.00	143.40
Dead children	2nd	100.00	25.00	130.80	110.00	158.60	173.30	126.30
	3rd	80.00	66.70	90.30	87.00	61.90	68.00	69.20
	4th	200.00	133.30	116.70	150.00	134.20	114.30	87.50
	5th	50.00	57.10	61.10	50.00	89.30	92.60	127.80
	6th	266.70	200.00	163.00	150.00	118.20	127.70	110.00
Difference in Birth Ratios	2nd	-17.90	68.00	-5.90	-9.00	-45.70	-66.90	-23.30
	3rd	32.50	27.20	-9.10	15.40	20.20	20.70	24.40
	4th	-95.10	-13.10	-15.20	-50.00	-29.50	-9.70	35.10
	5th	16.70	24.50	38.50	42.00	6.80	4.50	-61.80
	6th	-113.1	-98.20	-63.70	-41.90)	-3.20	-17.70	33.40
All Births	2nd	82.50	90.20	125.40	101.60	119.80	109.50	104.40
	3rd	110.00	93.50	81.50	101.30	76.60	87.20	91.60
	4th	110.80	120.50	102.70	102.80	110.60	105.20	118.40
	5th	65.00	80.60	95.20	88.70	94.50	96.80	72.80
	6th	159.30	104.70	104.90	110.40	115.70	113.30	138.00

Source; Computed from KDHS 1998.

The table 4.1.1.1 presents birth ratios for the second, third, fourth, fifth and sixth year before the survey. From the table it is clear that majority of birth ratios for third and fifth year for dead children are less than 100 indicating some degree of displacement of births. For living children and all births, the same is the case for fifth year before the survey. Generally it is clear that second, fourth and sixth year before the survey the birth dates are fairly reported by a majority of the regions. However, Central province has the poorest reporting of birth dates for the said period with birth ratios of 93.0 for living children and 25 for dead children in the second year prior to the survey. It also has a birth ratio of 90.2 for all births in the same period besides having the greatest difference in birth ratios for that period. It is therefore important to point out that for all regions, displacement of births is more prominent during the fifth year before the start of the survey. For majority of the regions, reporting of birth dates is better for fourth and sixth year before the start of the survey whereby birth ratios are more than 100 except for Coast province with a birth ratio of 99.3 in the sixth year before the survey.

Table 4.1.1.2 Birth ratios for the second, third, fourth, fifth and sixth before the start of the survey by survival status by place of residence, KDHS, 1998.

		Place of residence	
		Urban	Rural
Living children	2nd	99.70	108.00
	3rd	86.80	90.80
	4th	108.30	106.80
	5th	84.70	90.60
	6th	127.90	110.90
Dead children	2nd	150.00	138.10
	3rd	90.90	66.30
	4th	136.40	121.10
	5th	38.90	93.10
	6th	200.00	122.90
Difference in birth ratios	2nd	-50.3	-30.10
	3rd	-4.10	24.50
	4th	-28.10	-14.30
	5th	45.80	-2.50
	6th	-72.10	-12.00
All births	2nd	103.20	110.20
	3rd	87.20	88.30
	4th	110.50	108.20
	5th	79.80	90.90
	6th	133.60	112.30

Source; Computed from KDHS 1998.

The table 4.1.1.2 presents birth ratios for the second, third, fourth, fifth and sixth year before the survey. From the table it is evident that there is some degree of displacement of births from the reproduction section in the third and fifth year before the survey regardless of the survival status of the child.

All the birth ratios for the said period are below 100. The rest of the periods have good reporting in dates of birth except the urban which has a birth ratio of 99.7 in the second year prior to the survey for living children thus indicating some level of displacement of births.

Table 4.1.1.3 Birth ratios for the second, third, fourth, fifth and sixth before the start of the survey by survival status by age-group of the mother, KDHS,1998.

		Age-group 15-19	20-24	25-29	30-34	35-39	40-44	45-49
Living Children	2nd	92.80	104.50	113.70	92.60	123.90	118.10	109.10
	3rd	92.30	99.50	88.20	92.00	77.00	88.90	74.30
	4th	24.10	106.40	104.00	115.10	114.30	117.20	126.30
	5th	290.90	88.20	97.60	85.70	85.30	77.60	70.50
	6th	47.00	111.50	112.80	112.10	117.10	114.80	120.00
Dead Children	2nd	115.40	200.00	106.30	97.30	127.20	360.00	200.00
	3rd	63.60	72.70	100.00	72.30	72.20	21.10	11.10
	4th	125.00	101.90	77.60	138.10	125.70	333.30	450.00
	5th	40.00	111.60	103.30	82.00	95.70	28.60	37.50
	6th	-	147.10	107.90	136.20	117.10	240.00	116.70
Difference in birth ratios	2nd	-22.60	-95.50	7.40	-4.70	-3.30	-241.9	-90.90
	3rd	28.70	26.80	- 11.80	19.70	4.80	67.80	63.20
	4th	-100.90	-4.50	26.40	-23.00	-11.40	-216.10	323.70
	5th	-250.90	-23.40	-5.70	3.70	-10.40	-208.40	35.00
	6th	47.00	-35.60	4.90	-24.10	-	-125.20	3.30
All births	2nd	95.70	110.10	113.30	93.10	124.20	131.80	116.70
	3rd	88.30	96.70	88.90	89.80	76.60	79.40	59.60
	4th	36.40	105.90	102.00	117.50	115.60	127.90	157.10
	5th	212.50	91.10	98.10	85.20	86.50	70.50	65.90
	6th	44.40	116.00	112.20	114.50	117.10	125.00	119.50

Source; Computed from KDHS 1998.

The table4.1.1.3 presents birth ratios for the second, third, fourth, fifth and sixth year before the survey. The table shows that there is marked displacement of births during the third and fifth year prior to the survey for both living and dead children for majority of the age-groups. The age-group 15-19 however shows variations in birth ratios for the periods considered. This could result from the fact that this age-group has a lower number of children ever born and those who have died. Apart from this age-group, the rest shows accurate reporting of birth dates for second, fourth and sixth year before the survey except age-group 30-34 during the second year.

Table 4.1.1.4 Birth ratios for the second, third, fourth, fifth and sixth before the start of the survey by survival status by Ethnicity of the mother, KDHS,1998

		Ethnic Group									
		Kalenjin	Kamba	Kikuyu	Kisii	Luhya	Luo	Maasai	Meru/Embu	Mijikenda	Taita Taveta
Living children	2nd	109.70	100.00	84.40	121.80	101.70	68.10	144.00	132.70	140.20	90.9
	3rd	81.90	100.00	103.70	74.40	95.10	102.20	84.60	87.30	84.40	85.7
	4th	112.00	98.10	107.30	106.40	86.40	95.00	100.00	110.70	96.90	110
	5th	93.70	110.30	84.90	107.10	73.80	88.20	142.90	70.60	90.90	120
	6th	106.70	89.90	115.50	104.60	98.60	122.90	72.70	146.30	112.80	62
Dead children	2nd	293.30	100.00	50.00	133.30	150.00	133.30	-	200.00	120.00	66.7
	3rd	3.80	104.80	114.30	36.40	74.30	72.10	66.70	33.30	105.90	66.7
	4th	130.40	12.00	100.00	70.00	89.50	124.30	300.00	400.00	100.00	133.3
	5th	86.50	50.00	72.70	111.10	104.20	95.60	66.70	22.20	70.00	66.7
	6th	125.00	125.00	155.60	129.40	140.90	112.80	-	250.00	171.40	114.3
Difference in birth ratios											
	3rd	44.1	--4.8	-16	38	20.80	30.10	17.90	54	-21.5	19.0
	2nd	183.6	-	34.4	11.5	-48.3	-65.2	140	-67.3	20.0	24.2
	4th	18.4	26.90	7.30	36.4	-3.1	-29.3	-200	-289.3	-3.1	-23.3
	5th	7.20	60.3	12.0	- 4	-30.40	-7.40	76.20	48.40	20	53.3
	6th	18.30	-35.1	-40.1	-24.8	-42.30	10.10	72.70	103.7	-58.6	-52.3
All births	2nd	116.00	100	83.10	122.30	104.90	101.20	96.30	132.70	138.60	89.8
	3rd	78.50	100.4	104.00	71.90	93.20	93.90	82.90	87.30	86.10	84.8
	4th	113.00	100	107.10	107.20	113.10	102.40	144.30	110.70	97.10	111.1
	5th	93.50	100.00	84.50	107.50	77.60	90.30	133.30	70.60	88.60	114.8
	6th	108.10	92.50	116.90	107.10	120.10	69.60	146.30	117.60	66.70	

Source; Computed from KDHS 1998

The table4.1.1.4 presents birth ratios for the second, third, fourth, fifth and sixth year before the survey. The majority of birth ratios reported in the table for both surviving and dead children for the third and fifth year are below 100 except those reported by Kamba, Kisii,Kikuyu, Luo,Massai,Taita/Taveta and Luyhia.For the third year before the survey, more ethnic groups have birth ratios lower than 100 for dead children compared to living children indicating some displacement of births for dead children compared to living children. In this period, displacement is most severe among the Kalenjin for living children and among the Meru/Embu for dead children. During the fifth year before the survey, the Meru/Embu have the most severe level of displacement for living children and also for dead children. For the second, fourth and sixth year before the start of the survey, majority of the ethnic groups have fair reporting of dates of birth for both living and dead children with birth ratios exceeding100.From the table ,it is clear that date of birth data derived from among the Meru/Embu is grossly inaccurate due to severe displacement of births and therefore any mortality estimates thus derived should be handled with caution.

Table 4.1.1.5 Birth ratios for the second, third, fourth, fifth and sixth before the start of the survey by survival status by Educational level of the mother, KDHS,1998

Educational Level		No. Education	Primary Education	Secondary Education	Higher Education
Living children	2nd	130.80	107.60	95.00	85.
	3rd	119.90	88.00	104.40	121.
	4th	121.20	106.00	106.80	65.
	5th	76.60	92.40	85.70	185.
	6th	130.00	111.50	112.40	59.
Dead children	2nd	81.50	149.10	161.50	
	3rd	68.60	70.40	68.40	
	4th	160.00	121.20	97.10	
	5th	64.30	86.00	122.20	
	6th	182.90	127.50	95.00	
Difference in birth ratios	2nd	49.30	-41.50	-66.50	85.
	3rd	43.30	17.60	36.00	121.
	4th	-38.80	-15.20	9.70	65.
	5th	12.30	6.40	-36.50	185.
	6th	-52.90	-16.00	17.40	-40.
All births	2nd	126.50	110.80	98.30	85.
	3rd	73.20	86.10	101.80	121.
	4th	125.60	107.60	106.10	65.
	5th	74.80	91.60	88.30	179.
	6th	135.70	113.30	110.80	60.

Source; Computed from KDHS 1998.

The table 4.1.1.5 presents birth ratios for the second, third, fourth, fifth and sixth year before the survey. The table shows that displacement of births is usually severe for dead and living children especially among women with no education in the fifth year before the survey. For dead children, displacement is most severe during the third year before the start of the survey among all education categories. It is evident from the table that mortality estimates based on five years before the survey will be biased because there marked displacement of birth dates compared to other periods considered. Births occurring 6 years prior to the survey are better reported. However, these births are not of interest in calculating infant and child mortality. Nevertheless, reporting accuracy of such births would indicate the pattern expected for more recent births i.e. those occurring during the second, third, fourth and fifth year before the start of the survey.

4.2 Accuracy of the age –at- Death data.

Table 4.2.1 The amount of heaping at 12 months in KDHS 1998 by age of the mother Using the index of heaping.

Age group	Index of heaping	Excess deaths.
15-19	6.0	6.0
20-24	4.8	10.0
25-29	6.7	17.0
30-34	4.2	18.0
35-39	5.8	29.0
40- 44	7.3	35.0
45-49	7.1	28.0

Notes; Index of heaping was calculated as 4D12/(D10+D11+D13+D14) where D12 includes all deaths reported at 12 months and 1 year.
Source; Computed from KDHS 1998

From table 4.2.1 it is clear that heaping at 12 months, as the age of death is more common the younger the women or the older the women. It is evident that women in 15-19 age group tend to heap age at death at 12 months because their children are at a higher risk of early death. The same case applies to women aged 40 years and over. Women aged 30-34 have the lowest level of age heaping at 12 months.

Table 4.2.2 The amount of heaping at 12 months in KDHS 1998 by region of the mother Using the index of heaping

Region	Index of heaping	Excess deaths
Nairobi	1.3	-0.33
Central	2.0	-0.33
Coast	18.5	28.0
Eastern	6.0	5.0
Nyanza	5.0	41.0
Rift valley	6.2	21.0
Western	5.3	18.0

Source; Computed from KDHS 1998.

The table4.2.2 shows that Nairobi and Central provinces have the lowest level of heaping. This could be as result of high literacy levels among the women and therefore are able to give accurate age at death without necessarily rounding up those ages to 12 months or 1 year. This therefore implies that, it is possible to derive robust age-specific mortality rates for these regions. The amount of heaping is highest at the Coast which also reflects high illiteracy levels among the women and therefore unable to give accurate age at death data. The infant mortality estimates thus derived will be severely biased. Nyanza province though with a lower amount of heaping has the highest number of excess deaths. These excess deaths will lead to overestimate of infant mortality although child mortality will be unaffected because these deaths falls within the range of child mortality calculation.

Table 4.2.3 The amount of heaping at 12 months in KDHS1998 by place of residence 0f the mother using the Index of heaping

Place of residence	Index of heaping	Excess deaths
Urban	11.1	17
Rural	5.7	96

Source; Computed from KDHS 1998

Table 4.2.3 presents the amount of heaping at 12 months by residence of the mother.

From the table, it is clear that there is variation in the amount of heaping by place residence. The urban has amount of heaping compared to rural. However, the rural has a higher number of excess deaths compared to the rural .It is noteworthy that it would be expected that rural shows higher amount of heaping compared to urban due to high literacy levels in the urban and therefore better reporting of the dates but this is not the case here. This could be due to differential in sample sizes used in each case and thus making any comparison becomes impossible.

Table 4.2.4 The amount of heaping at 12 months in KDHS 1998 by Ethnicity of the Mother using the index of heaping for selected ethnic groups.

Ethnic group	Index of heaping	Excess deaths
Kalenjin	5.5	12
Kamba	7.3	10
Kikuyu	3.0	3.3
Kisii	1.2	0.5
Luhyia	6.9	31
Luo	5.7	55
Mijikenda	17.6	21

Source; Computed from KDHS 1998

From table 4.2.4, it is evident that most ethnic groups show high levels of heaping at 12 months for the age at death.

The Mijikenda indicates the highest level of heaping which therefore imply that more deaths occurring either shortly before the first birthday or shortly after the first birthday are rounded up to 12 months or one year. This means that estimates for age –specific mortality will be biased. The Kisii have the lowest level of age heaping at 12 months and therefore it is possible to get plausible age-specific mortality estimates from their reported ages at death compared to other ethnic groups.

Table 4.2.5 The amount of heaping at 12 months in KDHS 1998 by the educational level of the mother.

Educational level	Index of heaping	Excess deaths
No education	10.2	58
Primary education	4.9	76
Secondary education	5.3	10
Higher education	---	---

--- cases too few to estimate the amount of heaping.

Source; Computed from KDHS 1998

Table 4.2.5 Indicates that variations in the amount of heaping at 12 months exist by level of education. Women with no education show the highest amount of heaping while those with primary education show the lowest heaping at 12 months. It is evident that those with no education are twice as likely to heap age at death at 12 months as compared to those with primary and secondary education.

It is clear therefore that mortality estimates from the different education categories will be biased by varying magnitude and the reliability of those estimates should be taken with caution

4.3 Completeness of Reporting by Survival Status

Table 4.3.1 Percentage of births before the survey with incomplete information on date of birth by survival status by age of the mother KDHS 1998.

Age –group.	Living children			Dead children			All births
	Anything missing	Month only imputed	Year imputed	Anything missing	Month only imputed	Age and month imp.	Anything Missing
15-19	0.5	0.0	0.0	0.0	0.0	0.0	0.5
20-24	1.0	0.4	0.0	1.6	0.0	1.6	1.1
25-29	1.4	0.7	0.1	4.3	0.0	4.0	1.7
30-34	1.4	0.8	0.1	4.1	0.0	3.4	1.7
35-39	3.0	2.1	0.0	8.0	0.0	7.3	3.5
40-44	2.5	1.7	0.03	10.4	0.0	10.1	3.5
45-49	4.8	3.0	0.0	7.5	0.0	7.1	5.2

Source; Computed from KDHS 1998

Table4.3.1 presents the percentages of births with incomplete information on date of birth by survival status. The completeness of information on date of birth prior to the survey is lowest among the youngest age group. As expected, this age-group has the lowest number of deaths and births and also both the deaths and the births are relatively more recent events and therefore easy to remember. The percentage of births with missing information on death of birth is consistently higher for dead children than for surviving children. As we would expect missing information to vary with the age of the mother since the events are further back in time ,there is a discrepancy because those aged between 40-44 show lower level of missing information on living children compared to the adjacent age-group. However, they the highest level of missing information for dead children. This pattern could suggest that some mothers in the 40-44 age-group may have shifted their ages to either 35-39 or 45-49 age-groups and they reported their births in those age-groups.

This would therefore affect age-specific mortality rates because bias is introduced to those age-groups for which births and deaths are reported. For surviving children the month of birth is the most difficult to recall, while for the dead, the age and the month of birth are the most difficult to remember

Table 4.3.2: Percentage of births before the survey with incomplete information on date of birth by educational level of the mother, KDHS1998.

Educational level	Living children			Dead children			All births
	Anything missing	Month only imputed	Year imputed	Anything missing	None(all imputed)	Age and month imp.	Anything missing
No education	5.2	3.1	0.02	11.6	0.5	11.1	6.2
Primary education	2.0	1.3	0.04	4.7	0.4	4.2	2.3
Secondary education	0.7	0.3	0.03	2.6	0.0	2.6	0.8
Higher education	1.2	.2	0.0	0.0	0.0	0.0	1.1

Source; Computed from KDHS 1998.

Table 4.3.2 presents the percentage of births with incomplete information on date of birth by survival status. For both living and dead children, the category with no education presents the highest percentage of births with incomplete information on date of birth. For all births, the category with secondary education presents the lowest percentage with incomplete information on date of birth.

For all education categories, dead children present more births with incomplete information on date of birth as compared to living children. For the category with higher education there is no missing information on date of birth for dead children as compared to living children. However, this could be due to the small proportion dead among this category as they have high memory for dates. It is also unexpected that the category with secondary education has better completeness of information on date of birth for living children than the category with higher education when the reverse should be the case. This could suggest that some respondents with secondary education may have reported themselves as having higher education. This misreporting of educational level may bias differentials by educational level for mortality estimates. Nevertheless, it is clear from the table that any estimate of mortality differentials by educational attainment may be biased because the degree of completeness of information on date of birth varies and any imputation procedure used to adjust information completeness may bias the estimates depending on whether the imputation is downward or upward for the exact date of birth.

Table 4.3.3: Percentage of births before the survey with incomplete information on date of birth by survival status for selected ethnic groups of the mother, KDHS 1998

Ethnic group..	Living children			Dead children			All births
	Anything missing	Month only imputed	Year imputed	Anything missing	None (all imputed)	Age and month imp.	Anything missing
Kalenjin	3.6	2.7	0.0	10.2	0.0	10	4.1
Kamba	4.9	3.5	0.0	12.8	0.9	12.0	5.7
Kikuyu	1.9	0.9	0.1	3.2	0.0	3.2	2.0
Kisii	1.1	0.2	0.1	3.2	0.6	2.5	1.3
Luhyia	1.3	0.5	0.0	5.7	0.8	4.9	1.9
Luo	1.8	1.5	0.0	5.2	0.4	4.7	2.6
Meru	1.6	1.3	0.0	6.0	0.0	6.0	1.9
Mijikenda	3.5	1.8	0.0	8.2	0.0	8.2	4.0
Taita	0.8	0.3	0.0	5.2	0.0	5.2	1.0

Source; Computed from KDHS 1998.

Table 4.3.3 presents the percentage of births with incomplete information by survival status. For both living and dead children, the Kamba present the highest percentages of births with incomplete information on date of birth. The Taita present the lowest percentage of births with incomplete information for living children while the Kikuyu and the Kisii present the lowest for dead children. For living children, the month of birth is the most common missing information while for dead children, the age and the month of birth are more common. From the table, it is evident that reporting by the Kisii on date of birth is more likely to be better compared to other ethnic groups. This is because missing information on date of birth is relatively lower. For both the Kamba and the Kalenjin, estimates of mortality could be severely biased because the difference in missing information on date of birth for dead and living children is very great. The best estimates could be derived for the Kikuyu

Table 4.3.4: Percentage of births before the survey with incomplete information on date of birth by survival status by region, KDHS 1998

Region	Living children			Dead children			All births
	Anything missing	Month only imputed	Year imputed	Anything missing	None (all imputed)	Age and month imp.	Anything missing
Nairobi	0.0046	0.0046	0.0	0.0	0.0	0.0	0.0043
Central	0.023	0.0079	0.0	0.08	0.0	0.8	0.025
Coast	0.025	0.013	0.0003	0.077	0.0	0.077	0.031
Eastern	0.037	0.028	0.0	0.1	0.007	0.09	0.043
Nyanza	0.016	0.0095	0.0005	0.044	0.004	0.04	0.022
Rift valley	0.03	0.021	0.0007	0.09	0.004	0.08	0.034
Western	0.014	0.005	0.0	0.06	0.005	0.05	0.019

Source; Computed from KDHS 1998.

Table 4.3.4 presents percentage of births with incomplete information by region. The table shows that Nairobi province has the highest completeness of birth dates for both living and dead children. Eastern province shows the highest percentage of births with incomplete information for both living and dead children .Therefore, mortality estimates derived from the province are likely to be biased because any imputation procedure used for the province may either bias the estimates either upwards or downwards. For most of the regions, month of birth of the child tends to pose the greatest problem for living children while age and month is the case for dead children .Again , this problem is most severe in Eastern province .However , year of birth of the child is not a big problem for women especially for living children. Most of the births with no information provided pertaining to birth details are those of dead children. This could be expected since most women would want to forget a sad event relating to a loved one.

Table 4.3.5: Percentage of births before the survey with incomplete information on date of birth by survival status by place of residence of the mother, KDHS 1998

Residence	Living children			Dead children			All births
	Anything missing	Month only imputed	Year imputed	Anything missing	None (all imputed)	Age and month imp.	Anything missing
Urban	0.024	0.016	0.0004	0.058	0.0	0.058	0.027
Rural	0.024	0.015	0.0003	0.067	0.004	0.062	0.029

Source: _Computed from KDHS 1998

Table 4.3.5. presents percentage of births with incomplete information on date of birth .From the table, it is clear that for living children ,there's no difference on the completeness of information on the date of birth of children .However, for dead children, urban provides more complete information compared to rural areas. Again for living children, the most difficult birth detail remains the month of birth and this more of a problem in urban areas. This however ,should not be the case and thus, the issue of differential sample size arises. For dead children, age and month remains a problem to most women especially in rural areas.

Table 4.3.6: Percentage of births before the survey with incomplete information on date of birth by sex of the child KDHS 1998.

	Male	Female	All births
Anything missing	0.031	0.027	0.029
Month	0.014	0.013	0.013
Year imputed	0.0004	0.0002	0.0003
Age and month imputed	0.01	0.006	0.008
None all imputed	0.0008	0.009	0.008

Source; Computed from KDHS 1998

Table 4.3.6 presents percentage of births with incomplete information by sex of the child. The table indicate that more male births are missing information on the date of birth. This could be as a result of the high mortality rates of male children at very young ages compared to females who have higher survival chances at those ages. This therefore implies that the women are not able to remember all date of birth details since children mainly male may have died very young and thus the mother may have liked to forget that birth which has a distressing memory . Again, when we consider that more women prefer male children to female and therefore a male birth which possibly died could arouse more sadness than a female death and thus we may expect that with the high mortality of male children, it is possible that the women want to forget that birth that never survived and there not able to the birth details of that child.

However, the month of birth is the most common problem in date of birth data for both male and female children. Therefore the variations in the missing information by sex of the child may cause bias in sex differentials in mortality because it is not possible to accurately allocate deaths to the periods in which they occurred.

4.4 Accuracy of age reporting by women

Table 4.4.1: **Myers' Blended Index KDHS,1998**

Terminal Digit (1)	Sum of ages(20-49) (2)	Weights Ages(20-49) (3)	Products (2)*(3) (4)	Sum of ages (30-49) (5)	Weights (6)	Products (5)*(6)	Blended population	Percent distribution	Deviation From 10
0	752	0	0	423	9	3807	3807	7.09	2.91
1	581	1	581	294	8	2352	2933	5.46	4.54
2	634	2	1268	313	7	2191	3459	6.44	3.56
3	614	3	1842	295	6	1770	3612	6.73	3.27
4	581	4	2324	295	5	1475	3799	7.08	2.92
5	1153	5	5765	419	4	1676	7441	13.86	-3.86
6	842	6	5052	259	3	777	5829	10.86	-0.86
7	778	7	5446	245	2	490	5936	11.06	-1.06
8	1066	8	8528	343	1	343	8871	16.56	-6.52
9	887	9	7983	257	0	0	7983	14.87	-4.87
Total	7881		33789	3143		14881	53670	100	34.37

Source; Computed from KDHS 1998

The table 4.4.1 presents the Myers' blended index to show the level of digital preference. From the table, it clear that reporting of ages by women is faced with some degree of digital preference with a level of 34.37 which indicates a modest amount of digital preference in age reporting. Particularly, there is over-selection of ages ending in digits 5,6,7,8,and 9 while the rest of the digits are avoided or under-selected. Mainly, ages ending in digit 1 are most avoided.

Table 4.4.2; Sex Ratios by age-group of the mother,KDHS 1998

Age-group	Sex ratios
15-19	118.5
20-24	104.0
25-29	102.1
30-34	102.3
35-39	100.1
40-44	99.4
45-49	103.4

Source; Computed from KDHS 1998

Table 4.4.2 presents sex ratios by age group of the women. From the table, it is clear that age group 15-19 has the highest sex ratio indicating excess of male births.Age-group 40-44 has a lower sex ratio indicating a deficit of males. This could be as a result of ommission of births especially males who might have died in the past.Generally most of the age-groups give fair sex ratios. Therefore,it is clear that most of the sex ratios would not adversely mortality estimates apart from those reported by 15-19 and 40-44 age-groups.

4.5 Lifetable probabilities of death.

Construction of a life table.

Cross tabulate (for all those born in each five years preceding the survey) survival status (alive or dead) by age. The age variable here is age at interview for living children and age at death for those who have died.

Table.4.5.1: Survival Status by Interval since Birth
(Births in the last five years; Age at interview; KDHS 1998.

Interval	Alive	Dead
Less than 1 month	60	2
1-2 months	190	6
3-5 months	275	16
6-11 months	583	40
12-23 months	1127	110
24-35 months	1040	82
36-47 months	962	106
48-59 months	949	124
60+ months	98	8
Total	5284	494

gTable 4. 5.2: **LIFE TABLE FOR BIRTHS IN THE LAST FIVE YEARS, (KENYA) KDHS, 1998.**

Age interval (x) (months) (1)	No. Alive at start of interval (2)	No. Interviewed Age x (3)	No. Deaths in interval (4)	No. Exposed to risk (5)	$_nq_x$ (6)	$_np_x$ (7)	L_x (8)
<1	5778	60	2	5748	0.00035	0.99965	1.000
1-2	5716	190	6	5621	0.0011	0.9989	0.99965
3-5	5520	275	16	5382.5	0.003	0.997	0.99855
6-11	5229	583	40	4937.5	0.008	0.992	0.99556
12-23	4606	1127	110	4042.5	0.027	0.973	0.98756
24-35	3369	1040	82	2849	0.028	0.972	0.9609
36-47	2247	962	106	1766	0.060	0.94	0.9340
48-59	1179	949	124	704.5	0.176	0.824	0.8779
60+	106	98	8	57	0.140	0.86	0.7234

Source; Computed from table 4.5.1

Table.4.5.3: Survival Status by Interval since Birth
(Births in the last five years; Age at interview; urban: KDHS 1998.

Interval	Alive	Dead
Less than 1 month	5	0
1-2 months	35	2
3-5 months	41	5
6-11 months	98	5
12-23 months	175	13
24-35 months	136	18
36-47 months	134	15
48-59 months	120	11
60+ months	18	0
Total	762	69

Table 4. 5.4: life table for births in the last five years, (urban) KHDS, 1998.

Age interval (x) (months) (1)	No. Alive at start of interval (2)	No. Interviewed Age x (3)	No. Deaths in interval (4)	No. Exposed to risk (5)	$_nq_x$ (6)	$_np_x$ (7)	L_x (8)
<1	831	5	0	828.5	0.000	1.000	1.000
1-2	826	35	2	808.5	0.0025	0.9975	1.000
3-5	789	44	2	767.0	0.0026	0.9974	0.9975
6-11	743	98	5	694	0.0072	0.9928	0.9949
12-23	640	175	13	552.5	0.024	0.976	0.9878
24-35	452	136	18	384	0.047	0.953	0.964
36-47	298	134	15	231	0.065	0.935	0.919
48-59	149	120	11	89	0.124	0.876	0.859
60+	18	18	0	9	0.00	1.000	0.752

Source; Computed from table 4.5.3

Table.4.5.5: **Survival Status by Interval since Birth (Births in the last five years; Age at interview; Rural: KDHS 1998.**

Interval	Alive	Dead
Less than 1 month	55	2
1-2 months	148	11
3-5 months	230	15
6-11 months	485	35
12-23 months	952	97
24-35 months	904	64
36-47 months	828	91
48-59 months	829	113
60+ months	80	8
Total	4511	436

Table 4. 5.6 **LIFE TABLE FOR BIRTHS IN THE LAST FIVE YEARS, (RURAL) KDHS, 1998.**

Age interval (x) (months) (1)	No. Alive at start of interval (2)	No. Interviewed Age x (3)	No. Deaths in interval (4)	No. Exposed to risk (5)	$_nq_x$ (6)	$_np_x$ (7)	L_x (8)
<1	4947	55	2	4919.5	0.004	0.9996	1.000
1-2	4890	148	11	4816	0.0022	0.9978	0.9996
3-5	4731	230	15	4616	0.0032	0.9968	0.9974
6-11	4486	485	35	4243.5	0.008	0.9920	0.9942
12-23	3966	952	97	3490	0.028	0.972	0.9862
24-35	2917	904	64	2465	0.026	0.974	0.9586
36-47	1949	828	91	1535	0.059	0.941	0.9337
48-59	1030	829	113	615.5	0.184	0.816	0.8786
60+	88	80	8	48	0.166	0.834	0.7169

Source; Computed from table 4.5.5

CHAPTER FIVE

FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Date of Birth data

There are marked variations in the displacement of births for both living and dead children by region. Displacement of births is more severe for third and fifth year before the start of the survey particularly for dead children.

By place of residence, there is some displacement of births for both living and dead children for third and fifth year before the survey. Second, fourth and sixth year before survey have birth dates fairly reported regardless of the survival status of the child. The rural has better reporting of birth dates compared to urban. This could however result from the small sample taken for urban because our expectation would be better reporting in urban area because there are likely to be more educated women and therefore give accurate birth dates.

By age group of the women, there is marked displacement of births during the third and fifth year prior to the survey. The most severe displacement of births occurs for the 15-19 age group. However, this age group has a lower number of children ever born and those who have died. Age group 30-34 has a lower displacement of births.

By ethnicity, there is displacement of births for the third and fifth year before the start of the survey for both living and dead children. The Meru/Embu have the most severe form of displacement of births for both living and dead children. For second, fourth and sixth year before the survey, most ethnic groups have fair reporting of birth dates.

By level of education of the women, it is important to note that displacement of births occur among women with no education for both living and dead children in the fifth year before the survey.

5.2 Accuracy of age at death data

By age group of the women, younger and older women tend to heap deaths at 12 months. Middle-aged women have fairly accurate age at death.

For the region of the women, it is clear that there are variations in the heaping of deaths at 12 months. This kind of heaping implies that infant mortality will be overestimated by a certain degree of a measure. Age heaping is most severe for Coast province.

By residence of the women, the urban shows higher levels of age heaping at 12 months. This implies that infant mortality will be overestimated especially if more of the deaths occurred between 13 and 14 months and fewer deaths occurred between 10 and 11 months and these deaths are rounded up to 12 months or one year.

For ethnic group of the women, there is marked heaping for various ethnic groups. The most severe heaping of age at death at 12 months occurs among the Mijikenda.This trend indicates that death of infants is a taboo issue which most ethnic groups are reluctant to talk about and therefore the failure to give accurate age at death. Again, it is possible that the interviewer could have approximated the age at death of children at 12 months especially among the luos where we have naming of children according to different seasons. This community has more excess deaths compared to other ethnic groups.

For education categories of the women, there are variations in the amount of heaping at 12 months. As expected, the category with education shows the highest amount of heaping at 12 months. However, the category with secondary education shows higher level of heaping compared to the category with primary education. This is converse of our expectation since we may expect that the more educated the woman is, the more accurate would be the statement of age at death. Therefore, we may conclude that there was some misstatement of education level of the women so that the category with secondary education was infiltrated by a number of women with primary education and these could be the same who rounded age at death at 12 months. This kind of scenario would thus lead to biased mortality estimates particularly mortality differentials brought about by misstatement of education achievement.

5.3 Completeness of reporting

In estimating infant and child mortality, the date of birth both the month and the year and that age at death are very vital components for infant and child mortality estimation.

By age of the mother, it is clear that there is missing information in date of birth and this varies with the age of the mother. However, the variations are more severe for dead children compared to living children. Imputation is mainly higher for age and month of birth and are more prominent for dead and this implies that the deaths can not be accurately to the period in which they occurred and their corresponding births and therefore biasing mortality estimates. The most biased infant and child mortality estimates would expected to occur among women aged 35 years and above because they have the highest percentage of births with missing information regardless of the survival status of the child.

Therefore any imputation procedure used for birth dates introduces bias in the age-specific mortality estimates either upward or downward.

The level of education of the women also shows variations in missing information on date of birth and varies with the survival status of the child. Month of birth has a higher percentage of births for which this parameter is imputed while age and month of birth is the biggest problem for dead children. It is evident that the most unreliable mortality estimates could be derived for the category with no education due to the high percentage of births with missing information for both dead and living children. Therefore any mortality differentials by education level should be judged from the point of view of the completeness of information but not living circumstances of women with different education achievement.

By ethnicity of the mother, variations also exist and this is manifest of various taboos related to birth and death of a child among the various ethnic groups. Thus most ethnic groups have high percentages of births with missing information for dead children. It is evident that the Kamba, Kalenjin and the Mijikenda have the highest percentage of deaths with missing information for dead children. Therefore, any mortality differentials by ethnic group are not purely unique to the living conditions of the community but rather the quality of data thus provided.

For regional differentials, there are also variations in the completeness of information on the date of birth. Again this is more severe for dead children compared to living children. Eastern province stands out as the region with the poorest reporting of date of birth. It is expected that the Kambas mainly inhabit the province and this community was found to have poor giving unreliable mortality estimates. reporting of birth dates and therefore

By place of residence, the urban provide better reporting of birth dates compared to the rural. This would be expected because women who are educated and therefore able to recall birth dates of both living and dead children usually inhabit the urban.

For sex differentials there are also variations in the reporting of birth dates. More male births are missing information on the date of birth. Due to male preference by most women, there is tendency by a majority of the women forgetting especially the death occurred to a male child. Again, male children have got higher mortality compared to female children during the very young ages and therefore these births of these children are likely to be forgotten.

Accuracy of age reporting among women is faced with a modest level of digital preference. This implies that infant and child mortality differentials based on single year age-groups will be biased because of over selection of ages ending in certain and under selection of others

The reporting of sex of the child may affect sex differentials of infant and child mortality. However, sex ratios calculated indicates that mortality estimates will not be adversely affected because there is not much omission of births.

The lifetable probabilities of dying between certain age intervals vary between the rural and the urban. These variations are even greater when we compare these mortality estimates with national ones. However, these mortality differentials between rural and urban could result from the data quality derived from those places of residence. The, the sample size is also an issue because the urban tends to have fewer cases compared to rural for the estimation.

5.4 Recommendation.

The study recommends that the Kenya Demographic and Health Survey questionnaire should include more probing questions particularly those pertaining to the birth and the death of a child. It would be important to include a calendar of events in the questionnaire such that the women who are interviewed can relate the occurrence of a birth or death to such events. Such events may include national public holidays, General election dates among others, which are significant to different groups of people. This calendar of events worked fairly well for 1999 Kenya population and housing census.

The information derived from certain categories of respondents should always be censored especially if the quality of the responses is suspect. Particular caution should be taken in the field during data collection so that the competence of the respondent is judged to determine the quality of responses so that data quality is safeguarded. The respondents' word should not always be taken as final regarding to certain questions.

A framework should introduced in the questionnaire to give the interviewer certain objective options to certain responses that are not consistent with any substantive demographic axioms or models so that interviewer's personal judgement in such circumstances does not influence the quality of the data.

The interviewers should be given a modest training in psychology so that they easily judge respondents reaction and therefore be able to get accurate responses.

The study recommends that future Demographic and Health Surveys should provide a structure whereby men of reproductive age asked fertility questions in cases whereby the woman who was the mother of their children is dead especially in this era of HIV/AIDS whereby adult mortality is rising. This would help in solving the problem of structural bias in current DHS set up whereby only surviving women of reproductive ages are asked fertility questions and therefore ignoring those children whose mothers have died.

Future Studies should focus on investigating the plausibility of data based on external sources. External validity here involves making comparisons of responses derived from other similar surveys like the World Fertility Surveys, Baseline studies and national censuses.

Future efforts should be made to investigate people's perception to fertility and mortality questions as they are asked to respondents. This will help in reaching a consensus on how certain questions the respondents and therefore unbiased responses should frame pertaining to births and deaths to elicit proper judgement. This will be important in safeguarding the quality of fertility and mortality data which is vital in direct estimation of infant and child mortality

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APPENDIX 1

Chart1: Birth ratios for 2nd,3rd,4th,5th and 6th year before the survey for living children by region.KDHS,1998.

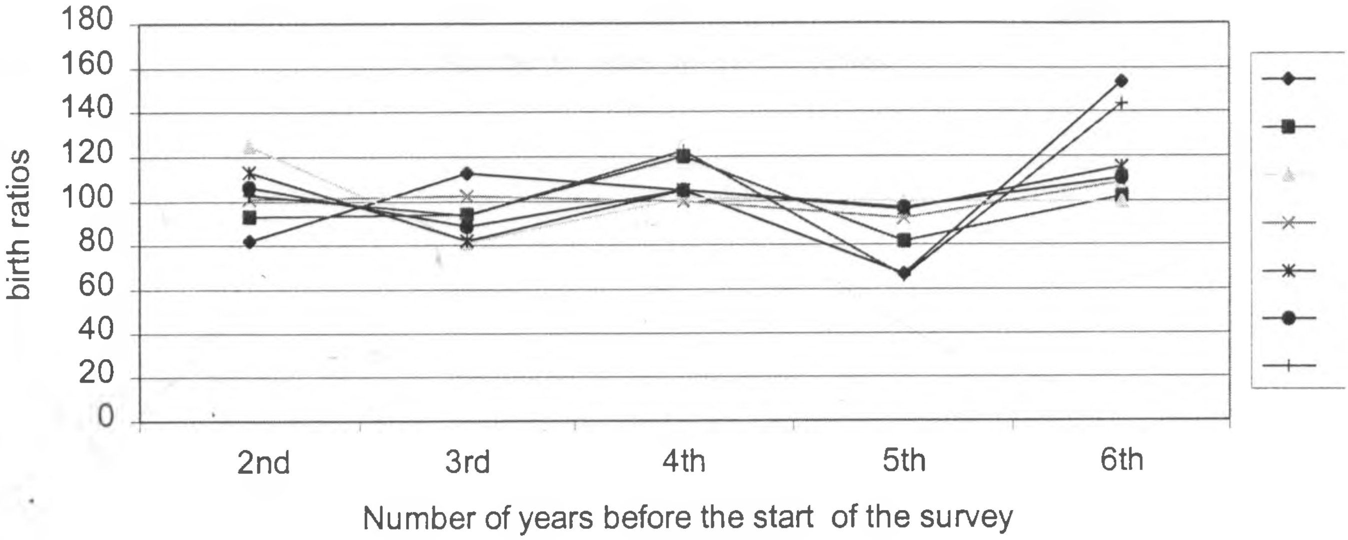


Chart2: Birth ratios for the 2nd,3rd,4th,5th and 6th year before the survey for dead children by region

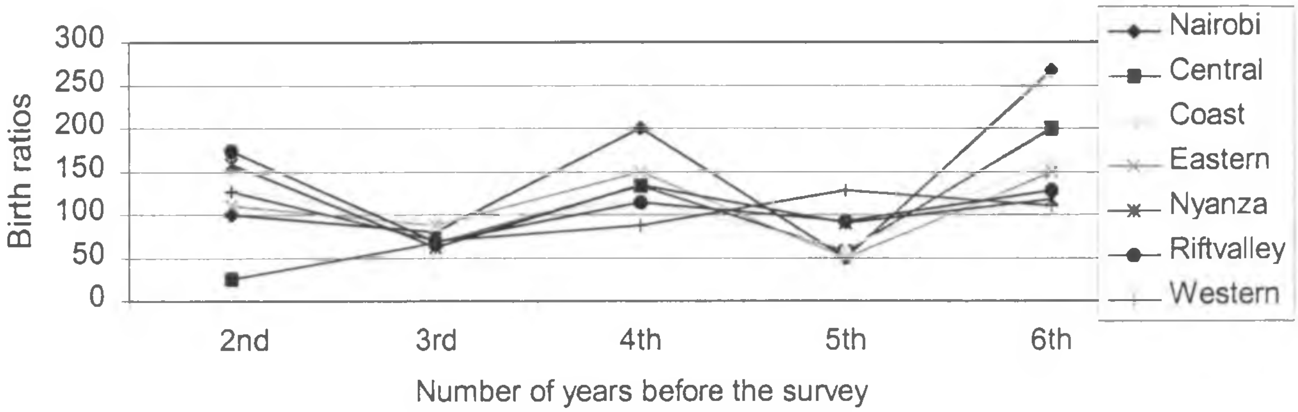
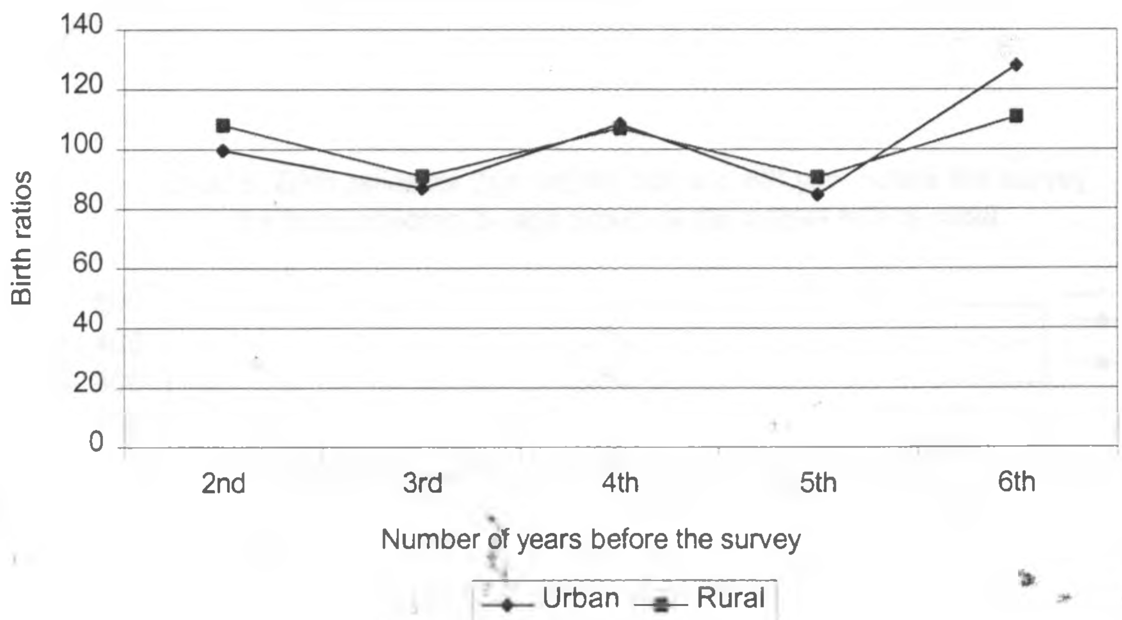


Chart 3:Birth ratios for the 2nd, 3rd,4th,5th and 6th year before the survey for living children by place of residence of the mother.KDHS,1998.



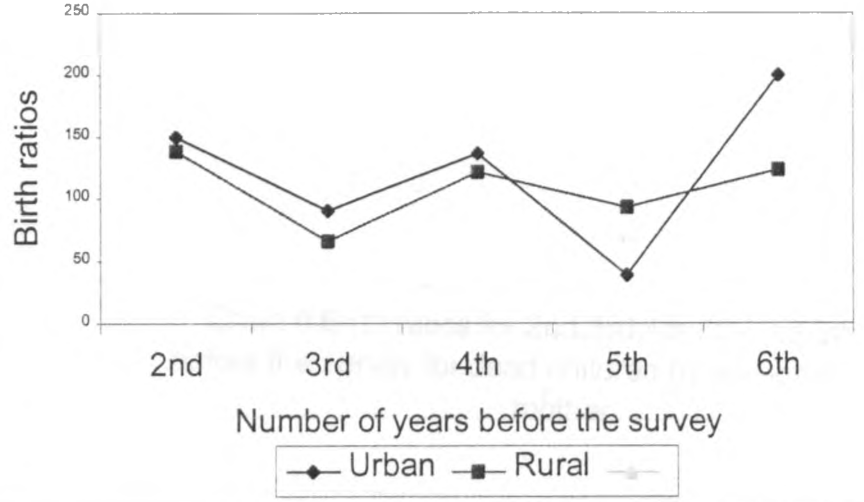
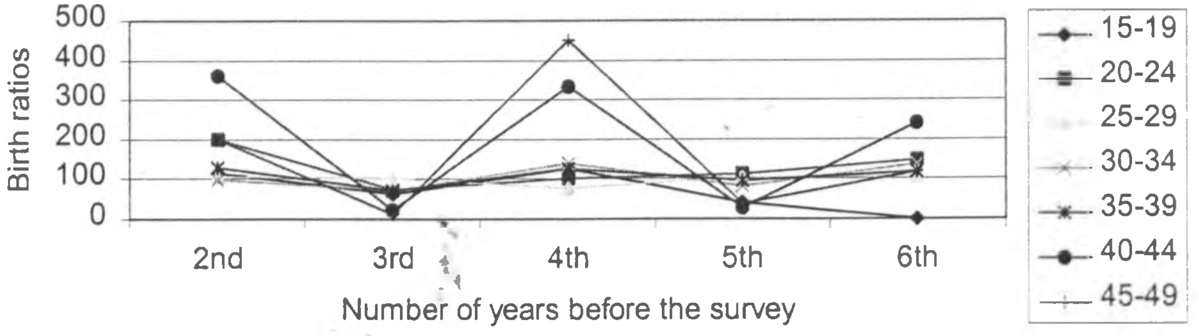


Chart 4: Birth ratios for the 2nd,3rd,4th, 5th and 6th year before the survey for dead children by place of residence of the mother.KDHS,1998.

Chart 5: Birth ratios for 2nd,3rd,4th,5th and 6th year before the survey for living children by age group of the mother.KDHS,1998.



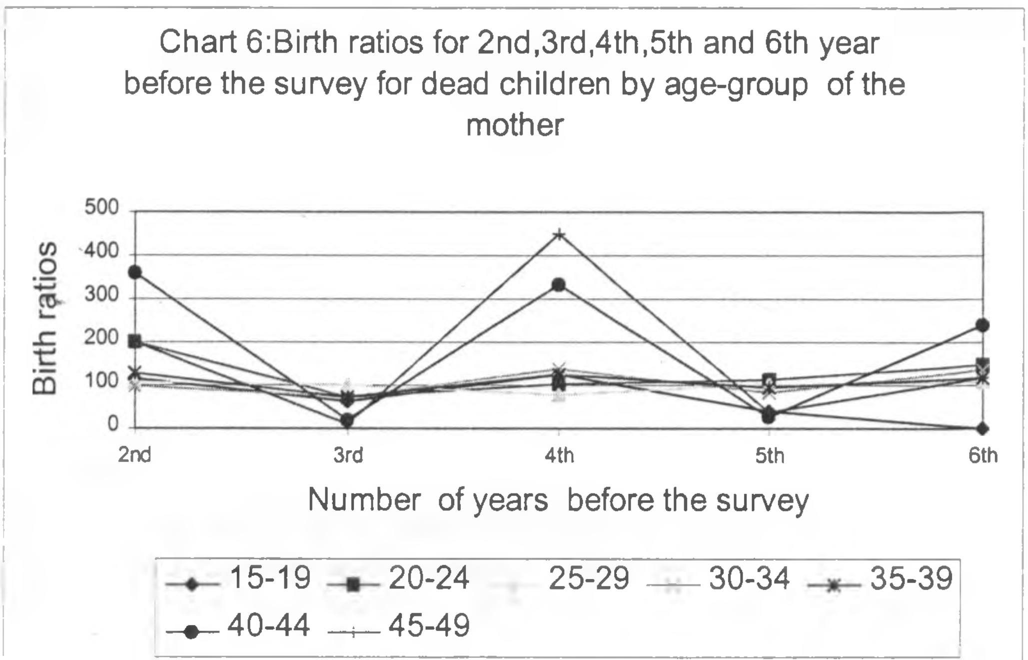


Chart 6:Birth ratios for 2nd,3rd,4th,5th and 6th year before the survey for dead children by age-group of the mother
500
400
300
200
100
0
Birth ratios
2nd
3rd
4th
5th
6th
Number of years before the survey
15-19
20-24
25-29
30-34
35-39
40-44
45-49

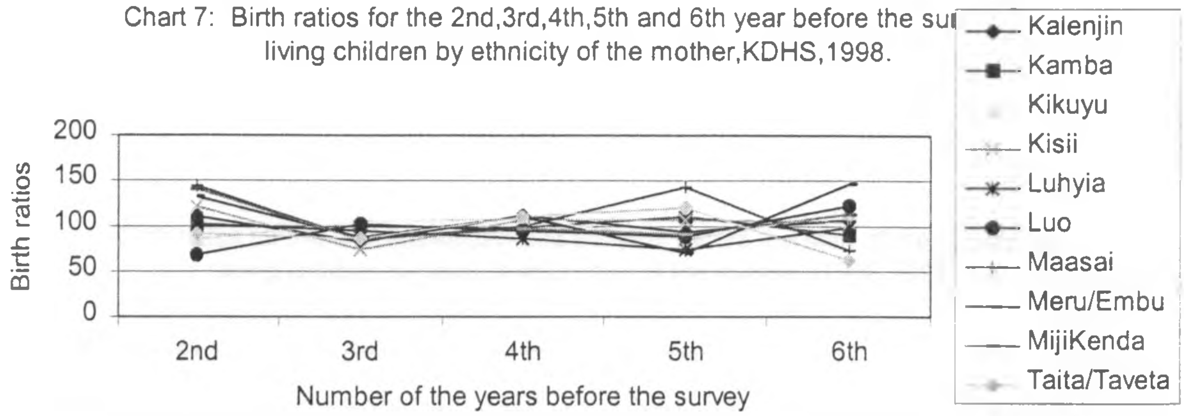
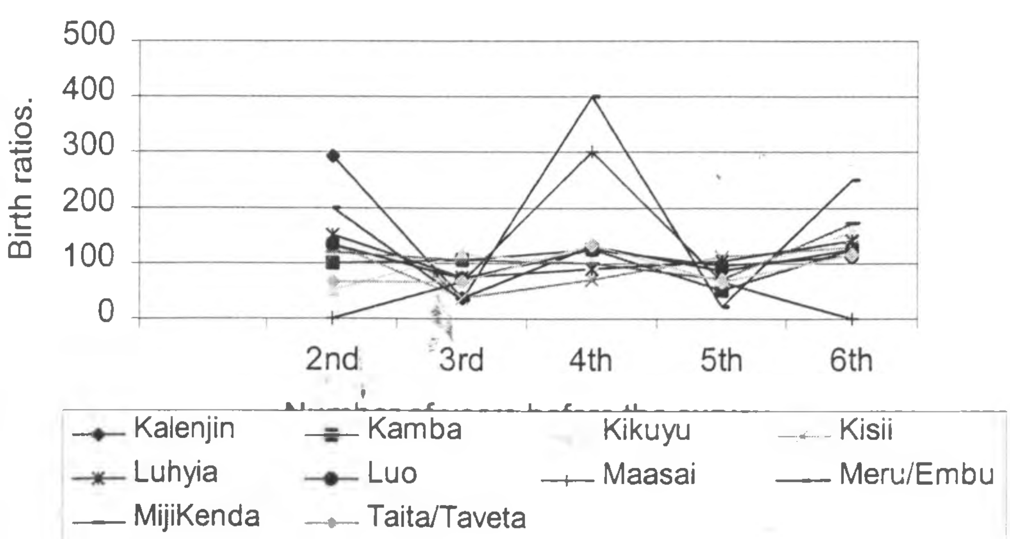


Chart 7: Birth ratios for the 2nd,3rd,4th,5th and 6th year before the sur living children by ethnicity of the mother,KDHS,1998.

Chart 8: Birth ratios for the 2nd,3rd,4th,5th and 6th year before the survey for dead children by ethnicity of the mother,KDHS 1998.



Birth ratios for the 2nd,3rd,4th,5th and 6th year before the start of the survey for living children by level of education of the mother.KDHS,1998

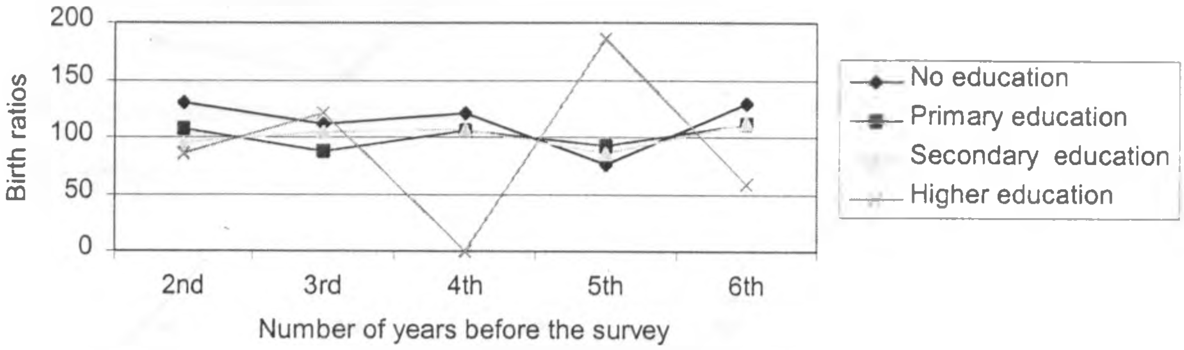


Chart 10: Birth ratios for the 2nd,3rd,4th,5th and 6th year before the start of the survey for dead children by education level of the mother.KDHS,1998