ESTIMATION OF ADULT MORTALITY IN KENYA USING INFORMATION ON ORPHANHOOD

BY

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

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To

My Father, Moses Mudaki
and my Mother, Erica Kamira

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ABSTRACT

There are various ways of constructing life table using indirect methods. One such method is using information of both child and adult mortality. In this thesis we have used the Trussell's method of estimating child mortality and Brass-Hill/Trussell-Hill method to estimate adult mortality based on orphanhood. Thus we have what is known as the Patched method of constructing life table.

It has been shown that this method is a good barometer for detecting under-reporting and over-reporting of child deaths. We have used the difference in the proportions of respondents aged 0-4 with mother alive and father alive, to measure the degree of adoption effect in variuos regions.

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CHAPTER I

BACKGROUND TO THE PROBLEM.

1.1 INTRODUCTION

A number of studies on child mortality have been made in the Population Studies and Research Institute. For example Kibet (1982) worked on mortality differentials in the forty one districts of kenya using the 1979 census data. Ronoh (1982) evaluated the different techniques for studying child mortality. He also looked at the methods of studying female adult mortality in Kenya. Nyamwange (1984) made a study of the child mortality of Nairobi Wards.

The Institute has now focussed attention to Adult mortality studies. Koyugi (1982) looked at the mortality and morbidity of Siaya District. With the introduction of the latest demorgraphic techniques known as the Generalised Stable Population Relation or the Age Specific Growth Rate technique, Nyokangi (1984) has studied the degree of completeness of death registration in Kenya. Nyokangi has also been able to construct life tables for Kenya using;

(i) Two censuses of 1969 and 1979 only,

(ii) The two censuses of 1969 and 1979 along with the data of the incomplete death registration. He managed to find out how many years one would live if a specific cause of death were eliminated. It has also been deduced that the parasitic and infectious diseases are a major cause of death in Kenya. Further, Kizito (1985) has also used the Age Specific Growth Rate technique to study the completeness of death registration and to construct life tables both at national and district levels in Kenya. While Nyokangi used an ordinary calculator, Kizito made computer programmes for the construction of life tables.

To continue with adult mortality studies, in this thesis, we have looked at the methods of studying parental orphanhood and we have also evaluated the adult mortality rates at national and district levels. The information on adult mortality thus obtained is then combined with that on child mortality to enable us to construct abridged life tables for Kenya.

1.2 STATEMENT OF THE PROBLEM:

The greatest problem that we have in developing countries, in particular, Kenya, is high adult mortality. This spreads through all adult ages. A substantial proportion of these adult deaths take place in families where children ar still very young, therefore causing high orphanhood situation The orphaned children are left without any support especially when both parents die. In most Kenyan families, the responsibility of caring for children is for both the father and the mother, therefore, the death of either of them causes instabbility in the family. Viewed from this standpoint, high adult mortality in Kenya is a problem that calls for a devoted study

It may be necessary now to define the word "orphan" a it is used in this context. The word orphan refers to a respondent whose mother is dead irrespective of the survivorship status of the father, it also refers to a respondent whose father is dead irrespective of the mother.

(i) From this kind of information, the number of respondents orphaned either by the death of the mother or of the father can be utilised in calculating the proportions not orphaned at each age group. Therefore, given the number of respondents orphaned, adult mortality rates can be calculated. This information therefore leads to an evaluation of the probability of dying of the adults in question. Knowledge of these probabilities also leads to a calculation of the life expectancies at each age group.

(ii) According to Blacker,[1] infomation on adult mortality in Africa is even scarcer than that on child mortality. The high level of adult mortality such as this prevailing in most of Africa indicates that an appreciable proportion of those individuals who survive the early years of chilhood die before they reach old age. Such deaths have a particular high social cost in terms of the break-up of families, the orphanhood of children and the loss of experienced and able members of the labour force.

(iii) In Kenya, some institutions have been established like the "Childrens' Homes" to cater for those children who are orphaned as well as those who are considered to have no parents. These institutions may need to know the number of children falling orphaned and at what rate, hence more of the childrens homes would be set up to take care of the orphaned children.

(iv) The earlier researchers, namely, Ronoh (1982), Koyugi (1982), Nyokangi (1984), and Kizito (1984) have analysed adult mortality in kenya which included all persons considered adult. Within the adult persons, there are those who are single, married with children and married but without children. The adult mortality estimates obtained by these researchers represent all adult persons irrespective of singleness, childlessness and marital status. In this study therefore the adult mortality rates obtained are representa--tive of the parents only or those adults who have had a child since the data utilized in their derivation is on the survival of the parents of the respondents.

1.3 SCOPE AND LIMITATION OF THE STUDY.

In estimating the adult mortality rates, the data on orphan-hood used is subject to certain errors:-

(i)A mother who has more than one child could be over-represented if all the children are asked about the survivor-ship status of their mother or father.This error could inflate the propotions of respondents with a surviving mother or father

(ii) Adults who are childless are not represented. The estimates obtained, therefore, cover only those adults with children. A limitation which is also observed is that orphanhood information obtained fron respondents at ages 0 to 14 years is not very reliable due to the adoption effect. This error could inflate the proportions with a surviving mother or father.

1.4 OBJECTIVES OF THE STUDY:

In this thesis, we aim at acheiving five main objectives.

The first objective, which is derived from the statement of the problem above, is to estimate the rates at which adults die. These rates are referred to as the conditional probabilities of of survival. The method used to calculate these conditional probabilities for both males and females is due to Brass and Hill. The second objective, which is also derived from the statement of the problem above, is to estimate the female adult mortality rates. The method used in this estimation is by Trussell and Hill. In this two objectives, the adult mortality rates are estimated both at national and district levels.

The third objective that is to be acheived in this study is that the proportions of persons not orphaned are adjusted using two techniques. These techniques are: the synthetic cohort (multiplicative model) and the Age Specific Growth Rate technique. The purpose of the adjustments is to eliminate the age patterns in mortality and fertility. The conditional probabilities of survival are then calculated as in the first and second objectives. The fourth objective is to utilise the adult mortality rates estimated above to construct abridged Life Tables for Kenya for both males and females.

The last objective is to estimate and compare the adoption effect in the forty one districts in Kenya by using the differences in proportions not orphaned. These proportions are obtained from the results of the first objective.

1.5 SIGNIFICANCE OF THE STUDY:

This study will enlighten us on the orphanhood situation in the country. Thus the government may know the rate at which children become orphaned and therefore through institutions like the childrens' Homes, it will develop ways and means of catering for the orphaned children.

The study will also help the government to come up with a proper policy of legalizing age at marriage. While late marriage has the effect of reducing marital fertility, it has the disadvantage of shortening the marriage duration for early adult mortality.

1.6 LITERATURE REVIEW:

The estimation of mortality in the developing regions of the world, namely, Africa, Latin America and Asia has had a common problem of lack of accurate and complete mortality data. By 1940, only a few countries in Africa, Latin America and Asia could supply suitable data for the estimation of mortality levels.[2] Due to the incompleteness and inaccuracy of the mortality data, demographers have developed methods of estimating mortality rates indirectly from the existing data, particularly those of adult mortality. In an attempt to overcome the problem of incompleteness of deaths registration, Brass[3] (1975) developed a method that adjusts for the under-reporting of deaths in the civil registration systems and other demographic enquiries. Along with Brass work, Preston and Hill[4] (1980) also developed techniques for estimating the completeness of death registration. With the introduction of the latest techniques of indirect estimation of mortality and fertility, one approach has been the collection of mortality data in censuses and surveys about the survival of parents and close relatives of the respondents. From these data, conventional measures of survivorship are estimated using models of demographic relationships.

Louis Henry[5] (1960) is among the earliest demographers who developed a means of estimating adult mortality indices from information about the survival of the parents of the respondents. He established that the mortality of the parents was a functional relationship of the proport--tions of the respondents with a surviving mother or father. Over the same period, Lotka[6] made a number of calculations relating adult mortality rates to orphanhood data.

Developing the ideas of Lotka and Henry, Brass and Hill[7] (1973) proposed a simpler technique for estimating adult mortality levels from information on the survival of parents of the respondents.

Orphanhood data collected by simple questions "Is your Mother alive ?" and "Is your Father alve ?" with the results tabulated by age group and sex of the respondents are thus a potentially valuable source of information for the analysis of adult mortality. These questions involve no dating or reference period and can be answered by a straight forward "Yes" or "No". Blacker[8] (1977) has recommended that these questions take up little room on the census schedule and that the results obtained are simple to code, punch and tabulate. BLacker, however, recognizes one major drawback in collecting information on the survival of parents from respondents. He notes that in Africa, the words "Father" and "Mother" are often used loosely to denote not only a person's biological parents but also foster parents or older relatives. Such persons may often refer to children as their sons and daughters when they are not infact their true offspring. This substitution of foster parents for true parents clearly leads to serious biases and errors. For example, these errors can inflate the proportions of persons not orphaned. Such errors can be eliminated by wording the questions in such a way as to make it clear that it refers to the true biological parents; suitable terms exist in most African languages.

A method for extracting usable life table survivorship probabilities from this source of data was therefore developed. As a result of the better estimates derived from this information, many countries in Africa have included these questions in their censuses and national demographic surveys. For instance, in kenya data on orphanhood was collected in the 1969 and 1979 censuses. In Chad and West Cameroon, the orphanhood type of questions were incorporated in the 1963 and 1964 demographic sample surveys. In Malawi and Tanzania mortality data on orphanhood was collected in the 1972 and 1973 demographic sample surveys. This inclusion of such data in many developing countries is an indication that the mortality rates obtained from them give a clearer picture of the mortality trends.

The techniques developed by Brass and Hill (1973) have been applied widely to orphanhood data in most African countries. Blacker (1977) worked out the adult survivorship probabilities using the information on orphanhood for Malawi and Chad. From the results he obtained, he concluded that data on survival of parents of the respondents yielded plaus--ible and internally consistent estimates of adult mortality for the two countries. Henin (1973)[9] has evaluated the adult mortality rates for Tanzania based on orphanhood data, using the Brass and Hill technique. The data he utilized in the study was derived from the Tanzania's National Demographic survey of 1973. Brass and Hill's technique was also applied on Uganda's 1969 census by Brass himself and the ultimate justification of the method was that very plausible mortality estimates of males and females were obtained. Recently, Timaeus[10] (1984) has estimated the adult mortality rates for Lesotho by application of this technique. The information on orphanhood that he utilized in the study was extracted from the Lesotho Fertilty Survey of 1977. Timaeus concluded that the indirect methods for estimating adult mortality from orphanhood data perfomed well in Lesotho. He considered it unsurprising, as the more detailed information required to measure mortality directly had been collected successfully and this provided yet a further confirmation of the basic soundness of the approach.

Improvements have been made on the Brass and Hill method of estimating adult mortality. All along it has been assumed that mortality and fertility schedules were constant. This is not true especially for developing countries where mortality is declining and fertility is high and fluctuating. In a paper published in 1981, Zlotnik and Hill[11] presented procedures whereby indirect methods of demographic estimation could be applied to Synthetic or Hypothetical cohorts that are constructed using data from two surveys which have been conducted five or ten years apart. (U.N Manual X, 1983). The value of the synthetic cohort methods is that they avoid the complexities introduced into the analysis and interpret--ation by the changing mortality and fertility. Zlotnik and Hill applied the procedure to maternal orphanhood data collected in the 1972 and 1976 demographic survey of peru. From their results, they conclude that the female mortality levels were implausibly low due to two reasons:

(i) that the error could stem from respondents exaggerating their ages and thereby inflating the proportions of them with living mothers.

(ii) possibly respondents reporting their mother as living when in fact they are dead.

An alternative approach to adjusting the proportions of persons not orphaned was introduced by Preston[12] (1983) through the application of the Age Specific Growth Rate technique.

This technique adjusts the observed measures into period measures of orphanhood and it removes the impact of past trends as reflected by the growth rates of the proportions not orphaned. Preston's method uses intersurvey changes in orphanhood experienced by each age group to estimate period measures, while Zlotnik and Hill's method uses the changes experienced by each age cohort for the same purpose.

Preston and Chen[13] (1984) have applied the age specific growth rate technique to some Latin American countries. Timaeus[14] (1985) has also applied both Synthetic and Age Specific Growth Rate technique to some developing countries. He also introduced the cumulative age technique which reduces the impact of age mis-reporting. This techniq also removes the effect of all errors which do not result in the net transfer of respondents across each age boundry. By cumulating both the total population and the population with a surviving mother or father downwards, it is possible to calculate the proportion of the population over each age group with a surviving mother or father.

Some analysis of the sensitivity of the models has been done by Palloni[15] (1984). The assumptions and errors that are looked at by Palloni are: (i) constancy of mortal in the past, (ii) absence of adoption effect, (iii) zero effect of selectivity produced by the interrelations between mother's reproductive history, mothers mortality and child mortality.

Along with the analysis of the sensitivity of the techniques, approximate formulae for the errors involved were made and quantitative evaluations of the errors was done. Palloni points out that other errors may also distort the estimates of adult mortality. This include mis-statement of ages, under-enumeration and mis-identification of the mortality models.

The estimation of life table survivorship probabilities from orphanhood data provides us with adult mortality levels only. It then remains for us to combine this adult mortality levels with those of child mortality. This will enable us to draw an abridged life table. The technique of patching child mortality and adult mortality is due to William Brass.

There are two procedures for patching child mortality and adult mortality. These are: (i) Use of the logit system and (ii) Use of the Coale-Demeny model life tables.
In the logit transformtion system, two parameters, a and b are estimated iteratively to obtain better estimates. These parameters define a fitted function I(x) in the logit system and are generated by a selected standard life table.

Ronoh (1982) applied the logit life table system to female adult mortality levels in each of the provinces in Kenya. He then patched this adult mortality levels with the child mortality levels and constructed abridged life tables for females. Koyugi (1982) has also applied this technique to both male and female adult mortality for Siaya district. He then patched these estimates with those of child mortality in the district. Finally, he constructed abridged life tables for both male and female for Siaya district.

A brief description of the logit life table system is now presented. Two parameters, one to determine the general level of mortality and the other to determine the rate at which mortality changes with age are required to combine child and adult mortality. If we denote the logit of observed I(x) values with Y(x) and denote the selected standard life table I(x) values by V(x), then at any given age x we have the relationship:

$$Y(x) = a + b*V(x) \quad \ldots \quad \ldots \quad (1.1)$$

where a and b are the parameters.

The logit of I(x) is defined as: (Brass, 1971)

$$\text{logit}[I(x)] = \frac{1}{2} \log\left[\frac{I(x)}{1-I(x)}\right] \quad \ldots \quad (1.2)$$

When combining child and adult mortality, it is necessary to have a single value representing the childhood mortality rates. It is preferred to take q(2) or its complement, I(2), as a representative value for two reasons: (i) q(2) unlike q(1) is based on reports from a substantial number of women, this reduces the effect of sampling error. (ii) q(2) unlike the rest of the other estimates is based on reports from women whose childbearing experience is relatively recent, this also reduces the error of omission of dead children due to recall relapse.

To obtain a graduated or smoothed value of I(2), the mean of the differences between the logits of the observed I(x) values at ages 2, 3 and 5 and the corresponding logits of standard life table values is subtracted from the logit of the standard life table I(2) to give the logit of the graduated I(2). The value of the graduated I(2) is then obtained. Ronoh (1982) utilized the "African Standard" life table which was generated by Brass. (Brass et al; 1968)

Now, substituting the graduated I(2) value into equation (1.1) we get;

$$Y(2) = a + b*V(2) \qquad \ldots (1.3)$$

and if we eliminate "a" from equation (1.1) and (1.3) we get an equation in terms of "b".

that is

$$b = \frac{(Y(x) - Y(2))}{(V(x) - V(2))} \qquad \ldots (1.4)$$

In the equation (1.4) above the only unknown is Y(x) which can be estimated from adult survivorship ratios. We now require a knowledge of I(25) for females and I(35) for males. But I(25) and I(35) each depends on "b" which we are looking for. In each case then an iterative process is required to reach a reliable solution. A first approximation to I(25) in the case of female mortality is obtained by interpolation using the Coale and Demeny model life tables. The process is repeated three or four times to give better converging estimates of "a" and "b". The final value of I(25) was then multiplied by the conditional probabilities of survival I(y)/I(25) to obtain the rest of the survivorship probabilities. These probabilities are now used to construct an abridged life table.

In this thesis we have used the regional Coale and Demeny model life tables to patch child and adult mortality estimates. The child mortality estimates utilized in this study were extracted from a study conducted by Kichamu (1986). Life tables for kenya were then constructed both at national and district levels.

1.7 THEORETICAL FRAMEWORK

In demographic estimation most of the parameters are based on data collected by census and by vital registration system. When this system is coupled with censuses periodically, the calculation of demographic parameters becomes possible. If both vital registration and censuses were perfect, then demographic parameters would be calculated directly from the reported data and there would be no need for indirect estimaion.

In many developing countries today, either the data collection systems do not exist or their performance is so poor that the mortality rates obtained from them directly are are severely flawed. In Kenya, it is quite difficult to estimate adult mortality rates directly from the vital registration systems. Demographers, have developed a set of techniques that allow an indirect estimation of these demographic parameters and in particular adult mortality rates.

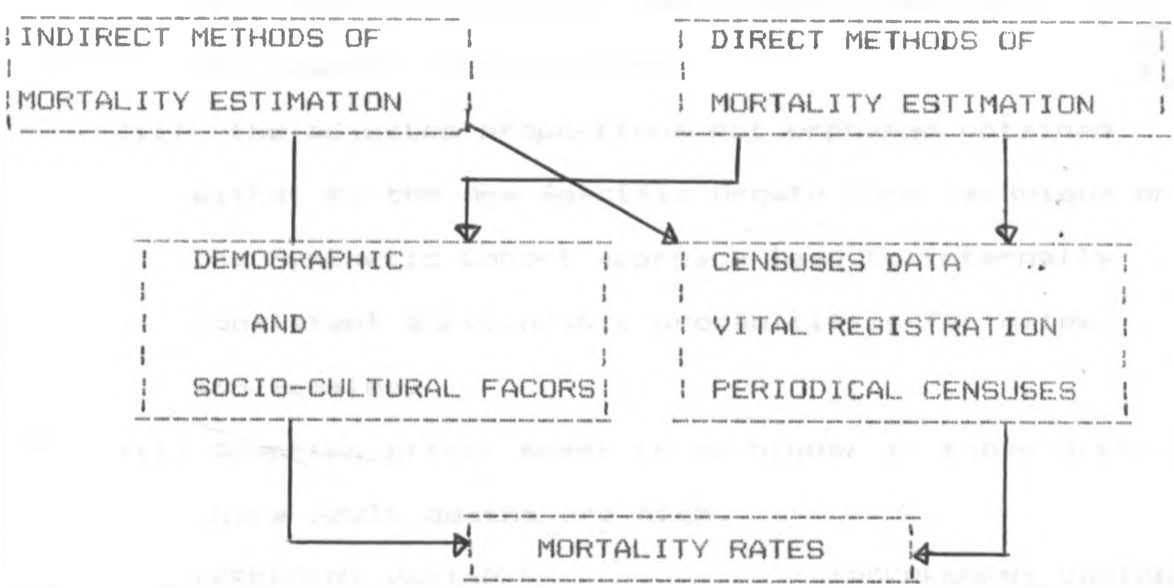
When estimating adult mortality rates there are two categories of factors which are taken into account, these are: (i) the demographic factors, (ii) the socio-cultural factors. Within these broad categories of factors there are intermediate variables. The purpose of this thesis is not to test these factors.

A conceptual statement that may be formulated from these factors is that:-

> "Adult mortality rates estimated by either direct or indirect methods are likely to be affected, positively or negatively by demographic, socio-cultural factors of any given society."

As already pointed out above, the purpose of this study is not to test thiese factors, but it is rather to evaluate the adult mortality rates by indirect methods of estimation using the information on survival of the respondents' parents.

A conceptual framework would be as follows:-



1.7.1 CONCEPTUAL HYPOTHESIS:

A conceptual hypothesis that may be formulated from the above framework is that:-

"The adult mortality estimates obtained by indirect methods of analysis are reasonably approximate to those obtained by direct methods of estimation."

1.7.2 OPERATIONAL HYPOTHESES:

The operational hypotheses considered in this study are:-

(i) the adult deaths calculated by the Brass and Hill method are reasonably approximate to those calculated by the Trussell and Hill, for the case of female deaths.

(ii) the adjusted proportions not orphaned obtained either by the Age Specific Growth Rate technique or the Synthetic Cohort approach lead to internally consistent survivorship probabilities for males and females.

(ii) Adoption effect seems to be higher in those districts where adult deaths are high.

DEPENDENT VARIABLES	INDEPENDENT VARIABLES
(i) Adult deaths.	(i) Brass & Hill method
(ii) Adjusted proportions of persons not orphaned.	(ii) Synthetic method &
	(iii) Age Specific Growth Rate Technique

CHAPTER II

DATA COLLECTION AND METHODOLOGY

2.1 Data collection.

In this chapter, our main objective is to show the methods used to calculate conditional probabilities of survival for adults. Using this information along with the information on child mortality we shall also show the procedure for constructing life tables.

However, before showing these procedures we shall first explain briefly how data is generally collected for this type of work, and in particular the type of data utilized in this study.

To calculate proportions not orphaned we require the number of respondents with mother alive (or father) alive along with the total number of respondents classified by five-year age groups for each case. To calculate mean age at maternity we require the number of births that occurred in the last twelve months also classified by five-year age groups of the mother.

However, to calculate the mean age at paternity we need the median age of currently married men, the median age of currently married women and the mean age at maternity. To calculate the median age at marriage for each sex we require data on marital status for males and females separatetly.

From censuses and surveys, relevant type of questions for this study are:-

(i) How old are you ?

(ii) Where were you born ?

(iii) Is your father alive ?

(iv) Is your mother alive ?

(v) Have you had a child in the last twevle months ?

In this thesis we have utilized the relevant data from the 1969 and 1979 censuses obtained from the ministry of Economic Planning and National Development (CBS). Possible errors in these data are age mis-reporting and adopting effect.

2.2 METHODOLOGY :

Two methods for calculating conditional probabilities of survival are given below. The first method of this adult mortality estimation is due to Brass and Hill (1973) while the other is by Trussel and Hill (1977).

2.2.1 THE BRASS - HILL METHOD:

In this method the conditional probability of a mother surviving from age 25 to age 25+n is given by the formulae:-

$$\frac{I(25+n)}{I(25)} = W(n)S(n-5) + [1-W(n)]S(n) \quad \ldots \quad (2.1)$$

where

$S(n)$ = the proportion of respondents aged between n and $n+4$

W(n) = a weighting factor employed to make allowance for the typical age patterns of fertility and mortality.

In the table 2(a) given below the values of W(n) are with respect to the mean age M at maternity. In most cases however this calculated mean age is not an integer. As such a linear interpolation is necessary. The interpolation formula is given by:

$$@ = \frac{\text{Upper value} - \text{Calculated value}}{\text{Upper value} - \text{Lower value}} \quad \ldots \quad (2.2a)$$

Since the upper value and lower value of the mean age at maternity are two consecutive integers then the denominator of the interpolated formula is 1. Thus, formula (2.2a) becomes

$$@ = \text{Upper value} - \text{Calculated value} \quad \ldots \quad (2.2b)$$

Hence the interpolated weighting factor is

$$W^*(n) = @ * [\text{Lower value } W(n)] + (1-@) * [\text{Upper value } W(n)] \quad \ldots \quad (2.3)$$

So now the Brass and Hill formula is

$$\frac{I(25+n)}{I(25)} = W^*(n)S(n-5) + [1-W^*(n)]S(n) \quad \ldots \quad (2.4)$$

TABLE 2(a)
WEIGHTING FACTORS, W(n), FOR CONVERSION OF PROPORTIONS OF RESPONDENTS WITH MOTHER ALIVE INTO SURVIVORSHIP PROBABILITIES FOR FEMALES:

Age n	22	23	24	25	26	27	28	29	30
10	.420	.470	.515	.557	.596	.634	.674	.717	.758
15	.418	.480	.556	.618	.678	.738	.800	.863	1.924
20	.404	.500	.590	.673	.756	.838	.921	1.004	1.085
25	.366	.485	.598	.704	.809	.913	1.016	1.118	1.218
30	.303	.445	.580	.708	.834	.957	1.080	1.203	1.323
35	.241	.401	.554	.701	.844	.986	1.128	1.270	1.412
40	.125	.299	.467	.630	.791	.950	1.111	1.274	1.442
45	.007	.186	.361	.535	.708	.884	1.063	1.250	1.447
50	-.190	-.017	.158	.334	.514	.699	.890	1.095	1.318
55	-.368	-.220	-.059	.101	.270	.456	.645	.856	1.083
60	.466	-.352	-.217	-.084	.053	.220	.378	.579	.800

Source: United Nations, Manual X, (1983). Indirect Techniques for Demographic Estimation. pp. 103.

The weighting factors W(n), for each n are used in the interpolation formula (2.3) above.

The mean age M is obtained from the formula

$$M = \frac{a(1)*B(1) + ..+ a(i)*B(i)+ ..+ a(7)*B(7)}{B(1) + ..+ B(i) +..+ B(7)} = \frac{\sum a(i)\cdot B(i)}{\sum B(i)}$$

where i = 1, 2, ..., 7 are the 7 age groups from 15-19 to 45-49; while a(i)'s are the mid-values of these age groups. The B(i)'s are the corresponding births in the last twelve months preceding the census.

In estimatng conditional probabilities for males, the same principles are followed as those for females with a few changes. The value 25 taken as the base age for females is replaced by 32.5 or 37.5 to allow for the fact that men are usually older than women at the birth of their children.

Since the information on the age of fathers at the at the birth of their children is not available in the censuses, Brass developed a procedure of estimating the mean age at paternity by the formula

$$M(male) = M(female) + Md(male) - Md(female) \quad ... \quad (2.5)$$

where Md stands for median and M is the mean age at maternity (paternity). Using 32.5 years as the base age, the coditional probability for males is given by the formula

$$\frac{I(35+n)}{I(32.5)} = W(n)S(n-5) + [1-W(n)]S(n) \quad ... \quad (2.6)$$

For 37.5 as the base age we use the formula

$$\frac{I(40+n)}{I(37.5)} = W(n)S(n-5) + [1-W(n)]S(n) \quad \ldots \quad (2.7)$$

Tables 2(b) and 2(c) below give the relevant values of W(n) with respect to the mean age at paternity.

TABLE 2(b)
WEIGHTING FACTORS, W(n), FOR CONVERSION OF PROPORTIONS OF RESPONDENTS WITH MOTHER ALIVE INTO SURVIVORSHIP PROBABILITIES FOR MALES:
(FROM AGE 32.5 YEARS)

Age n	28	29	30	31	32	33	34	35	36
10	.192	.258	.322	.388	.455	.521	.587	.650	.714
15	.151	.243	.336	.429	.522	.613	.702	.790	.877
20	.043	.166	.287	.406	.523	.638	.750	.861	.969
25	-.093	.051	.194	.335	.474	.611	.744	.877	1.007
30	-.327	-.161	.001	.162	.319	.475	.627	.779	.931
35	-.640	-.408	-.211	-.047	.109	.269	.438	.610	.782
40	-.856	-.714	-.554	-.379	-.203	-.034	.133	.303	.480
45	-1.120	-.963	-.806	-.651	-.495	-.340	-.183	-.024	.141
50	-1.162	-1.03	-.903	-.776	-.651	-.524	-.396	-.264	-.128
55	-1.040	-.943	-.850	-.758	-.667	-.576	-.486	-.397	-.304

Source: United Nations, Manual X, (1983).
Indirect Techniques for Demographic Estimation.
pp. 103.

The weighting factors W(n), for each n are used in the interpolation formula (2.6) above.

TABLE 2(c)
WEIGHTING FACTORS, W(n), FOR CONVERSION OF PROPORTIONS OF RESPONDENTS WITH FATHER ALIVE INTO SURVIVORSHIP PROBABILITIES FOR MALES:

(37.5 years)

Age n	36	37	38	39	40	41	42	43	44
10	.384	.460	.537	.613	.687	.758	.827	.897	.969
15	.378	.484	.588	.690	.790	.888	.984	1.079	1.174
20	.324	.455	.582	.708	.833	.954	1.075	1.195	1.318
25	.164	.315	.465	.613	.613	.759	.904	1.051	1.197
30	-.043	.122	.286	.450	.614	.778	.944	1.116	1.295
35	-.359	-.183	-.015	.152	.321	.496	.677	.863	1.062
40	-.624	-.473	-.316	-.157	.003	.168	.342	.529	.722
45	-.757	-.631	-.503	-.372	-.237	-.099	.047	.208	.393
50	-.742	-.650	-.559	-.471	-.377	-.280	-.182	-.069	.063
55	-.559	-.541	-.485	-.425	-.366	-.308	-.238	-.149	-.049

Source: United Nations, Manual X, (1983). Indirect Techniques for Demographic Estimation. pp. 103.

The weighting factors W(n), for each n are used in the interpolation formula (2.6) above.

2.2.2 TRUSSELL - HILL METHOD:

This method is based on a regression equation

$$\frac{I(25+n)}{I(25)} = a(n) + b(n)M + c(n)S(n-5) \quad \ldots \quad (2.8)$$

with the usual notations,

where a(n) b(n) and c(n) are coefficients determined by simulating several fertility and mortalty schedules generated by the logit system and the Coale - Demeny models.

Unfortunately this technique caters only for respondents with mother alive. No regression coefficients have been developed to estimate male survivorship. Table 2(d) gives the values of the coefficients for a(n), b(n) and c(n) for n = 20 upto 50 in steps of five.

TABLE 2(d)
COEFFICIENTS FOR ESTIMATION OF FEMALE SURVIVORSHIP PROBABILITIES FROM AGE 25 FROM PROPORTIONS WITH A SURVIVING MOTHER.

AGE	COEFFICIENTS		
n (1)	a(n) (2)	b(n) (3)	c(n) (4)
20	-0.1798	0.00476	1.0505
25	-0.2267	0.00737	1.0291
30	-0.3108	0.01072	1.0287
35	-0.4259	0.01473	1.0473
40	-0.5566	0.01903	1.0818
45	-0.6676	0.02256	1.1228
50	-0.6981	0.02344	1.1454

Estmation Equation:
I(25+n)/I(25) = a(n) + b(n)*M + c(n)*S(n-5)

Source: United Nations, Manual X, (1983). Indirect Techniques for Demographic Estimation. pp. 107

2.3 TECHNIQUES FOR ADJUSTING PROPORTIONS NOT ORPHANED

Most of the demographic indirect estimation methods have been developed based on constant vital rates. However, in most situations this is not so. To allow for their changing mortality and fertility, adjustments on the demographic parameters must be made before the formulae based on stability are uesd. Of late two techniques have been developed for such adjustments namely the Synthetic or Hypothetical approach and the Age Specific Growth Rate Technique which are described below.

2.3.1 SYNTHETIC APPROACH:

In this technique two sets of data which are either 5-years or 10-years apart are required to synthesize a third set as follows,

Let $S(i,1)$ be the proportion of respondents not orphaned from the ith age group of the first census.

let $S(i,2)$ be the proportion of the respondents not orphaned from the ith age group of the second census.

Then for the censuses which are five years apart, $S(i,3)$, which is the adjusted proportion not orphaned is given by,

$$S(1,3) = S(1,2)$$

and

$$S(i,3) = \frac{S(i,2)}{S(i,1)} * S(i-1,3) \quad \text{for} \quad i=2,3,... \quad ..(2.9)$$

For elaboration we have the following table 2(e) below,

TABLE 2(e)
SYNTHETIC APPROACH FOR THE CENSUSES 5-YEARS APART:

AGE GROUP	FIRST CENSUS (1)	SECOND CENSUS (2)	SYNTHETIC COHORT (3)
5-9	S(1,1)	S(1,2)	S(1,3)
10-14	S(2,1)	S(2,2)	S(2,3)
15-19	S(3,1)	S(3,2)	S(3,3)
20-24	S(4,1)	S(4,2)	S(4,3)
25-29	S(5,1)	S(5,2)	S(5,3)
30-34	S(6,1)	S(6,2)	S(6,3)
35-39	S(7,1)	S(7,2)	S(7,3)
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.

The values in column (4), that is, the proportions not orphaned for the synthetic cohort, S(1), S(2), S(3), ..., are calculated as follows:

$$S(1,3) = S(1,2)$$

$$S(2,3) = \frac{S(2,2)}{S(1,1)} * S(1,3)$$

$$S(3,3) = \frac{S(3,2)}{S(2,1)} * S(2,3) \quad \text{(i.e. see Formula 2.9)}$$

For the censuses 10 years apart we have table 2(f) for illustration. The values in column (3), in table 2(f) below that is, the proportions not orphaned for synthetic cohort, S(1,3), S(2,3), S(3,3), ... are calculated as follows:-

$$S(1,3) = S(1,2)$$

$$S(2,3) = S(2,2)$$

$$S(3,3) = \frac{S(3,2)}{S(1,1)} * S(1,3)$$

Thus,

$$S(i,3) = \frac{S(i,2)}{S(i-2,1)} * S(i-2,3) \qquad \ldots \qquad (2.10)$$

$$\text{for} \quad i = 3,4,5,\ldots$$

TABLE 2(f)
SYNTHETIC APPROACH FOR THE CENSUSES 10-YEARS APART:

AGE GROUP	FIRST CENSUS (1)	SECOND CENSUS (2)	SYNTHETIC COHORT (3)
5-9	S(1,1)	S(1,2)	S(1,3)
10-14	S(2,1)	S(2,2)	S(2,3)
15-19	S(3,1)	S(3,2)	S(3,3)
20-24	S(4,1)	S(4,2)	S(4,3)
25-29	S(5,1)	S(5,2)	S(5,3)
30-34	S(6,1)	S(6,2)	S(6,3)
35-39	S(7,1)	S(7,2)	S(7,3)
.	.	.	.
.	.	.	.
.	.	.	.

2.3.2 THE AGE SPECIFIC GROWTH RATE TECHNIQUE:

In this technique we also need two sets of data to obtain the adjusted proportions. However, this time we are not restricted for the censuses or surveys to be 5 years or 10 years apart. The two consecutive censuses can be any number of years apart. This is one advantage of this technique over the Synthetic Approach. The model of the age speific growth rate technique to adjust for the proportions of persons not orphaned is now derived below.

From the stable population theory the proportion of persons at age 'a' is given by

$$c(a) = b*p(a)*\exp(-ra) \quad \ldots \quad (2.11)$$

where,

'b' is the birth rate, 'r' is the growth rate and

'p(a)' is the probability of surviving from birth to age 'a'.

If N(a) is the actual number of persons at age 'a' and N is the total population size, then tha above formula (2.11) can be written as:

$$\frac{N(a)}{N} = \frac{N(o)}{N} * p(a)*\exp(-ra)$$

which implies,

$$N(a) = N(o)p(a)\exp(-ra) \quad \ldots \quad (2.12)$$

since N(o) is the total number of births.

For the case where r is a function of age this formula (2.12) is modified to

$$N(a) = N(o)p(a)\exp\left(-\int_0^a r(y)dy\right) \quad \ldots \quad (2.13)$$

But

$$p(a) = \exp(-\int_0^a u(x)dx) \quad \ldots \quad (2.14)$$

which is obtain by integrating

$$u(x) = -\frac{1}{l(x)}\frac{dl}{dx} = -\frac{d}{dx}\log l(x) \quad \ldots \quad (2.15)$$

between ages o and 'a'.

Therefore (2.13) becomes,

$$N(a) = N(o)\exp(-\int_0^a [r(x)+u(x)]dx) \quad \ldots \quad (2.16)$$

If we are studying a particular population, in this case the non-orphaned, the formula (2.16) is modified to:

$$No(a) = No(o)\exp(-\int_0^a [ro(x)+uo(x)+k(x)]dx) \quad \ldots \quad (2.17)$$

where k(x) is the risk of being orphaned at age x.

No(a) is the number of persons not orphaned at age 'a'.

ro(x) and uo(x) are the age specific growth rate and age specific mortality rate respectively.

Hence the proportion of persons not orphaned at age 'a' is given by;

$$\Pi(a) = \frac{No(a)}{N(a)} = \frac{No(o)\exp(-\int_0^a [ro(x)+uo(x)+k(x)]dx)}{N(o)\exp(-\int_0^a [r(x)+u(x)]dx)}$$

this implies,

$$\Pi(a) = \Pi(o)\exp(-\int_0^a [ro(x)-r(x)]dx - \int_0^a [uo(x)-u(x)]dx - \int_0^a k(x)dx) \quad \ldots (2.18)$$

At birth every child has a mother therefore, $No(o) = N(o)$, which implies that $\Pi(o)=1$. It is however not always the case that every child has a father at birth. So $\Pi(0)$ is slightly less than one. However, for computational purposes we shall assume that $\Pi(o)=1$ for both cases. Therefore,

$$\Pi(a) = \exp\left(-\int_0^a [ro(x)-r(x)]dx-\int_0^a [uo(x)-u(x)]dx-\int_0^a k(x)dx\right) \quad .. \quad (2.19)$$

Also assuming that,

$$uo(x) = u(x)$$

then we have

$$\Pi(a) = \exp\left(-\int_0^a [ro(x)-r(x)]dx - \int_0^a k(x)dx\right) \quad ... \quad (2.20)$$

Let $$P^m(a) = \exp\left(-\int_0^a k(x)dx\right)$$

which is the probability that a mother would survive 'a' years from the birth of a child.

Re-arranging the formula at (2.20), we get

$$P^m(a) = \Pi(a) \exp\left(\int_0^a [ro(x)-r(x)]dx\right)$$

Therefore in the five year age groups we have the formula,

$$\int_x^{x+5} P^m(a)\,da = \int_x^{x+5} \Pi(a) \exp\left(\int_0^a [ro(x)-r(x)]dx\right)da \quad (2.21)$$

That is,

$$ {}_5P_x^m(a) = \int_x^{x+5} \Pi(a) \exp\left(\int_0^{x+2.5} [ro(x)-r(x)]dx\right) da $$

$$ = \left[\exp\left(\int_0^{x+2.5} [ro(x)-r(x)]dx\right)\right] \int_x^{x+5} \Pi(a)da $$

$$ = {}_5\Pi_x \exp\left(\int_x^{x+2.5} [ro(x)-r(x)]dx\right) \qquad ..(2.22) $$

Let

$$ Z(x) = ro(x) - r(x) $$

Therefore,

$$ {}_5P_x^m = {}_5\Pi_x \exp\left(\int_0^{x+2.5} Z(x)dx\right) $$

$$ = {}_5\Pi_x \exp\left[\int_0^5 Z(x)dx + \int_5^{10} Z(x)dx + \ldots + \int_{x-5}^{x} Z(x)dx + \int_x^{x+2.5} Z(x)dx\right] $$

That is,

$$ {}_5P_x^m = {}_5\Pi_x \exp[5({}_5Z_0 + {}_5Z_5 + \ldots + {}_5Z_{x-5}) + 2.5({}_5Z_x)] \qquad ..(2.23) $$

Denote the expression in the square bracket from the formula (2.23) by ${}_5R_x$. That is,

$$ {}_5R_x = 2.5({}_5Z_x) + 5({}_5Z_0 + {}_5Z_5 + \ldots + {}_5Z_{x-5}) \qquad \ldots (2.24a) $$

Thus, we have the following arrangement:

$$\left.\begin{aligned}
{}_5R_0 &= 2.5\;{}_5Z_0 + 5[0] \\
{}_5R_5 &= 2.5\;{}_5Z_5 + 5[\;{}_5Z_0\;] \\
{}_5R_{10} &= 2.5\;{}_5Z_{10} + 5[\;{}_5Z_0 + {}_5Z_5\;] \\
{}_5R_{15} &= 2.5\;{}_5Z_{15} + 5[\;{}_5Z_0 + {}_5Z_5 + {}_5Z_{10}\;]
\end{aligned}\right\} \quad . \quad (2.24b)$$

e.t.c

The values in the square brackets in the expression (2.24b) have been denoted by "cum" in the foregoing tables. We should note that the difference in growth rate between the total population and that not orphaned for age 'x' is:

$${}_5Z_x = {}_5r^o_x - {}_5r_x$$

$$= \frac{1}{t2-t1} * \mathrm{Log}\left[\frac{{}_5N(2)^o_x}{{}_5N(1)^o_x}\right] - \frac{1}{t2-t1} * \mathrm{Log}\left[\frac{{}_5N(2)_x}{{}_5N(1)_x}\right]$$

$$= \frac{1}{t2-t1} * \mathrm{Log}\left(\frac{{}_5N(2)^o_x}{{}_5N(2)_x}\right) * \left(\frac{{}_5N(1)_x}{{}_5N(1)^o_x}\right)$$

$$= \frac{1}{t2-t1} * \mathrm{Log}\left(\frac{{}_5N(2)^o_x}{{}_5N(2)_x}\right) * \left(\frac{1}{{}_5N(1)^o_x / {}_5N(1)_x}\right)$$

$$ {}_{5}Z_{x} = \frac{1}{t2-t1} * \mathrm{Log}\left\{\frac{\text{Proportion not-orphaned in census 2}}{\text{Proportion not-orphaned in census 1}}\right\} \quad .. (2.25)$$

where 1 and 2 refer to the first and second censuses respectively. The time the populations were taken are denoted by t1 and t2, while ${}_{5}N^{o}_{x}(1)$ and ${}_{5}N^{o}_{x}(2)$ refer to the population not orphaned respectively in the five-year age groups.

In a summary to calculate the adjusted proportions not orphaned by the age specific growth rate technique the following steps are followed:

Step 1:

For each age group calculate the proportions not orphaned by dividing the number of persons not orphaned by the corresponding total number of persons.

Step 2:

Calculate the mean of the proportions not orphaned for each age group of the two censuses. This mean could be arithmetic or geometric, denoted by ${}_{5}\Pi_{x}$.

Step 3:

For each age group calculate the difference in growth rate, between the number of persons not orphaned and the total number of persons for that age group using the formula at (2.25) above. That is,

$$ {}_{5}Z_{x} = \frac{1}{t2-t1} * \mathrm{Log}\left\{\frac{\text{Proportion not-orphaned in census 2}}{\text{Proportion not-orphaned in census 1}}\right\}$$

Where $t1$ and $t2$ are the times when census 1 census 2 were taken respectively.

Step 4:

Cumulate the difference in the growth rate $_5Z_x$ obtained in step 3 for each age group. For the first age group put the value zero, for the second age group the value is $_5Z_0$, and for the third put $_5Z_0 + {}_5Z_5$, and for the fourth put $_5Z_0 + {}_5Z_5 + {}_5Z_{10}$, and so on.

Step 5:

Calculate the exponential of $_5R_x$ which is obtained by the formula:

$$\text{Exp } {}_5R_x = \text{Exp}[\, 2.5\ {}_5Z_x + 5 * \text{"Cum"}] \quad .. (2.26)$$

where "cum" is the cumulated values for each age group as explained in step 4 above.

Step 6:

At last the adjusted proportion is obtained by multiplying $_5\pi_x$ calculated in step 2 by the Exponential of $_5R_x$ calculated in step 5.

2.4 LIFE TABLE CONSTRUCTION BY PATCHING METHOD:

In this section we wish to show how to derive a life table from the estimates of child and adult mortality. To estimate child mortality we shall use the coale-trussell technique which requires the information on children ever born (CEB) and children surviving (CS) or children dead (CD) classified by age of mother. The female population (FPOP) classified by five year age groups has also to be known.

The probability of dying at age x is given by the formula:

$$q(x) = K(i)D(i) \quad .. (2.27)$$

for x = 1,2,3,5,10,15 and 20

and i = 1,2,3,4,5,6 and 7 which represents the age groups 15-19, 20-24,..., 45-49.

$$K(i) = a(i) + b(i)P(1)/P(2) + c(i)P(2)/P(3) \quad .. (2.28)$$

where a(i), b(i) and c(i) are Trussell's coefficients for estimating child mortality.

P(i) is the parity for age group i while D(i) is the proportion of children dead for the age group i.

That is,

$$P(i) = \frac{(CEB)}{(FPOP)} \text{ for age group } i \quad .. (2.29)$$

and

$$D(i) = \frac{(CD)}{(CEB)} \text{ for age group } i \quad .. (2.30)$$

We should note that the probability of dying q(x) here is for both sexes. To obtain the q(x) for female or male we used the sex ratio of 105 males per 100 females. Thus, the q(x) for females is given by :

q(x) for females = q(x) both sexes divided by 1.05, while q(x) for males is obtained by multiplying 1.05 by the q(x) for both sexes.

For each sex we estimate the mortality level from Coale-Demeny life table using l(2), l(3) and l(5) calculated from q(x) above. To estimate the mortality level, interpolation is applied. Again by interpolation, we estimate l(x) for x = 1, 2, 3, ... upto 30 for females and upto 40 for males.

To calculate adult mortality based on orphanhood method, we use the conditional probabilities which are obtained as shown in section 2.2 using the Brass and Hill method. Having obtained the conditional probabilities of of survival from age 25 for females and from age 35 for males, i.e., l(25+n)/l(25) for females and l(35+n)/l(32.5) for males, we again use the Coale-Demeny life table for conditional probabilities to estimate the adult mortality levels. We take the average adult mortality level which are now used to obtain the probabilities of survival from birth. These values are again obtained from the Coale-Demeny life table by interpola-tion (using the unconditional probabilities).

Finally we combine the values of l(x) from child mortality estimates and those from adult mortality estimates.

Thus, for females, we take the values of l(x), from x = 1,2,3,5.10,15,...., upto 30. Then from 35 onwards we take the values from the adult mortality estimates. In the case of males we take the values of l(x) from x = 1,2,3,5,10,15,...., upto x = 40. Then from 45 onwards we take values of l(x) from the adult mortality estimates. Once we have the values of l(x) the other life table functions can be obtained using the appropriate formulae relating them.

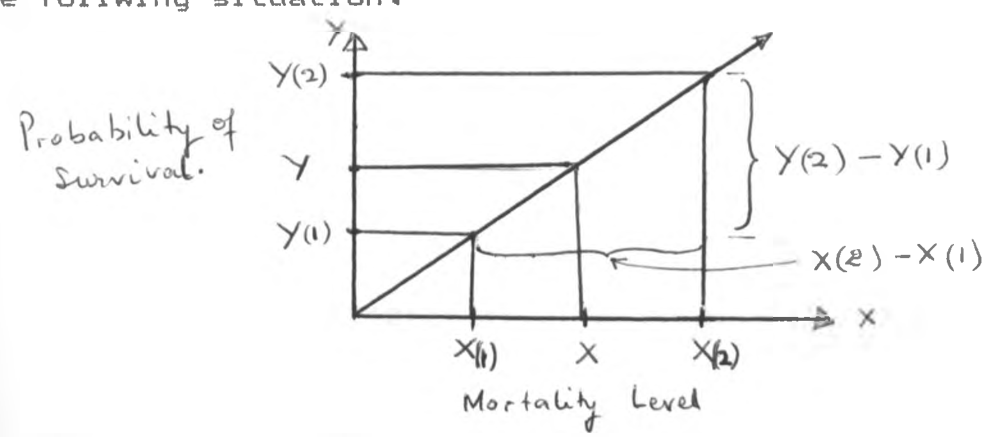
2.5 DERIVATION OF LINEAR INTERPOLATION:

In this study a lot of linear interpolation is used. It is therefore worthwhile to derive the formulae used.

Let X(1) be the lower mortality level and Y(1) be the corresponding probability of survival.

Further let X(2) be the upper mortality level and Y(2) its corresponding probability of survival. Suppose X lies between X(1) and X(2) what is its corresponding probability of survival?.

Let Y be the probability of survival corresponding to the mortality level X. Thus diagramatically, we have the follwing situation:



To obtain the gradient of this line we can use the follwing relation,

$$\frac{Y(2) - Y(1)}{X(2) - X(1)} = \frac{Y - Y(1)}{X - X(1)} \qquad .. (2.31)$$

or

$$\frac{Y(2) - Y(1)}{X(2) - X(1)} = \frac{Y(2) - Y}{X(2) - X} \qquad .. (2.32)$$

From

$$\frac{Y(2) - Y(1)}{X(2) - X(1)} = \frac{Y - Y(1)}{X - X(1)}$$

we have the following

$$(Y - Y(1))(X(2) - X(1)) = (Y(2) - Y(1))(X - X(1))$$

which implies

$$Y(X(2) - X(1)) - Y(1)(X(2) - X(1)) = (Y(2) - Y(1))(X - X(1)$$

Thus,

$$Y = Y(1) + (Y(2) - Y(1)) * \left(\frac{X - X(1)}{X(2) - X(1)}\right) \qquad .. (2.33)$$

This interpolation is used in obtaining probabilities of parent survival (adult mortality).

In the child mortality estimation interpolation is applied when determining mortality level. In this case it is X which is the subject.

So from,

$$\frac{Y(2) - Y(1)}{X(2) - X(1)} = \frac{Y - Y(1)}{X - X(1)}$$

we have,

$$(Y - Y(1))(X(2) - X(1)) = (Y(2) - Y(1))(X - X(1))$$

which implies

$$(Y - Y(1))(X(2) - X(1) = (Y(2) - Y(1))X - (Y(2) - Y(1))X(1)$$

which further implies

$$X = X(1) + (X(2) - X(1)) * \frac{Y - Y(1)}{Y(2) - Y(1)} \qquad .. (2.34)$$

In the Brass and Hill method the weighting factor W(n) is also interpolated. This interpolation is based on the formula (2.32) above.

That is,

$$\frac{Y(2) - Y(1)}{X(2) - X(1)} = \frac{Y(2) - Y}{X(2) - X}$$

which implies

$$(Y(2) - Y)(X(2) - X) = (Y(2) - Y)(X(2) - X(1))$$

which further implies

$$(Y(2) - Y(1))(X(2) - X) = Y(2)(X(2) - X(1)) - Y(X(2) - X(1))$$

Hence,

$$Y = Y(2) - (Y(2) - Y(1) * \frac{X(2) - X}{X(2) - X(1)} \qquad .. (2.35)$$

Letting $\partial = \frac{X(2) - X}{X(2) - X(1)}$

then the above formula (2.35) becomes

$$Y = Y(2) - (Y(2) - Y(1)) * \partial$$

$$= Y(2) - Y(2)*\partial + Y(1)*\partial$$

$$= \partial*Y(1) + (1-\partial)*Y(2)$$

$$=\partial*\text{Lower value of } W(n) + (1-\partial)*\text{Upper value of } W(n)$$

as shown in section (2.2).

CHAPTER III

ADULT MORTALITY ESTIMATION AT NATIONAL LEVEL

3.1 INTRODUCTION

In this chapter, we are going to analyse adult mortality estimates at the national level using data based on orphanhood. The data sources are the 1969 and 1979 censuses for females and males. Having obtained the conditional probabilities of survival we shall then construct life tables based on both child and adult mortality estimation.

3.2 APPLICATION OF THE BRASS-HILL METHOD.

3.2.1 Calculating conditional probabilities of survival using un-adjusted proportions of respondents (combined sexes) with mother alive.

In this section we are going to show step by step how to arrive at the conditional probabilities of survival using the Brass and Hill method. We shall first look at the 1969 census.

The first step is to calculate the mean age at maternity. This is shown in table 3.1 below. The table represents the age groups 15-19 to 45-49 in column (1), followed by the corresponding female population in column (2). Column (3) is the proportion of births per woman in each age group denoted by f(i).

These values of f(i)'s are not computed as such but rather obtained as they are from the 1969 census volume IV Analytical report.

Table 3.1:
Calculating Mean Age at Maternity for Kenya (1969 census).

Age Group (1)	Female Population (2)	f(i) (3)	Births B(i) (4)	Index i (5)	a(i) (6)	Product of column (4) & (6) (7)
15-19	544847	0.1112	60586.98	1	17	1029978
20-24	450096	0.2844	128007.3	2	22	2816160
25-29	411245	0.2897	119137.6	3	27	3216717
30-34	299241	0.253	75707.97	4	32	2422655
35-39	264819	0.2004	53069.72	5	37	1963579
40-44	201936	0.1212	24474.64	6	42	1027935
45-49	163852	0.0604	9896.660	7	47	465143
TOTALS			470880.9			12942167

M = 27.48500

Column (4) of table 3.1 is the number of births preceding the 1969 census and is obtained by multiplying the female popula--tion in column (2) by the proportions of births in column (3) column (5) is simply the indexing of the 7 age groups while column (6) gives the adjusted mid-point of each age group. The adjustment is done by subtracting half the year from the mid-point to take into account the reporting time of births from the time of the survey. Column (7) is the product of values of column (4) and column (6).

So the mean age at maternity, M, is the ratio of the total of values in column (7) and the total of values in column (4). We shall use this value of M to calculate the interpolated weighting factors as shown in table 3.2 below.

Table 3.2:
Interpolated weighting factors, W(n), for females. 1969 census.

Age n (1)	W(n) M=27 (2)	W(n) M=28 (3)	$W^*(n)$ M=27.48501 (4)	$1-W^*(n)$ (4)
10	0.634	0.674	0.653397	0.346602
15	0.738	0.8	0.768067	0.231932
20	0.838	0.921	0.878252	0.121747
25	0.913	1.016	0.962952	0.037047
30	0.957	1.08	1.016652	-0.01665
35	0.986	1.128	1.054867	-0.05486
40	0.95	1.111	1.028082	-0.02808
45	0.884	1.063	0.970813	0.029186
50	0.699	0.89	0.791634	0.208365
55	0.456	0.645	0.547665	0.452334
60	0.22	0.378	0.296630	0.703369

Interpolation factors:
α = 0.514986
$1-\alpha$ = 0.485014

W(n) at M=27 and W(n) at M=28 are the weighting factors for ages 27 and 28 respectively as shown in table 2(a)

The interpolated weighting factor $W^*(n)$ for M=27.48501 is calculated by the formula:

$$W^*(n) = \alpha * [\text{Lower } W(n)]_{M=27} + (1-\alpha) * [\text{Upper } W(n)]_{M=28}$$

Where

$$\alpha = \frac{\text{Upper M} - \text{Calculated M}}{\text{Upper M} - \text{Lower M}}$$

$$\alpha = \frac{28 - 27.48501}{28 - 27}$$

$$\alpha = 0.514986$$

For n = 10, and M = 27.48501

$$W(10) = 0.514986*0.634 + 0.48501*0.674$$

$$W(10) = 0.653397$$

The next step is to calculate the conditional prbabilities of survival which are denoted by the formula I(25+n)/I(25) for female adult mortality. The steps leading to these probabilities of survival follow from table 3.3.

Table 3.3:
Calculating Probabilities of survival for Females 1969 census. Combined sexes of respondents

Age Group (1)	Population combined sexes (2)	Pop. with Mother alive (3)	Prop. with Mother alive S(n) (4)	n (5)	25+n (6)	Prob. of survival I(25+n) / I(25) (7)
0-4	2090825	2074451	0.992168	0	-	
5-9	1787037	1752320	0.980572	5	-	
10-14	1377462	1328368	0.964359	10	35	0.974953
15-19	1096574	1020233	0.930382	15	40	0.956478
20-24	872132	765506	0.877740	20	45	0.923973
25-29	747015	602698	0.806808	25	50	0.875113
30-34	573875	409444	0.713472	30	55	0.808363
35-39	506001	317546	0.627560	35	60	0.718186
40-44	388036	197426	0.508782	40	65	0.630896
45-49	331733	131401	0.396104	45	70	0.505494
50-54	268241	70979	0.264609	50	75	0.368705
55-59	215227	43522	0.202214	55	80	0.236385
60-64	199012	25069	0.125967	60	85	0.148584
65-69	132542	13174	0.099394	65		
70+	254888	17435	0.068402	70+		

The proportions not orphaned, S(n), with respect to mothers is shown in column (4) of table 3.3. This is simply obtained by dividing values in column (3) by those in column (2). To calculate the probability of survival we use the formula:

$$\frac{I(25+n)}{I(25)} = W(n) * S(n-5) + [1-W(n)] * S(n)$$

Where

W(n) are interpolated weighting factors, as calculated in table 3.2 above in column (4).

For the 1979 census we have the actual number of births twelve months before the census. This is shown in column (3) of table 3.4. Column (4) is the product of the values of column (2) and column (3). In this case the mean age at maternity is given by;

$$M = \frac{\text{Totals for product of column (2) \& (3)}}{\text{Total of Births, column (3)}}$$

$$M = \frac{17966710}{671500} = 26.75608$$

Table 3.4:
Calculating Mean Age at maternity for Kenya (1979 census)

Age Group (1)	Mid-point of age group (2)	Births in the 12 months (3)	Product of column (2) & (3) (4)
15-19	17	95638	1625846
20-24	22	201211	4426642
25-29	27	167023	4509621
30-34	32	105123	3363936
35-39	37	63486	2348982
40-44	42	28442	1194564
45-49	47	10577	497119
TOTALS		671500	17966710

M = 26.75608

For the interpolation of W(n) values we use table 3.5 which gives the values of W(n) for mean age at 26 and 27 in column (2) and (3). These values are extracted from table 2(a).

The parameter @ which is the interpolation factor is defined by:

$$@ = \frac{\text{Upper M} - \text{Calculated M}}{\text{Upper M} - \text{Lower M}}$$

$$= \frac{(27 - 26.75608)}{(27 - 26)}$$

$$= 0.243916$$

and

$$1 - @ = 0.756084$$

So using these interpolation factors, the interpolated W(n) values are given by the formula:

$$W^{*}(n) = @ * [\text{Lower } W(n)]_{M=26} + \{1-@\} * [\text{Upper } W(n)]_{M=27}$$

Table 3.5:
Interpolated weighting factors, W(n), for proportions of respondents with a surviving mother, (Kenya, 1979 census).

Age n	W(n) M=26	W(n) M=27	$W^{*}(n)$ M=26.756084	$1-W^{*}(n)$	For M = 26.756084
10	0.596	0.634	0.624731	0.375268	Interpolation
15	0.678	0.738	0.723365	0.276634	factors:
20	0.756	0.838	0.817998	0.182001	@ = 0.243916
25	0.809	0.913	0.887632	0.112367	1-@ = 0.756084
30	0.834	0.957	0.926998	0.073001	
35	0.844	0.986	0.951363	0.048636	
40	0.791	0.95	0.911217	0.088782	
45	0.708	0.884	0.841070	0.158929	
50	0.514	0.699	0.653875	0.346124	
55	0.27	0.456	0.410631	0.589368	
60	0.053	0.22	0.179266	0.820733	

Using the formula above, for example, at n = 20, we have

$$W^{*}(20) = (0.243916 * 0.756) + (0.756083 * 0.838)$$
$$= 0.817998$$

We now proceed to calculate the probabilities of survival. Table 3.6 below shows the steps taken to calculate the conditional probabilities of survival using the formula:

$$I(25+n)/I(25) = W(n)*S(n-5) + \{1-W(n)\}*S(n).$$

The steps followed in calculating the probabilities of survival are similar to those in table 3.3.

Table 3.6:
Calculating Probabilities of survival for Females 1979 census. Combined sexes of respondents

Age Group (1)	Population combined sexes (2)	Pop. Mother alive (3)	Prop. with Mother alive S(n) (4)	n (5)	25+n (6)	Prob. of survival I(25+n)/I(25) (7)
0-4	2838599	2819168	0.993154	0	-	
5-9	2488633	2451944	0.985257	5	-	
10-14	2071694	2016406	0.973312	10	35	0.980774
15-19	1738470	1654173	0.951510	15	40	0.967281
20-24	1324623	1206271	0.910652	20	45	0.944074
25-29	1053501	904774	0.858825	25	50	0.904828
30-34	815956	631918	0.774451	30	55	0.852666
35-39	613908	425280	0.692742	35	60	0.770477
40-44	533618	309393	0.579802	40	65	0.682715
45-49	439606	207615	0.472275	45	70	0.562713
50-54	372616	122456	0.328638	50	75	0.422559
55-59	274499	63755	0.232259	55	80	0.271835
60-64	216452	30037	0.138769	60	85	0.155529
65-69	182547	17666	0.096775	65		
70+	302117	20661	0.068387	70+		

3.2.2 Calculating conditional probabilities of survival using adjusted proportions of respondents (combined sexes) with mother alive.

To adjust for the possible changes in mortality patterns we use the Synthetic and Age Specific Growth Rate techniques to calculate the proportions not orphaned.

In table 3.7 we have shown the procedure of using the Age Specific Growth Rate technique. Columns (2) and (3) are the proportions not orphaned obtained from column (4) of table 3.3 and column (4) of table 3.6. We should note that these proportions are for respondents (combined sexes) with mother alive.

Next, column (4) of table 3.7 gives the values of the geometric mean of 1969 and 1979 values. These are obtained by taking the square root of the product of values in column (2) and column (3). For example, for age group 10-14, we have

SQRT[0.964359*0.973312] = 0.968825

column (5) is the difference in growth rates between the total population and that not orphaned for a specific age group. This is given by the formula at (2.25) on page 35.

Thus each value in column (5) is obtained by the following formula:

$$Z_{5\ x} = \frac{1}{10} \ln \left(\frac{\text{Value in column 3}}{\text{Value in column 2}} \right)$$

So for age group 10-14, say, we have;

$$Z_{5\ 10} = \frac{1}{10} \ln \left(\frac{0.973312}{0.964359} \right) = 0.000924$$

Table 3.7:
Proportions of respondents (combined sexes) with mother alive:
(Using the Age Specific Growth Rate technique for adjustment)

Age Group (1)	Proportions not orphaned 1969 (2)	Proportions not orphaned 1979 (3)	Geometric Mean $_5\Pi_x$ (4)	Diff' in growth Rate $_5Z_x$ (5)	CUM (6)	EXP 5Rx (7)	Adjusted Props S(n) (8)
0-4	0.992168	0.993154	0.992660	0.000099	0	1.000248	0.992907
5-9	0.980572	0.985257	0.982911	0.000476	0.000099	1.001689	0.984572
10-14	0.964359	0.973312	0.968825	0.000924	0.000575	1.005203	0.973866
15-19	0.930382	0.95151	0.940886	0.002245	0.001500	1.013200	0.953306
20-24	0.87774	0.910652	0.894044	0.003681	0.003745	1.028324	0.919367
25-29	0.806808	0.858825	0.832410	0.006247	0.007426	1.054169	0.877501
30-34	0.713472	0.774451	0.743336	0.008201	0.013674	1.092944	0.812425
35-39	0.62756	0.692742	0.659346	0.009881	0.021875	1.143487	0.753954
40-44	0.508782	0.579802	0.543132	0.013066	0.031757	1.211009	0.657738
45-49	0.396104	0.472275	0.432515	0.017588	0.044824	1.307467	0.565500
50-54	0.264609	0.328638	0.294890	0.021670	0.062412	1.442300	0.425321
55-59	0.202214	0.232259	0.216716	0.013852	0.084083	1.576247	0.341598
60-64	0.125967	0.138769	0.132213	0.009679	0.097935	1.671758	0.221028
65-69	0.099394	0.096775	0.098075	-0.00267	0.107614	1.701309	0.166857
70+	0.068402	0.068387	0.068394	-0.00002	0.104944	1.689896	0.115579

Column (6) is a cumulative sum of values in column (5). Column (7) values denoted by 5Ra are obtained by calculating the exponetial of 2.5 multiplied by values of column (5) added to 5 multiplied by values of column (6). For example, in age group 20 - 24 of table 3.7 above, we have the following:

$$\text{Exp } {}_5R_{20} = \exp(2.5*0.003681) + 5*(0.003745))$$

$$= 1.028324$$

The final column gives the adjusted proportions not orphaned obtained by multiplying columns (4) and (7). For example, the adjusted proportion not orphaned for age group 30-34 is given by 0.743336*1.092944, which is 0.812425.

Similarly, in table 3.8 we have the procedure for adjusting the proportion not orphaned by the Synthetic Cohort approach. In this table, column (3) is the geometric mean values of column (2) and (4), which are from table 3.3 and 3.6 respectively. Column (5) gives the adjusted proportion not orphaned 5-years apart, in this case, for the 1974 and 1979 censuses while column (6) represents the adjusted proportions not orphaned 10-years apart from the 1969 and 1979 censuses.

Table 3.8
Proportions of respondents (combined sexes) with mother alive: (Using the Synthetic Cohort approach for adjustment).

Age Group	Proportions with mother Alive:			Adjusted proportions by the synthetic approach:	
	1969	1974	1979	5-Year	10-Year
(1)	(2)	(3)	(4)	(5)	(6)
0-4	0.992168	0.992660	0.993154	0.993154	0.993154
5-9	0.980572	0.982911	0.985257	0.985746	0.985257
10-14	0.964359	0.968825	0.973312	0.975634	0.974279
15-19	0.930382	0.940886	0.95151	0.955916	0.956056
20-24	0.87774	0.894044	0.910652	0.920933	0.919106
25-29	0.806808	0.832410	0.858825	0.874778	0.878328
30-34	0.713472	0.743336	0.774451	0.799026	0.803490
35-39	0.62756	0.659346	0.692742	0.721738	0.737404
40-44	0.508782	0.543132	0.579802	0.609169	0.629356
45-49	0.396104	0.432515	0.472275	0.504160	0.521328
50-54	0.264609	0.294890	0.328638	0.358848	0.374512
55-59	0.202214	0.216716	0.232259	0.258838	0.276922
60-64	0.125967	0.132213	0.138769	0.148721	0.172347
65-69	0.099394	0.098075	0.096775	0.101573	0.111153
70+	0.068402	0.068394	0.068387	0.067479	0.075337

For the synthetic cohort 5 years apart in table 3.8, the first value of column (5) is the same as the first value in column (4). The second value in column (5) is obtained by multiplying the first value in column (5) with the ratio of the second value in column (4) and the first value in column (3).

In general,

$$S(1,5) = S(1,4)$$

and

$$S(i,5) = \frac{S(i,4)}{S(i-1,3)} * S(i-1,5)$$

for i = 2, 3, 4, 5, ... which refers to the row and the second values 3, 4 and 5 refer to the column.

For the 10 years apart, the first two values in column (6) are the same as those in column (4). The third value in column (6) is obtained by dividing the third value in column (4) by the fisrt value in column (2) and hence multiplying the result by the first value in column (6); thus we get,

$$\frac{0.973312}{0.992168} * 0.993154 = 0.974279.$$

In general, we have the following relationships;

$$S(1,6) = S(1,4)$$

$$S(2,6) = S(2,4)$$

and

$$S(i,6) = \frac{S(i,4)}{S(i-2,2)} * S(i-2,6).$$

for i = 3, 4, 5, ..., which refers to the rowth number, while the second values 2, 4 and 6 in S(i,j) refer to the columnth number,

Table 3.9 below gives the conditional probabilities of survival corresponding to the adjusted proportions of respondents with mother alive. We should note that the mean age at maternity, M, used in the analysis is the average of that calculated from the 1969 census and that from the 1979 census. This is because the average mean age at maternity refers to the intersurvey period. The weighting factors, W(n), are then different from those calculated from the two censuses.

The conditional probabilities of survival are then calculated using the formula:

$$\frac{I(25+n)}{I(25)} = W(n) *S(n-5) +[1-W(n)*S(n)]$$

Table 3.9
Calculating the conditional probabilities of survival corresponding to the adjusted proportions of respondents with mother alive:

Age n (1)	Age 25+n (2)	W(n) (3)	SYNTHETIC COHORT 5-Year (4)	SYNTHETIC COHORT 10-Year (5)	ASGR (6)
5	-	-	-		-
10	35	0.638821	0.982094	0.981292	0.980705
15	40	0.745473	0.970615	0.96964	0.968633
20	45	0.848004	0.950599	0.950439	0.948148
25	50	0.925415	0.917491	0.916064	0.916245
30	55	0.971826	0.872643	0.876219	0.875667
35	60	1.003116	0.799267	0.803695	0.812607
40	65	0.969406	0.718294	0.734099	0.75101
45	70	0.905576	0.599253	0.619156	0.649029
50	75	0.722023	0.463767	0.480516	0.526533
55	80	0.478782	0.306721	0.323646	0.381683
60	85	0.239045	0.175044	0.197345	0.24985

3.2.3 Calculating conditional probabilities of survival using un-adjusted proportions of respondents (combined sexes) with father alive.

In this section we have first to calculate the mean age at paternity, this is obtained by adding the mean age at maternity to the difference between the median ages at marriage for males and females.

The estimation of M for males is one of the additional problems associated with the estimation of male adult mortality from the proportions of respondents with a surviving father. Fertility questions are generally not asked of males, so the information from which the female M is estimated is usually not available for fathers. Births during the year preceding a survey are sometimes tabulated by age of husband, but this tabulation is generally limited to the cases in which a mother and a father are enumerated in the same household. Calculating the male M from such a tabulation will bias the value upward because young fathers are more likely to be temporarily absent. A more robust procedure for estimating M for males consist of adjusting the female M by using informa--tion on marital status. That is, calculating the median ages at marriage and using them to adjust the female M.

The table 3.10 below gives the married male and female population with their corresponding cumulative frequency. These are shown in columns (2) & (3) and (4) & (5) respectively.

Table 3.10:
Calculating mean age at paternity for Kenya, 1969 census.

Age Group	Number Married		Cumulative Frequency		
	Males	Females	Males	Females	
(1)	(2)	(3)	(4)	(5)	Statistic
0-9	0	0	0	0	
10-19	21712	191811	21712	191811	Males Median age
20-29	335917	695095	357629	886906	Md = 39.98025
30-39	444007	485373	801636	1372279	
40-49	319070	292375	1120706	1664654	Female Median age
50-59	220195	161667	1340901	1826321	Md = 31.73188
60-69	154320	76887	1495221	1903208	
70+	106298	38726	1601519	1941934	
TOTAL	1601519	1941934			

To calculate the median age at marriage we use the formula:

$$Md = L + \frac{(N/2 - C)}{f} * h$$

where L is the lower limit of the class in which the median lies,

f is the frequency of this class,

C is the cumulative frequency upto and including the class preceding that class in which the median lies.

N is the total frequency, while h is the width of this class.

So from table 3.10, for males we have the following;

$$\frac{N}{2} = \frac{1601519}{2} = 800759.5$$ this value lies in the

class interval 30-39. Therefore,

L = 30, h = 10, C = 357629 and f = 444007

Therefore,

$$Md = 30 + \left(\frac{800759.5 - 357629}{444007} \right)$$

$$Md = 39.98025$$

For females, from the same table , we have

$$\frac{N}{2} = \frac{1941934}{2} = 970967$$ which also lies in the

interval 30-39.

The other parameters are:

L = 30, h = 10, C = 886906, and f = 485373.

Therefore, the median age at marriage for female population is;

$$Md = 30 + \left(\frac{970967 - 886906}{485373} \right)$$

$$Md = 31.73188$$

Thus the mean age at paternity for the 1969 census is given by

Mp(1969) = Mean age at maternity(1969) + Md(males) - Md(females

Mp(1969) = 27.48501 + (39.98025 - 31.73188)

Mp(1969) = 35.73338

The mean age at maternity for 1969 census was calculated ealier on page 43.

For the conversion of proportions of respondents with father alive we shall use the weighting factors, W(n), given in table 2(b) on page 24 of chapter II. The relevant weighting factors are those calculated between age 35 and 36. Using the W(n) values at ages 35 and 36 we have calculated the weighting factors by interpolation for the mean age at paternity Mp, obtained above as 35.73338. These are shown in table 3.11 below

W(n) = @ * [Lower W(n)] + (1-@) * [Upper W(n)]

at Mp=35.73338 at M=35 at M=36

n increases in steps of 5 from 10 to 55.

where

$$@ = \frac{[\text{ Upper M - Calculated M }]}{[\text{ Upper M - Lower M }]}$$

$$@ = \frac{[\ 36 - 35.73338]}{[\ 36 - 35\ ]} = 0.266615$$

and 1 - @ = 0.733385

Table 3.11:
Interpolated weighting factors, W(n), for proportions of respondents with a surviving father, (Kenya, 1969 census).

Age n (1)	W(n) M=35 (2)	W(n) M=36 (3)	* W(n) M=35.733381 (4)	* 1-W(n) (5)	Parameters
10	0.650	0.714	0.696936	0.303063	
15	0.790	0.877	0.853804	0.146195	
20	0.861	0.969	0.940205	0.059794	
25	0.877	1.007	0.972340	0.027659	@ = 0.266615
30	0.779	0.931	0.890474	0.109525	1- @ = 0.733384
35	0.610	0.782	0.736142	0.263857	
40	0.303	0.480	0.432809	0.567190	
45	-0.024	0.141	0.097008	0.902991	
50	-0.264	-0.128	-0.16425	1.164259	
55	-0.397	-0.304	-0.32879	1.328795	

We now calculate the conditional probabilities of survival for males using the formula,

$$\frac{l(35+n)}{l(32.5)} = W(n) * S(n-5) + [1-W(n)] * S(n)$$

The results are shown in table 3.12 below.

Table 3.12:
Calculating Probabilities of survival for males, (1969 census), Combined sexes of respondents.

Age Group (1)	Population combined sexes (2)	Pop. Father alive (3)	Prop. with Father alive S(n) (4)	n (5)	35+n (6)	Prob. of survival l(35+n) / l(35) (7)
0-4	2104482	2008630	0.954453	0	-	
5-9	1799913	1680998	0.933932	5	-	
10-14	1388051	1227899	0.884620	10	45	0.918988
15-19	1105506	822627	0.744118	15	50	0.86408
20-24	885809	654775	0.739183	20	55	0.743822
25-29	756627	479274	0.633434	25	60	0.736258
30-34	579703	296444	0.511372	30	65	0.620065
35-39	508201	208143	0.409568	35	70	0.48451
40-44	388036	114352	0.294694	40	75	0.344412
45-49	331733	68718	0.207148	45	80	0.215641
50-54	268241	40094	0.149470	50	85	0.139995
55-59	215225	27664	0.128535	55	90	0.121651
60-64	199012	20513	0.103074	60		
65-69	132542	10182	0.076820	65		
70+	254888	11903	0.046698	70+		

For the 1979 census, we have table 3.13 which shows the steps taken to calculate the mean age at paternity, M.

Table 3.13:
Calculating mean age at Paternity for Kenya, (1979 census).

Age Group (1)	Number Married Males (2)	Number Married Females (3)	Cumulative Frequency Males (4)	Cumulative Frequency Females (5)	Statistic
0-9	0	0	0	0	
10-19	22042	247651	22042	247651	Males Median age
20-29	509944	945379	531986	1193030	Md = 39.19347
30-39	592924	636568	1124910	1829598	
40-49	430628	402082	1555538	2231680	Female Median age
50-59	289439	223604	1844977	2455284	Md = 31.73985
60-69	181971	101317	2026948	2556601	
70+	127230	50966	2154178	2607567	
TOTAL	2154178	2607567			

Using the formula:

$$Md = L + \frac{(N/2 - C)}{f} * h$$

with the usual notations, the median age at marriage for males is calculated from table 3.13 as follows;

$$\frac{N}{2} = \frac{2154178}{2} = 1077089$$ this value lies in the

class interval 30-39. Therefore,

$L = 30$, $h = 10$, $C = 531986$ and $f = 592924$

Hence,

$$Md(males) = 30 + \frac{1077089 - 531986}{592924}$$

$$Md(males) = 39.19347$$

Similarly, for females, we have the median age at marriage calculated as follows:

$$\frac{N}{2} = \frac{2607567}{2} = 1303783$$ which also lies in the

class interval 30-39. Therefore,

L = 30, h = 10, C = 1193030 and f = 636568

Therefore,

$$Md(female) = 30 + \frac{1303783 - 1193030}{636568}$$

$$Md(females) = 31.73985$$

The mean age at paternity from the 1979 census is therefore given by;

Mp = Mean age at maternity (1979 census)+[Md(males)-Md(females)

= 26.75608 + [39.193471 - 31.73985]

= 34.20969

The mean age at maternity (1979 census) was calculated ealier on page 46.

The next step is to calculate the interpolated weighting factors, W(n), for the males in the 1979 census. The weighting factors, W(n), with respect to the calculated mean age at paternity (34.20969), are calculated by interpola--ting between those at ages M=34 and M=35. These factors are given in table 2(b) on page 24. The table 3.14 below shows the interpolated weighting factors.

Table 3.14:
The Interpolated weighting factors, W(n), for proportions of respondents with father alive for the 1979 census.

Age n (1)	W(n) M=34 (2)	W(n) M=35 (3)	W(n)* M=34.20969 (4)	1-W(n)* (5)	Parameters ə and 1-ə
10	0.587	0.650	0.600211	0.399789	
15	0.702	0.790	0.720453	0.279547	
20	0.750	0.861	0.773276	0.226724	
25	0.744	0.877	0.771889	0.228111	ə = 0.209699
30	0.627	0.779	0.658874	0.341126	1-ə = 0.790301
35	0.438	0.610	0.474068	0.525932	
40	0.133	0.303	0.168648	0.831352	
45	-0.183	-0.024	-0.14965	1.14965	
50	-0.396	-0.264	-0.36831	1.36831	
55	-0.486	-0.397	-0.46733	1.46733	

To calculate the conditional probabilities of survival shown in table 3.15 below we use the formula;

$$\frac{l(35+n)}{l(32.5)} = W(n) * S(n-5) + [1-W(n)] * S(n)$$

in this formula W(n) values for n = 10, 15, ..., 55, are obtained from table 3.14 column (4) while S(n), the proportions with a surviving father are obtained from table 3.15 below. 1-W(n) in the formula is the complement of W(n) and is in column (5) of table 3.14 above.

As an example, the probability of surviving from age 32.5 to age 32.5 + 2.5 + 20 = 35 + 20, is calculated as;

$$\frac{l(35+20)}{l(32.5)} = W(20)*S(15) + \{1-W(20)\}*S(20)$$

$$= 0.773276*0.854697 + 0.226723*0.779289$$

$$= 0.837601$$

Table 3.15:
Calculating Probabilities of survival for males 1979 census.
Combined sexes of respondents

Age Group (1)	Population combined sexes (2)	Pop. Father alive (3)	Prop. with Father alive S(n) (4)	n (5)	35+n (6)	Prob. of survival l(35+n) / l(35) (7)
0-4	2809244	2686576	0.956334	0	-	
5-9	2472198	2312026	0.935210	5	-	
10-14	2057037	1859151	0.903800	10	45	0.922653
15-19	1733327	1481471	0.854697	15	50	0.890074
20-24	1314043	1024020	0.779289	20	55	0.837601
25-29	1051431	718808	0.683647	25	60	0.757472
30-34	815079	454022	0.557028	30	65	0.640454
35-39	613375	276358	0.450553	35	70	0.501029
40-44	533184	177307	0.332543	40	75	0.352445
45-49	439278	106369	0.242145	45	80	0.228616
50-54	372395	54239	0.145649	50	85	0.110107
55-59	274304	25837	0.094191	55	90	0.070142
60-64	216364	13015	0.060153	60		
65-69	182444	8065	0.044205	65		
70+	301998	14760	0.048874	70+		

4 Calculating conditional probabilities of survival using adjusted proportions of respondents (combined sexes) with father alive.

For possible changes in mortality between 1969 and 1979 we have used the Age Specific Growth rate technique and the Synthetic approach to adjust for proportions of respondents with father alive. In table 3.16 below we have shown the procedure of adjustments using the age specific growth rate technique.

Table 3.16:
Proportions of respondents (combined sexes) with father alive:
(Using the Age Specific Growth Rate technique for adjustment)

Age Group	Proportions not orphaned 1969	1979	Geometric Mean	Diff' in growth Rate 5Zx	CUM	EXP 5Rx	Adjusted Props S(n)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0-4	0.954453	0.956334	0.955393	0.000196	0	1.000492	0.955863
5-9	0.933932	0.93521	0.934570	0.000136	0.000196	1.001327	0.935811
10-14	0.88462	0.9038	0.894158	0.002144	0.000333	1.007055	0.900467
15-19	0.744118	0.854697	0.797493	0.013854	0.002478	1.048153	0.835895
20-24	0.739183	0.779289	0.758971	0.005283	0.016333	1.099522	0.834505
25-29	0.633434	0.683647	0.658061	0.007628	0.021617	1.135594	0.747291
30-34	0.511372	0.557028	0.533712	0.008551	0.029245	1.182472	0.631099
35-39	0.409568	0.450553	0.429571	0.009537	0.037797	1.237174	0.531455
40-44	0.294694	0.332543	0.313047	0.012083	0.047334	1.305885	0.408803
45-49	0.207148	0.242145	0.223963	0.015610	0.059417	1.399500	0.313437
50-54	0.14947	0.145649	0.147547	-0.00258	0.075028	1.445805	0.213324
55-59	0.128535	0.094191	0.110031	-0.03108	0.072438	1.329062	0.146238
60-64	0.103074	0.060153	0.078741	-0.05385	0.041350	1.074779	0.084629
65-69	0.076821	0.044205	0.058274	-0.05526	-0.01250	0.818171	0.047678
70+	0.046698	0.048874	0.047773	0.004554	-0.06776	0.720753	0.034433

In column (2) and (3) of table 3.16 we have the proportions of respondents with father alive. Column (4) is the geometric mean of these two columns (2) and (3), obtained by calculating the square roots of the product of their values. In column (5) we have the difference in growth rate between the number of respondents with fathers alive and the total number of persons for each age group using the formula;

$$ {}_5Z_x = \frac{1}{1979-1969} \ln \left[\frac{\text{Proportions with Father alive in the 1979 census.}}{\text{Corresponding Proportions for the 1969 census}} \right] $$

Thus for age group 10-14 we have,

$$ {}_{5}Z_{10} = \frac{1}{10} \ln \left[\frac{0.95151}{0.930382} \right] $$

$$ = 0.002245 $$

Column (6) gives the cumulative of the values ${}_{5}Z_{x}$ calculated in column (5). Column (7) gives the exponential of 5Rx where 5Rx is defined as,

$$ 5Rx = 2.5 [{}_{5}Z_{x}] + 5 * [\text{values of column (6)}] $$

Therefore values of column (7) are calculated as,

$$ \text{Exp} [5Rx] = \text{Exp} [2.5 * \{ {}_{5}Z_{x} \} + 5 * \{\text{values of col.(6)}\}] $$

Example, for age group 20-24 we have the value in column (7) as

$$ \text{Exp}[{}_{5}R_{20}] = \text{Exp}[2.5*0.005283 $$

$$ = 1.099522 $$

The adjusted proportions in column (8) are obtained by multiplying values in column (4) by those in column (7). Further, in table 3.17 below, we have the adjusted proportions due to the synthetic approach for the cohorts 5 years and 10 years apart. The procedure of arriving at these adjusted proportions was discussed in section 3.2.2 on page 49.

Table 3.17:
Proportions of respondents (combined sexes) with father alive (Using the synthetic cohort approach for adjustment).

Age Group	Proportions with father Alive:			Adjusted proportions by the synthetic approach:		
	1969	1974	1979	5-Year	10-Year	
(1)	(2)	(3)	(4)	(5)	(6)	
0-4	0.954453	0.955393	0.956334	0.956334	0.956334	0.955863
5-9	0.933932	0.934570	0.93521	0.936131	0.93521	0.935811
10-14	0.88462	0.894158	0.9038	0.904418	0.905581	0.900467
15-19	0.744118	0.797493	0.854697	0.863912	0.855866	0.835895
20-24	0.739183	0.758971	0.779289	0.835187	0.796185	0.834505
25-29	0.633434	0.658061	0.683647	0.701948	0.785239	0.747291
30-34	0.511372	0.533712	0.557028	0.578685	0.587250	0.631099
35-39	0.409568	0.429571	0.450553	0.470236	0.486268	0.531455
40-44	0.294694	0.313047	0.332543	0.348784	0.362232	0.408803
45-49	0.207148	0.223963	0.242145	0.257225	0.266376	0.313437
50-54	0.14947	0.147547	0.145649	0.157472	0.164355	0.213324
55-59	0.128535	0.110031	0.094191	0.092979	0.110104	0.146238
60-64	0.103074	0.078741	0.060153	0.051493	0.058615	0.084629
65-69	0.076821	0.058274	0.044205	0.033769	0.032393	0.047678
70+	0.046698	0.047773	0.048874	0.037074	0.028522	0.034433

To calculate the conditional probabilities of survival from age 32.5 to age 35+n, we employ weghting factors, W(n), which have been calculated from the average of the mean ages at paternity, Mp. These mean ages at paternity have been calculated from the 1969 and 1979 censuses on pages 56 and 60 respectively. An average of the mean age at paternity is given by

$$Mp = \frac{35.73338 + 34.20969}{2} = 34.97154$$

The weighting factors, W(n), with respect to this mean age at paternity are given in table 3.18 below, along with the corresponding probabilities of survival which are derived from the adjusted proportions with father alive.

The formula used is,

$$\frac{l(35+n)}{l(32.5)} = W(n) * S(n-5) + \{1-W(n)\}*S(n)$$

where W(n) values are from column (3) of table 3.18 and S(n) values for a synthetic cohort 5-years and 10-years apart are from columns (4) and (5) of table 3.17. For the age specific growth rate technique, the adjusted proportions are given in column (6) of the same table.

Table 3.18:
Probabilities of survival for males from the adjusted proportions (Using the Synthetic approach and the ASGR).

Age n (1)	35+n (2)	W(n) (3)	Synthetic 5-years apart (4)	Synthetic 10-years apart (5)	ASGR (6)
5	-	-	-	-	-
10	45	0.648207	0.924974	0.924786	0.923377
15	50	0.787495	0.89581	0.895016	0.886745
20	55	0.85784	0.859829	0.847382	0.835697
25	60	0.873214	0.818294	0.794797	0.823447
30	65	0.774674	0.674173	0.740627	0.721109
35	70	0.605104	0.535859	0.547373	0.591749
40	75	0.298161	0.384996	0.399215	0.445373
45	80	-0.02852	0.254614	0.263642	0.310717
50	85	-0.26775	0.130763	0.137039	0.186518
55	90	-0.39953	0.067212	0.088429	0.119435

APPLICATION OF THE TRUSSELL-HILL METHOD:

As explained in section 2.2.2, the Trussell-Hill method of calculating the conditional probabilities of survival for females is based on regression equation of the form;

$$\frac{l(25+n)}{l(25)} = a(n) + b(n)*M + c(n)S(n-5)$$

where

$\frac{l(25+n)}{l(25)}$ is the conditional probability of surviving from age 25 to age 25+n.

The coefficients a(n), b(n) and c(n) are obtained from table 2(d). M is the mean age at maternity and S(n-5) is the proportion of the respondents with mother alive.

So far, no regression model exists for the respondents with a surviving father.

In table 3.19(a) below we have retrieved the values of a(n), b(n) and c(n) from table 2(d), and in addition we have shown values of S(n), the proportions of respondents with mother alive for 1969 and 1979 census. We also have the adjusted proportions obtained by both Synthetic and Age Specific Growth Rate techniques. All these values have been calculated in the preceding sections of this chapter.

The conditional probabilites of survival for the corresponding proportions not orphaned have been given in table 3.19(b).

Table 3.19:
Calculating conditional probabilities of survival for female adults, using the Trussell-Hill method.

le 3.19(a) Proportions of respondents with a surviving mother the Trussell coefficients.
M (1969) = 27.48501 M (1979) = 26.75608

a(n) (2)	b(n) (3)	c(n) (4)	PROPORTIONS NOT ORPHANED 1969 (5)	1979 (6)	Synthetic 5-Year (7)	Synthetic 10-Year (8)	A.S.G.R.T (9)
-	-	-	0.930382	0.95151	0.955916	0.956054	0.953306
-.1798	.00476	1.0505	0.87774	0.910652	0.920933	0.919106	0.919367
-.2267	.00737	1.0291	0.806808	0.858825	0.874778	0.878328	0.877501
-.3108	.01072	1.0287	0.713472	0.774451	0.799026	0.80349	0.812425
-.4259	.01473	1.0473	0.62756	0.692742	0.721738	0.737404	0.753954
-.5566	.01903	1.0818	0.508782	0.579802	0.609169	0.629356	0.657738
-.6676	.02256	1.1228	0.396104	0.472275	0.50416	0.521328	0.5655
-.6981	.02344	1.1454	0.264609	0.328638	0.358848	0.374512	0.425321

3.19(b) Conditional probabilities of survival for females, Trussell-Hill method.

Age n (1)	25+n (2)	PROBABILITY OF SURVIVAL 1969 (3)	1979 (4)	Synthetic 5-Year (5)	Synthetic 10-Year (6)	A.S.G.R.T (7)
15	-	-	-	-	-	-
20	45	0.928394	0.94712	0.953483	0.948855	0.950741
25	50	0.879146	0.907644	0.92091	0.91033	0.919298
30	55	0.813802	0.859498	0.879816	0.863405	0.882617
35	60	0.726173	0.779299	0.810405	0.784668	0.824438
40	65	0.645334	0.701976	0.74028	0.708912	0.775131
45	70	0.523722	0.587018	0.628214	0.595241	0.682747
50	75	0.399846	0.470006	0.51507	0.478549	0.585329

For the adjusted proportions in the table 3.19(a) in columns (7), (8) and (9) we used the average of the mean age at maternity M, for 1969 census and the 1979 census, since this average mean age refers to the intersurvey period.

Comparing the conditional probabilities of survival for females obtained by the Brass-Hill method and the Trussell-Hill method, in tables 3.19(b) and 3.19(c) below, it is found that there is a decline in mortality in the period 1969 and 1979. This is clear from the fact that the conditional probabilities of survival at each age in 1979 are greater than those in 1969, columns (3) and (4). At each age the conditional probabilities of survival obtained by the Brass-Hill method are reasonably close to those obtained by the Trussell-Hill method. Their difference, in absolute value, is less than 0.04. For instance, the difference between values in column (3) of table 3.19(b) and table 3.19(c) for each age are: 0.004, 0.004, 0.005, 0.007, 0.014, 0.018, ,0.031.

Table 3.19(c). Conditional Probabilities of survival. (Brass-Hill Method).

		PROBABILITY OF SURVIVAL				
Age n (1)	25+n (2)	1969 (3)	1979 (4)	Synthetic 5-Year (5)	Synthetic 10-Year (6)	ASGR (7)
15	-	-	-	-	-	-
20	45	0.923973	0.944074	0.950599	0.950439	0.948148
25	50	0.875113	0.904828	0.917491	0.916064	0.916245
30	55	0.808363	0.852666	0.872643	0.876219	0.875667
35	60	0.718186	0.770477	0.799267	0.803695	0.812607
40	65	0.630896	0.682715	0.718294	0.734099	0.75101
45	70	0.505494	0.562713	0.599253	0.619156	0.649029
50	75	0.368705	0.422559	0.463767	0.480516	0.526533

LINKING CHILD AND ADULT MORTALITY:

In this section we wish to show how to combine a life table based on child mortality estimates with that of adult mortality based on orphanhood information.

To estimate child mortality we shall use the Coale-Trussell technique as explained in Chapter II. The probability of dying at age x is given by

$$q(x) = K(i)*D(i)$$

where

$x = 1, 2, 3, 5, 10, 15$ and 20

and

$$K(i) = a(i) + b(i)*P(1)/P(2) + c(i)*P(2)/P(3).$$

The coefficients a(i), b(i) and c(i) are due to Trussell and are given below in table 3.20.

Table 3.20:
Trussell's coefficients for estimating child mortality for North Model.

Age group (1)	index i (2)	a(i) (3)	b(i) (4)	c(i) (5)
15-19	1	1.1119	-2.9287	0.8507
20-24	2	1.239	-0.6865	-0.2745
25-29	3	1.1884	0.0421	-0.5156
30-34	4	1.2046	0.3037	-0.5656
35-39	5	1.2586	0.4236	-0.5898
40-44	6	1.224	0.4222	-0.5456
45-49	7	1.1772	0.3486	-0.4624

The steps taken to estimate q(x) are summarized in table 3.21 for 1969 census and in table 3.22 for 1979 census. These results are based on Kichamu's study on child and infant mortality in Kenya (1986).

Table 3.21:
Estimating probability of dying at age x in 1969.

Index i	P(i)	D(i)	K(i)	x	Combined sexes q(x)	Female q(x)/1.05	Male q(x)*1.05
1	0.35	0.1277	1.004832	1	0.128317	0.122206	0.134732
2	1.88	0.1465	0.969807	2	0.142076	0.135310	0.149179
3	3.65	0.1737	0.930668	3	0.161657	0.153959	0.169739
4	5.11	0.2023	0.969817	5	0.196194	0.186851	0.206003
5	6	0.2309	1.033674	10	0.238675	0.227309	0.250608
6	6.44	0.2629	1.021579	15	0.268573	0.255783	0.282001
7	6.69	0.3033	1.003931	20	0.304492	0.289992	0.319716

Note: i refers to the age groups 15-19, 20-24, ...,45-49.
P(1)/P(2)= 0.186170
P(2)/P(3)= 0.515068

Table 3.22:
Estimating probability of dying at age x in 1979.

Index i	P(i)	D(i)	K(i)	Age x	Combined sexes q(x)	Female q(x)/1.05	Male q(x)*1.05
1	0.351599	0.116137	1.025436	1	0.119091	0.11342	0.125045
2	1.955084	0.124835	0.973490	2	0.121525	0.115738	0.127601
3	3.778014	0.141054	0.929153	3	0.13106	0.124819	0.137613
4	5.560561	0.165839	0.966524	5	0.160287	0.152654	0.168301
5	6.663075	0.184545	1.029563	10	0.19	0.180952	0.1995
6	7.251667	0.217428	1.017585	15	0.221251	0.210715	0.232313
7	7.402246	0.253154	1.000604	20	0.253306	0.241243	0.265971

Note: i refers to the age groups 15-19, 20-24, ...,45-49.
P(1)/P(2)= 0.179838
P(2)/P(3)= 0.517489

For the 1969 census the values of P(i) and D(i) were readily available from the Analytical Report of the 1969 census vol.VI, For the 1979 census these values were computed from the data on Female Population, Children ever born and Children dead from which we have the parity P(i) and proportion of children dead D(i), given by;

$$P(i) = \frac{CEB(i)}{FPOP(i)}$$

and

$$D(i) = \frac{CD(i)}{CEB(i)}$$

We now calculate the levels for the q(x). We use interpolation to obtain the estimated level. This follows from tables 3.23 (a) and (b) for both females and males.

Table 3.23: (a).
Calculating the level for q(x) from the 1969 census. (Females)

Age x	Female p(x) = 1-q(x)	Lower p(x)	Upper p(x)	Interpolated Level	
1	0.877793	0.8707	0.88305	11.574	Average Level
2	0.864689	0.86319	0.8781	13.101	for x=2,3, & 5
3	0.84604	0.84391	0.8614	13.122	12.99633
5	0.813148	0.79628	0.81831	12.766	
10	0.77269	0.76259	0.78822	13.394	
15	0.744216	0.71883	0.74507	11.967	
20	0.710007	0.69917	0.72666	11.394	

Table 3.23: (b).
Calculating the level for q(x) from the 1969 census. (Males).

Age x	Males p(x) = 1-q(x)	Lower p(x)	Upper p(x)	Interpolated Level	
1	0.865267	0.86256	0.87589	12.203	Average Level
2	0.85082	0.84328	0.8592	13.474	for x=2,3, & 5
3	0.83026	0.82344	0.84186	13.37	13.23266
5	0.793996	0.77361	0.79749	12.854	
10	0.749391	0.73992	0.76689	12.351	
15	0.717998	0.69548	0.72297	11.819	
20	0.680283	0.67519	0.70365	11.179	

The lower and upper levels are obtained from the Coale-Demeny North Model life tables. To calculate the interpolated level we use the formula;

$$\text{Interpolated Level} = \text{Lower Level} + \frac{\text{Calculated } P(x) - \text{Lower Level } P(x).}{\text{Upper Level } P(x) - \text{Lower Level } P(x)}$$

For example, in table 3.23 (a), at age x = 2, we have the interpolated level given by

$$13 + \frac{0.864689 - 0.86319}{0.8781 - 0.86319} = 13.101$$

Similarly we have the estimated mortality levels for 1979 given below in tables 3.24 (a) and (b) for females and and males respectively.

Table 3.24: (a).
Calculating the level for q(x) from the 1979 census. (Females)

Age x	Female p(x) = 1-q(x)	Lower p(x)	Upper p(x)	Interpolated Level	
1	0.88658	0.88305	0.89451	12.308	Average Level
2	0.884261	0.8781	0.89247	14.429	for x=2,3, & 5
3	0.87518	0.8614	0.87813	14.824	14.55866
5	0.847345	0.83906	0.85864	14.423	
10	0.819047	0.81261	0.83564	14.279	
15	0.789284	0.77212	0.79809	13.661	
20	0.758756	0.75483	0.78216	13.144	

Table 3.24: (b).
Calculating the level for q(x) from the 1979 census. (Males).

Age x	Males p(x) = 1-q(x)	Lower p(x)	Upper p(x)	Interpolated Level	
1	0.874954	0.86256	0.87589	12.929	Average Level
2	0.872398	0.8592	0.87456	14.859	for x=2,3, & 5
3	0.862387	0.85954	0.87707	15.162	14.87533
5	0.831698	0.81916	0.8399	14.605	
10	0.8005	0.79161	0.81537	14.374	
15	0.767686	0.75116	0.77715	13.635	
20	0.734028	0.73264	0.75958	13.052	

We shall take the average level to be the mean of the estimated levels at ages 2, 3 and 5. Having calculated the average level we retrieve the probabilities of survival for the lower and upper levels where the average level lies in the Coale-Demeny North Model life tables.

To calculate the interpolated probabilities of survival we use the formula;

$$\text{Interpolated } p(x) = \text{Lower } p(x) + (\text{Upper } p(x) - \text{Lower } p(x)) * \frac{\text{Average Level} - \text{Lower Level}}{\text{Upper Level} - \text{Lower Level}}$$

The steps taken to calculate the interpolated probabilities of survival follow from tables 3.25 and 3.26 for both 1969 and 1979 censuses. Note that the upper and lower levels refer to the consecutive levels, and similarly for the probabilities of survival p(x).

Table 3.25:
Calculating the estimated life table probabilities by interpolation. Estimated Levels: Female(12.996) Male(13.232).
(1969 census).

Age x (1)	p(x) Level 12 (2)	p(x) Level 13 (3)	Est. p(x) Female (4)	p(x) Level 13 (5)	p(x) Level 14 (6)	Est. P(x) Male (7)
1	0.88305	0.89451	0.894467	0.87589	0.88772	0.878642
5	0.79628	0.81831	0.818229	0.79749	0.81916	0.802531
10	0.76259	0.78822	0.788125	0.76689	0.79161	0.772641
15	0.74507	0.77212	0.77202	0.75116	0.77715	0.757207
20	0.72666	0.75483	0.754726	0.73264	0.75958	0.738908
25	0.70565	0.73483	0.734722	0.70693	0.73511	0.713486
30	0.68204	0.71235	0.712238	0.6809	0.71031	0.687742
35	0.65567	0.68727	0.687154	0.65419	0.68474	0.661297
40	0.62669	0.65965	0.659529	0.62524	0.65694	0.632615
45	0.59579	0.62971	0.629585	0.59209	0.62489	0.599721
50	0.56355	0.59821	0.598082	0.55428	0.58794	0.562111
55	0.52529	0.56027	0.560141	0.50871	0.54258	0.51659
60	0.4776	0.51292	0.51279	0.45471	0.48838	0.462543
65	0.41494	0.4498	0.449672	0.38735	0.41967	0.394869
70	0.33401	0.36683	0.366709	0.30557	0.33494	0.312403
75	0.23755	0.2658	0.265696	0.21139	0.2358	0.217069

Table 3.26:
Calculating the estimated life table probabilities by interpolation. Estimated Levels: Female(14.559) Male(14.875).
(1979 census)

Age x (1)	p(x) Level 14 (2)	p(x) Level 15 (3)	Est.p(x) Female (4)	p(x) Level 14 (5),	p(x) Level 15 (6)	Est. P(x) Male (7)
1	0.90498	0.91512	0.910644	0.88772	0.89926	0.897821
5	0.83906	0.85864	0.849998	0.81916	0.8399	0.837314
10	0.81261	0.83564	0.825475	0.79161	0.81537	0.812407
15	0.79809	0.8227	0.811183	0.77715	0.80222	0.799094
20	0.78216	0.8082	0.796707	0.75958	0.78571	0.782452
25	0.76351	0.79099	0.778861	0.73511	0.76263	0.759199
30	0.74247	0.77149	0.758682	0.71031	0.73921	0.735607
35	0.71897	0.74971	0.736143	0.68474	0.71496	0.711192
40	0.69292	0.72543	0.711082	0.65694	0.6885	0.684565
45	0.66416	0.69809	0.683115	0.62489	0.6578	0.653697
50	0.63346	0.66846	0.653013	0.58794	0.62201	0.617762
55	0.59587	0.63155	0.615802	0.54258	0.57722	0.572901
60	0.54869	0.58495	0.568947	0.48838	0.52321	0.518867
65	0.485	0.5212	0.505223	0.41967	0.45349	0.449273
70	0.39998	0.43471	0.419382	0.33494	0.36631	0.362399
75	0.29447	0.32522	0.311648	0.2358	0.26248	0.259153

Note that to construct life tables for each sex we have divided the estimated q(x) in tables 3.21 and 3.22 by 1.05 in the case of females, and multiplied it by 1.05 in the case of males. The sex ratio at birth in Kenya is approximated at 105 males to 100 females.

For adult mortality, the mortality levels for the conditional probabilities of survival are also available in the Coale-Demeny model life tables. Using these model life tables along with the adult mortality estimates from orphanhood infor--mation, the steps leading to mortality levels follow from table 3.27 (a) & (b), and table 3.28 (a) & (b) for both 1969 and 1979 censuses.

Table 3.27: (a).
Calculating the estimated mortality level for Female adults, using the orphanhood informtion from the 1969 census.

Age n (1)	25+n (2)	l(25+n) / l(25) (3)	Lower Level (4)	Estimated level (5)	p(x) Level 13 (6)	p(x) Level 14 (7)	LifeTable Est. p(x) (8)
					Est. Level = 13.58432		
5	-	-					
10	35	0.974953	19	19.9864	0.67032	0.70143	0.688498
15	40	0.956478	19	19.5508	0.64202	0.67449	0.660993
20	45	0.923973	18	18.4758	0.61044	0.64404	0.630073
25	50	0.875113	16	16.9908	0.5757	0.61014	0.595824
30	55	0.808363	15	15.5545	0.53386	0.56857	0.554141
35	60	0.718186	13	13.9779	0.4831	0.51779	0.503370
40	65	0.630896	13	13.8123	0.41781	0.45153	0.437513
45	70	0.505494	13	13.2552	0.33545	0.36666	0.353686
50	75	0.368705	13	13.2919	0.23793	0.26441	0.253402
55	80	0.236385	13	13.8703			

Table 3.27: (b).
Calculating the estimated mortality level for male adults, using the orphanhood informtion from the 1969 census.

Age n (1)	35+n (2)	I(35+n) / I(32.5) (3)	Lower Level (4)	Estimated level (5)	Est. Level = 14.213: p(x) Level 14 (6)	p(x) Level 15 (7)	LifeTable Est. p(x) (8)
5	-	-					
10	45	0.918988	16	16.641	0.62489	0.6578	0.631899
15	50	0.86408	15	15.684	0.58794	0.62201	0.595196
20	55	0.743822	11	11.951	0.54258	0.57722	0.549958
25	60	0.736258	15	15.841	0.48838	0.52321	0.495798
30	65	0.620065	14	14.335	0.41967	0.45349	0.426873
35	70	0.48451	14	14.183	0.33494	0.36631	0.341621
40	75	0.344412	14	14.277	0.2358	0.26248	0.241482
45	80	0.215641	14	14.057	0.1367	0.15595	
50	85	0.139995					

Table 3.28: (a).
Calculating the estimated mortality level for Female adults, using the orphanhood information from the 1979 census.

Age n (1)	25+n (2)	l(25+n) / I(25) (3)	Lower Level (4)	Estimated level (5)	Est. Level = 15.26725: p(x) Level 15 (6)	p(x) Level 16 (7)	LifeTable Est. p(x) (8)
5	-	-					
10	35	0.980774	19	19.671	0.74971	0.77945	0.757658
15	40	0.967281	19	19.591	0.72543	0.7571	0.733893
20	45	0.944074	18	18.932	0.69809	0.73138	0.706986
25	50	0.904828	17	17.804	0.66846	0.70309	0.677714
30	55	0.852666	16	15.442	0.63155	0.66716	0.641066
35	60	0.770477	15	15.217	0.58495	0.62155	0.594731
40	65	0.682715	15	15.242	0.5212	0.55826	0.531104
45	70	0.562713	15	15.168	0.43471	0.47092	0.444387
50	75	0.422559	16	16.489	0.32522	0.35807	0.333999
55	80	0.271835	17	17.455			

Table 3.28: (b).
Calculating the estimated mortality level for male adults, using the orphanhood information from the 1979 census.

Age n (1)	35+n (2)	I(35+n) / I(32.5) (3)	Lower Level (4)	Estimated level (5)	p(x) Level 15 (6)	p(x) Level 16 (7)	LifeTable Est. p(x) (8)
					Est. Level =		15.079
5	-	-					
10	45	0.922653	17	17.067	0.6578	0.69069	0.660398
15	50	0.890074	17	17.772	0.62201	0.65636	0.624723
20	55	0.837601	17	17.704	0.57722	0.61249	0.580006
25	60	0.757472	16	16.899	0.52321	0.55909	0.526044
30	65	0.640454	15	15.727	0.45349	0.48902	0.456296
35	70	0.501029	14	14.883	0.36631	0.39966	0.368944
40	75	0.352445	14	14.627	0.26248	0.29152	0.264774
45	80	0.228616	15	15.696	0.15595	0.17753	0.157654
50	85	0.110107					

We now combine the values of p(x) from the child mortality estimates in tables 3.25 and 3.26 for ages 0 upto and including age 30 for females and age 40 for males. These estimates are in columns (4) & (7) in tables 3.25 and 3.26 for the 1969 and 1979 censuses respectively. The rest of p(x) value is obtained from the adult mortality estimates in table 3.27 (a) & (b) and table 3.28 (a) & (b) in column (8).

Thus we now have a combined p(x) from which we can calculate other life table functions. So we have the following life tables for 1969 and 1979 for both females and males.

ble 3.29:
ale Life Table for Kenya 1969, by the Patching Method.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.10553	0.89447	100000	10553	92612.9	4902281.	49.023
1	0.085234	0.914765	89447	7624	337203.2	4809668.	53.771
5	0.036786	0.963213	81823	3010	401590	4472464.	54.661
10	0.020440	0.979559	78813	1611	390037.5	4070874.	51.652
15	0.022395	0.977604	77202	1729	381687.5	3680837.	47.678
20	0.026512	0.973487	75473	2001	372362.5	3299149.	43.713
25	0.030596	0.969403	73472	2248	361740	2926787.	39.835
30	0.033331	0.966668	71224	2374	350185	2565047.	36.014
35	0.039956	0.960043	68850	2751	337372.5	2214862.	32.169
40	0.046778	0.953221	66099	3092	322765	1877489.	28.404
45	0.054359	0.945640	63007	3425	306472.5	1554724.	24.675
50	0.069954	0.930045	59582	4168	287490	1248252.	20.951
55	0.091619	0.908380	55414	5077	264377.5	960762.4	17.338
60	0.130838	0.869161	50337	6586	235220	696384.9	13.834
65	0.191584	0.808415	43751	8382	197800	461164.9	10.541
70	0.283553	0.716446	35369	10029	151772.5	263364.9	7.446
75+	1	0	25340	25340	111592.4	111592.4	4.404

ble 3.30:
le Life Table for Kenya 1969, by the Patching Method.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.12136	0.87864	100000	12136	91504.8	4791881.	47.919
1	0.086622	0.913377	87864	7611	330906.3	4700376.	53.496
5	0.037244	0.962755	80253	2989	393792.5	4369470.	54.446
10	0.019970	0.980029	77264	1543	382462.5	3975677.	51.456
15	0.024167	0.975832	75721	1830	374030	3593215.	47.453
20	0.034402	0.965597	73891	2542	363100	3219185.	43.567
25	0.036090	0.963909	71349	2575	350307.5	2856085.	40.029
30	0.038444	0.961555	68774	2644	337260	2505777.	36.434
35	0.043369	0.956630	66130	2868	323480	2168517.	32.792
40	0.001138	0.998861	63262	72	316130	1845037.	29.165
45	0.058078	0.941921	63190	3670	306775	1528907.	24.195
50	0.076008	0.923991	59520	4524	286290	1222132.	20.533
55	0.098479	0.901520	54996	5416	261440	935842.8	17.016
60	0.139027	0.860972	49580	6893	230667.5	674402.8	13.602
65	0.199709	0.800290	42687	8525	192122.5	443735.3	10.395
70	0.293132	0.706867	34162	10014	145775	251612.8	7.365
75+	1	0	24148	24148	105837.8	105837.8	4.382

able 3.31:
ale Life Table for Kenya 1979, by the Patching Method.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.08936	0.91064	100000	8936	93744.8	5417946.	54.179
1	0.066590	0.933409	91064	6064	347883.2	5324201.	58.467
5	0.028847	0.971152	85000	2452	418870	4976318.	58.545
10	0.017323	0.982676	82548	1430	409165	4557448.	55.209
15	0.017838	0.982161	81118	1447	401972.5	4148283.	51.139
20	0.022404	0.977595	79671	1785	393892.5	3746310.	47.022
25	0.025909	0.974090	77886	2018	384385	3352418.	43.043
30	0.001344	0.998655	75868	102	379085	2968033.	39.121
35	0.031372	0.968627	75766	2377	372887.5	2588948.	34.171
40	0.036653	0.963346	73389	2690	360220	2216060.	30.196
45	0.041415	0.958584	70699	2928	346175	1855840.	26.249
50	0.054064	0.945935	67771	3664	329695	1509665.	22.275
55	0.072285	0.927714	64107	4634	308950	1179970.	18.406
60	0.106989	0.893010	59473	6363	281457.5	871020.6	14.646
65	0.163264	0.836735	53110	8671	243872.5	589563.1	11.101
70	0.248407	0.751592	44439	11039	194597.5	345690.6	7.778
75+	1	0	33400	33400	151093.1	151093.1	4.523

ble 3.32:
le Life Table for Kenya 1979, by Patching Method.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.10218	0.89782	100000	10218	92847.4	5078726.	50.787
1	0.067396	0.932603	89782	6051	342790.3	4985879.	55.533
5	0.029738	0.970261	83731	2490	412430	4643089.	55.452
10	0.016395	0.983604	81241	1332	402875	4230659.	52.075
15	0.020823	0.979176	79909	1664	395385	3827784.	47.902
20	0.029714	0.970285	78245	2325	385412.5	3432399.	43.867
25	0.031072	0.968927	75920	2359	373702.5	3046986.	40.134
30	0.033196	0.966803	73561	2442	361700	2673284.	36.341
35	0.037430	0.962569	71119	2662	348940	2311584.	32.503
40	0.035306	0.964693	68457	2417	336242.5	1962644.	28.669
45	0.054027	0.945972	66040	3568	321280	1626401.	24.627
50	0.071568	0.928431	62472	4471	301182.5	1305121.	20.891
55	0.093050	0.906949	58001	5397	276512.5	1003939.	17.309
60	0.132575	0.867424	52604	6974	245585	727426.7	13.828
65	0.191452	0.808547	45630	8736	206310	481841.7	10.559
70	0.282349	0.717650	36894	10417	158427.5	275531.7	7.468
75+	1	0	26477	26477	117104.2	117104.2	4.423

Table 3.33. Life Table for Kenya, (Combined Sexes)
1969 census.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.11788	0.88212	100000	11788	91748.4	4799227.	47.99
1	0.089160	0.910839	88212	7865	331612.5	4707478.	53.37
5	0.040549	0.959450	80347	3258	393590	4375866.	54.46
10	0.021092	0.978907	77089	1626	381380	3982276.	51.66
15	0.024078	0.975921	75463	1817	372772.5	3600896.	47.72
20	0.031379	0.968620	73646	2311	362452.5	3228123.	43.83
25	0.034387	0.965612	71335	2453	350542.5	2865671.	40.83
30	0.027989	0.972010	68882	1928	339590	2515128.	36.51
35	0.025151	0.974848	66954	1684	330560	2175538.	32.49
40	0.047786	0.952213	65270	3119	318552.5	1844978.	28.27
45	0.055316	0.944683	62151	3438	302160	1526426.	24.27
50	0.070989	0.929010	58713	4168	283145	1224266.	20.85
55	0.093005	0.906994	54545	5073	260042.5	941121.3	17.25
60	0.132681	0.867318	49472	6564	230950	681078.8	13.77
65	0.194112	0.805887	42908	8329	193717.5	450128.8	10.49
70	0.286821	0.713178	34579	9918	148100	256411.3	7.42
75+	1	0	24661	24661	108311.3	108311.3	4.39

Table 3.34. Life Table for Kenya, (Combined Sexes)
1979 census.

AGE(x)	nQ(x)	nP(x)	l(x)	nd(x)	nL(x)	T(x)	e(x)
0	0.10149	0.89851	100000	10149	92895.7	5129619.	51.29
1	0.072931	0.927068	89851	6553	341710.9	5036724.	56.05
5	0.031741	0.968258	83298	2644	409880	4695013.	56.36
10	0.017668	0.982331	80654	1425	399707.5	4285133.	53.12
15	0.020888	0.979111	79229	1655	392007.5	3885425.	49.04
20	0.027457	0.972542	77574	2130	382545	3493418.	45.03
25	0.030048	0.969951	75444	2267	371552.5	3110873.	41.23
30	0.018175	0.981824	73177	1330	362560	2739320.	37.43
35	0.036243	0.963756	71847	2604	352725	2376760.	33.08
40	0.035873	0.964126	69243	2484	340005	2024035.	29.23
45	0.049521	0.950478	66759	3306	325530	1684030.	25.22
50	0.064693	0.935306	63453	4105	307002.5	1358500.	21.41
55	0.084956	0.915043	59348	5042	284135	1051498.	17.72
60	0.122546	0.877453	54306	6655	254892.5	767363.3	14.13
65	0.180940	0.819059	47651	8622	216700	512470.8	10.75
70	0.269825	0.730174	39029	10531	168817.5	295770.8	7.57
75+	1	0	28498	28498	126953.3	126953.3	4.45

CHAPTER IV

ESTIMATION OF ADULT MORTALITY AT THE DISTRICT LEVEL:

Intrduction.

In the previous two Chapters, two techniques of adult mortality estimation have been discussed, namely, the Brass-Hill method and the Trussell-Hill method. These techniques have been applied on the maternal and paternal orphanhood data at the national level. In some cases the proportions of respondents with a surviving mother or father were adjusted to take care of the changing mortality and fertility patterns over the decade. Again two adjustment procedures were discussed and applied on both the maternal and paternal orphanhood data at the national level. These adjustment techniques are, the Age Specific growth rate and the Synthetic Cohort approach. Having obtained the conditional life table survivorship probabilities, information on child mortality was then used in constructing patched life tables for Kenya, both for females and males.

In this chapter, we have applied the Brass-Hill method to maternal and paternal orphanhood data of the 1979 census, at the district level. Since the procedure of calculating the conditional probabilities of survival from the proportions of respondents with a surviving mother or father has been explain--ed in chapter III, we have only presented the results in tables. In each table we have the following values; the proportions of respondents (combined sexes) with a surviving mother and father are shown in columns (2) and (3) followed by their difference in column (4). In column (5) we have the e(x) values (life expectancies at all ages) estimated by Kichamu (1986) based on child mortality, while in column (6) we have the life expectancies estimated from data based on orphanhood information combined with those on child mortality. Column (7) gives the dofference between the two sets of life expectancies.

MORTALITY ESTIMATION IN NAIROBI:

The proportion of respondents with mother alive is found to be greater than that of respondents with father alive. The differences between these proportions increase gradually with age then start decreasing from age 45 onwards. The life expectancies are lower than those of Kichamu. Further we can take the diference in proportions at age group 0-4 as a measure of the adoption effect. This difference is found to be 0.0335 in Nairobi. Looking at the e(x) values we find that the life expectancy at birth for Nairobi is estimated at 56.824, while Kichamu's e(o) is 57.127. The life expectancy for Nairobi is then slightly higher than the national value calculated in chapter III earlier. All the above values are shown in table 4.1 below.

Table 4.1 MORTALITY ESTIMATION IN NAIROBI.
Mean age at maternity/paternity are:M(f)=25.1 M(m)=34.7

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.995821	0.962317	0.033504	57.127	56.824	0.303
5-9	0.989	0.939353	0.049647	59.297	58.955	0.342
10-14	0.974029	0.897046	0.076983	55.447	55.098	0.349
15-19	0.950678	0.846655	0.104023	51.071	50.718	0.353
20-24	0.92746	0.804652	0.122808	46.81	46.451	0.359
25-29	0.886961	0.727272	0.159689	42.724	42.258	0.466
30-34	0.827885	0.62947	0.198415	38.626	38.252	0.374
35-39	0.751557	0.520858	0.230699	34.521	34.138	0.383
40-44	0.642997	0.395036	0.247961	30.427	30.032	0.395
45-49	0.531007	0.291566	0.239441	26.388	26.272	0.116
50-54	0.381369	0.182252	0.199117	22.382	22.284	0.098
55-59	0.274076	0.11905	0.155026	18.521	18.441	0.08
60-64	0.156194	0.068466	0.087728	14.756	14.693	0.063
65-69	0.107243	0.052739	0.054504	11.204	11.159	0.045
70-74	0.08286	0.065155	0.017705	7.851	7.824	0.027
75+	-	-	-	4.553	4.544	0.009

MORTALITY ESTIMATION IN CENTRAL PROVINCE.

In central province the proportion of respondents with mother alive is greater than that of respondents with father alive for each age group. The differences in these proportions are quite substantial particularly in Kiambu and Nyandarua followed by Nyeri, Murang'a and Kirinyaga in that order. They increase with age upto the age group 40-44, after which they start decreasing.

The life expectancies are generally higher than those of Kichamu for Murang'a, Nyandarua and Nyeri while the rest of the districts, that is, Kiambu and Kirinyaga the opposite is the case.

Apart from Nyeri, the pattern of the differences (in absolute value) in life expectancies from the two sets of life expectancies is similar to that of the difference of the proportions of respondents with mother and father alive. The life expectancy at birth is highest in Nyeri (60.45), Nyandarua (60.18), followed by Murang'a (58.67), Kiambu (57.71) and lowest in Kirinyaga (55.59). Note that Nyeri has even the highest life expectancy at birth in the country. All these data is shown in tables 4.2, 4.3, 4.4, 4.5 and 4.6 for all the districts in central province, i.e, Kiambu, Kirinyaga, Murang'a Nyandarua and Nyeri respectively.

Table 4.2 MORTALITY ESTIMATION IN KIAMBU.
Mean age at maternity/paternity are:M(f)=27.1 M(m)=31.6

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.994369	0.925185	0.069184	58.751	57.705	1.046
5-9	0.989903	0.908226	0.081677	60.257	59.094	1.163
10-14	0.981981	0.885707	0.096274	56.274	55.091	1.183
15-19	0.968818	0.858583	0.110235	51.835	50.639	1.196
20-24	0.937562	0.804562	0.133	47.516	46.304	1.212
25-29	0.896827	0.721168	0.175659	43.364	42.129	1.235
30-34	0.83747	0.613704	0.223766	39.203	37.941	1.262
35-39	0.775324	0.508926	0.266398	35.031	33.742	1.289
40-44	0.676156	0.398242	0.277914	30.868	29.54	1.328
45-49	0.550585	0.292569	0.258016	26.765	26.347	0.418
50-54	0.413712	0.166837	0.246875	22.697	22.347	0.35
55-59	0.288419	0.094306	0.194113	18.782	18.493	0.289
60-64	0.162006	0.055248	0.106758	14.959	14.734	0.225
65-69	0.097324	0.036361	0.060963	11.348	11.188	0.16
70-74	0.055411	0.035045	0.020366	7.938	7.842	0.096
75+	-	-	-	4.582	4.551	0.031

Table 4.3 MORTALITY ESTIMATION IN KIRINYAGA.
Mean age at maternity/paternity are:M(f)=27.5 M(m)=32.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.99387	0.94566	0.04821	56.135	55.591	0.544
5-9	0.987649	0.929991	0.057658	58.722	58.103	0.619
10-14	0.97901	0.905271	0.073739	54.956	54.324	0.632
15-19	0.964998	0.865362	0.099636	50.62	49.979	0.641
20-24	0.927592	0.800432	0.12716	46.393	45.742	0.651
25-29	0.871268	0.712352	0.158916	42.346	41.681	0.665
30-34	0.782506	0.58458	0.197926	38.29	37.609	0.681
35-39	0.709202	0.484157	0.225045	34.225	33.526	0.699
40-44	0.588796	0.361087	0.227709	30.171	29.452	0.719
45-49	0.475591	0.259635	0.215956	26.171	25.954	0.217
50-54	0.317245	0.147734	0.169511	22.201	22.018	0.183
55-59	0.236482	0.103806	0.132676	18.371	18.221	0.15
60-64	0.135537	0.060768	0.074769	14.64	14.523	0.117
65-69	0.092741	0.043357	0.049384	11.121	11.037	0.084
70-74	0.05525	0.040095	0.015155	7.802	7.751	0.051
75+	-	-	-	4.536	4.518	0.018

Table 4.4 MORTALITY ESTIMATION IN MURANGA
Mean age at maternity/paternity are:M(f)=27.8 M(m)=35.82

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.994535	0.940049	0.054486	58.33	58.665	-0.335
5-9	0.988672	0.930568	0.058104	60.011	60.385	-0.374
10-14	0.981723	0.906472	0.075251	56.062	56.444	-0.382
15-19	0.969426	0.870083	0.099343	51.64	52.025	-0.385
20-24	0.935562	0.798861	0.136701	47.336	47.727	-0.391
25-29	0.884754	0.696435	0.188319	43.201	43.599	-0.398
30-34	0.814318	0.5877	0.226618	39.055	39.462	-0.407
35-39	0.733564	0.468368	0.265196	34.901	35.317	-0.416
40-44	0.63396	0.346663	0.287297	30.756	31.183	-0.427
45-49	0.524503	0.245716	0.278787	26.669	26.801	-0.132
50-54	0.351254	0.13927	0.211984	22.617	22.727	-0.11
55-59	0.241784	0.085649	0.156135	18.716	18.806	-0.09
60-64	0.12542	0.045998	0.079422	14.908	14.978	-0.07
65-69	0.082317	0.034062	0.048255	11.312	11.362	-0.05
70-74	0.051272	0.034303	0.016969	7.916	7.946	-0.03
75+	-	-		4.575	4.585	-0.01

Table 4.5 MORTALITY ESTIMATION IN NYANDARUA.
Mean age at maternity/paternity are:M(f)=28.2 M(m)=35.7

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.994559	0.924721	0.069838	59.559	60.175	-0.616
5-9	0.989432	0.914288	0.075144	60.729	61.409	-0.68
10-14	0.982041	0.897165	0.084876	56.681	57.373	-0.692
15-19	0.968715	0.871161	0.097554	52.211	52.909	-0.698
20-24	0.936394	0.796369	0.140025	47.864	48.571	-0.707
25-29	0.893728	0.706723	0.187005	43.679	44.399	-0.72
30-34	0.834954	0.620377	0.214577	39.484	40.218	-0.734
35-39	0.773739	0.506783	0.266956	35.28	36.031	-0.751
40-44	0.677536	0.399409	0.278127	31.084	31.853	-0.769
45-49	0.571868	0.297533	0.274335	26.948	27.196	-0.248
50-54	0.396211	0.174684	0.221527	22.851	23.061	-0.21
55-59	0.282132	0.104067	0.178065	18.908	19.081	-0.173
60-64	0.161151	0.056875	0.104276	15.057	15.192	-0.135
65-69	0.095469	0.033695	0.061774	11.418	11.513	-0.095
70-74	0.063329	0.048623	0.014706	7.979	8.036	-0.057
75+	-	-	-	4.596	6.615	-2.019

Table 4.6 MORTALITY ESTIMATION IN NYERI.
Mean age at maternity/paternity are:M(f)=27.6 M(m)=34.0

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.994038	0.940463	0.053575	64.145	60.447	3.698
5-9	0.987963	0.922599	0.065364	63.436	62.205	1.231
10-14	0.979941	0.898095	0.081846	59.031	59.487	-0.456
15-19	0.966959	0.866803	0.100156	54.388	55.043	-0.655
20-24	0.936461	0.79679	0.139671	49.882	50.376	-0.494
25-29	0.885404	0.702906	0.182498	45.514	45.831	-0.317
30-34	0.820594	0.59696	0.223634	41.132	41.409	-0.277
35-39	0.749329	0.505454	0.243875	36.74	36.968	-0.228
40-44	0.635602	0.378716	0.256886	32.354	32.511	-0.157
45-49	0.528234	0.279898	0.248336	28.034	28.049	-0.015
50-54	0.361004	0.152512	0.208492	23.764	26.574	-2.81
55-59	0.242647	0.094783	0.147864	19.661	22.538	-2.877
60-64	0.143526	0.048809	0.094717	15.64	18.651	-3.011
65-69	0.088563	0.034141	0.054422	11.831	14.857	-3.026
70-74	0.047996	0.033326	0.01467	8.222	11.275	-3.053
75+	-	-	-	4.673	7.894	-3.221

MORTALITY ESTIMATION IN COAST PROVINCE.

Down at the coast, we have quite a different pattern from that of central province. First the difference in proportions of respondents with mother alive and father alive is quite minimal, though the proportions with mother alive are greater than those with father alive. This could be a clear indication of the adoption effect being more adhered to than in central province. Another interesting observation is that the difference in these proportions increases with age upto the age group 35-39 in all districts, except Mombasa and Tana River Taita Taveta has a pattern of its own because, like central province the adoption effect seems to less effective. Also in Taita Taveta the difference in proportions not orphaned rises upto age 30-34 then goes down at age group 35-39, and then for age group 40-44 it comes up again before decreasing from age group 45-49 onwards.

The life expectancies at all ages in Coast province are quite low as compared to other provinces in the country. In Kilifi the life expectancy at birth is estimated at 40.88 years and the values at other ages are lower than those of Kichamu upto age 45, then from age 50 onwards the life expectancies are higher. For Kwale the life expectancy at birth is 45.43 years and is higher than that of Kilifi. Infact the life expectancies at all ages for Kwale are greater than those estimated by Kichamu from child mortality data. Mombasa and Taita Taveta have the highest life expectancies at birth in Coast province as compared to other disricts within the province. Life expectancy for Mombasa town is 51.76 years while that of Taita Taveta is 51.69 years. Lamu has quite a low life expectancy at birth estimated at 44.06 years. The values of e(x) estimated by Kichamu are higher for Mombasa and Tana River but are lower for Lamu. The estimates for all the districts in Coast province are shown in tables 4.7, 4.8, 4.9, 4.10, 4.11 and 4.12 below.

Table 4.7 MORTALITY ESTIMATION IN KILIFI.
Mean age at maternity/paternity are:M(f)=26.1 M(m)=36.5

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.993546	0.9744	0.019146	41.365	40.882	0.483
5-9	0.986729	0.953268	0.033461	50.041	49.393	0.648
10-14	0.973972	0.925445	0.048527	47.634	46.951	0.683
15-19	0.950679	0.866803	0.083876	43.904	43.202	0.702
20-24	0.901483	0.771107	0.130376	40.186	39.462	0.724
25-29	0.849748	0.673825	0.175923	36.706	35.954	0.752
30-34	0.743915	0.523135	0.22078	33.227	32.441	0.786
35-39	0.668596	0.425974	0.242622	29.749	28.356	1.393
40-44	0.555843	0.316683	0.23916	26.297	24.776	1.521
45-49	0.477315	0.249169	0.228146	22.866	19.872	2.994
50-54	0.349631	0.161015	0.188616	19.422	20.239	-0.817
55-59	0.278033	0.123589	0.154444	16.059	16.737	-0.678
60-64	0.172949	0.07765	0.095299	12.827	13.351	-0.524
65-69	0.132879	0.060872	0.072007	9.804	10.169	-0.365
70-74	0.084236	0.055105	0.029131	6.982	7.179	-0.197
75+	-	-	-	4.226	4.225	0.001

Table 4.8 MORTALITY ESTIMATION IN KWALE.
Mean age at maternity/paternity are:M(f)=26.3 M(m)=35.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.992218	0.972604	0.019614	43.144	45.426	-2.282
5-9	0.980847	0.949899	0.030948	51.137	54.124	-2.987
10-14	0.964363	0.923114	0.041249	48.573	51.709	-3.136
15-19	0.937152	0.868944	0.068208	44.77	47.989	-3.219
20-24	0.884963	0.78914	0.095823	40.991	44.303	-3.312
25-29	0.820569	0.685044	0.135525	37.442	40.878	-3.436
30-34	0.714064	0.540337	0.173726	33.893	37.472	-3.579
35-39	0.644715	0.449813	0.194902	30.343	34.087	-3.744
40-44	0.524393	0.341833	0.18256	26.816	30.758	-3.942
45-49	0.442854	0.2668	0.176054	23.313	25.795	-2.482
50-54	0.329756	0.19701	0.132746	19.802	21.341	-1.539
55-59	0.265416	0.143574	0.121842	16.378	17.764	-1.386
60-64	0.185028	0.107063	0.077965	13.081	14.265	-1.184
65-69	0.148554	0.078538	0.070016	9.991	10.921	-0.93
70-74	0.098829	0.071593	0.027236	7.101	7.695	-0.594
75+	-	-	-	4.271	4.415	-0.144

Table 4.9 MORTALITY ESTIMATION IN LAMU
Mean age at maternity/paternity are:M(f)=26.6 M(m)=34.0

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU Combined Sexes e(x) (5)	MUDAKI Combined Sexes e(x) (6)	(5)-(6) Diff' in e(x) (7)
0-4	0.989993	0.972021	0.017972	43.513	44.059	-0.546
5-9	0.973258	0.943808	0.02945	51.368	52.079	-0.711
10-14	0.952517	0.910079	0.042438	48.773	49.519	-0.746
15-19	0.924523	0.861012	0.063511	44.955	45.721	-0.766
20-24	0.884342	0.773252	0.11109	41.163	41.951	-0.788
25-29	0.818404	0.670447	0.147957	37.601	38.416	-0.815
30-34	0.7374	0.541319	0.196081	34.037	34.886	-0.849
35-39	0.630205	0.42599	0.204215	30.472	31.361	-0.889
40-44	0.469679	0.268878	0.200801	26.929	27.864	-0.935
45-49	0.414285	0.214626	0.199659	23.411	23.683	-0.272
50-54	0.261821	0.129668	0.132153	19.886	20.117	-0.231
55-59	0.22721	0.09375	0.13346	16.449	16.645	-0.196
60-64	0.125486	0.055447	0.070039	13.137	13.292	-0.155
65-69	0.085436	0.050485	0.034951	10.033	10.146	-0.113
70-74	0.078895	0.050495	0.0284	7.127	7.199	-0.072
75+	-	-	-	4.281	4.307	-0.026

Table 4.10. MORTALITY ESTIMATION IN MOMBASA.
Mean age at maternity/paternity are:M(F)=25.1 M(m)=32.7

Age group	Proportions with: Mother alive	Father alive	Diff' in Proport--ions	KICHAMU Combined Sexes e(x)	MUDAKI Combined Sexes e(x)	(5)-(6) Diff' in e(x)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0-4	0.994794	0.983498	0.011296	52.603	51.755	0.848
5-9	0.987281	0.964041	0.02324	56.658	54.994	1.664
10-14	0.971484	0.925464	0.04602	53.199	51.421	1.778
15-19	0.941844	0.854348	0.087496	49.005	47.181	1.824
20-24	0.906041	0.780205	0.125836	44.902	42.973	1.929
25-29	0.855829	0.680215	0.175614	40.997	38.845	2.152
30-34	0.768051	0.55304	0.215011	37.084	34.755	2.329
35-39	0.674548	0.441959	0.232589	33.163	30.683	2.48
40-44	0.557913	0.318029	0.239884	29.256	26.617	2.639
45-49	0.446843	0.232444	0.214399	25.394	24.839	0.555
50-54	0.311995	0.15044	0.161555	21.549	21.086	0.463
55-59	0.214721	0.095228	0.119493	17.833	17.451	0.382
60-64	0.132253	0.06123	0.071023	14.221	13.922	0.299
65-69	0.107354	0.047182	0.060172	10.821	10.604	0.217
70-74	0.091875	0.077423	0.014452	7.619	7.485	0.134
75+	-	-	-	4.471	4.419	0.052

Table 4.11. MORTALITY ESTIMATION IN TAITA TAVETA.
Mean age at maternity/paternity are:M(f)=27.2 M(m)=34.6

Age group	Proportions with: Mother alive	Father alive	Diff' in Proport--ions	KICHAMU Combined Sexes e(x)	MUDAKI Combined Sexes e(x)	(5)-(6) Diff' in e(x)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0-4	0.993301	0.948421	0.04488	51.091	51.698	-0.607
5-9	0.986479	0.931756	0.054723	55.788	56.513	-0.725
10-14	0.974546	0.904043	0.070503	52.469	53.217	-0.748
15-19	0.956441	0.858618	0.097823	48.338	49.098	-0.76
20-24	0.916789	0.774004	0.142785	44.289	45.065	-0.776
25-29	0.851814	0.666777	0.185037	40.443	41.241	-0.798
30-34	0.763114	0.534649	0.228465	36.591	37.413	-0.822
35-39	0.649376	0.428059	0.221317	32.731	33.581	-0.85
40-44	0.532529	0.303584	0.228945	28.885	29.767	-0.882
45-49	0.432475	0.223931	0.208544	25.081	25.315	-0.234
50-54	0.284518	0.134416	0.150102	21.288	21.483	-0.195
55-59	0.200111	0.091963	0.108148	17.618	17.778	-0.16
60-64	0.118479	0.051396	0.067083	14.053	14.178	-0.125
65-69	0.085291	0.037793	0.047498	10.699	10.791	-0.092
70-74	0.069239	0.043889	0.02535	7.544	7.6001	-0.0561
75+	-	-	-	4.442	4.463	-0.021

Table 4.12. MORTALITY ESTIMATION IN TANA RIVER.
Mean age at maternity/paternity are:M(f)=26.9 M(m)=36.4

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.987331	0.975191	0.01214	43.358	42.031	1.327
5-9	0.968924	0.944806	0.024118	51.271	49.539	1.732
10-14	0.947658	0.898639	0.049019	48.689	46.871	1.818
15-19	0.902336	0.813093	0.089243	44.877	43.013	1.864
20-24	0.839497	0.717335	0.122162	41.091	39.173	1.918
25-29	0.764812	0.600273	0.164539	37.534	35.544	1.99
30-34	0.644561	0.452515	0.192046	33.976	31.904	2.072
35-39	0.558717	0.358178	0.200539	30.418	28.251	2.167
40-44	0.438481	0.223721	0.21476	26.882	24.602	2.28
45-49	0.381949	0.172059	0.20989	23.371	22.692	0.679
50-54	0.259419	0.095279	0.16414	19.851	19.274	0.577
55-59	0.183673	0.068707	0.114966	16.421	15.934	0.487
60-64	0.118631	0.044428	0.074203	13.114	12.728	0.386
65-69	0.083505	0.036119	0.047386	10.015	9.731	0.284
70-74	0.060191	0.044126	0.016065	7.117	6.935	0.182
75+	-	-	-	4.276	4.206	0.07

MORTALITY ESTIMATION IN EASTERN PROVINCE.

In the Eastern Province we also note the general relationship between the two proportions. It is clearly seen that the proportions of respondents with a surviving mother are greater than those of respondents with a surviving father. Taking these proportions at age group 0-4 as a measure of the adoption effect we find that this effect seems to be highest in Meru (0.0202) and lowest in Marsabit (0.0653). Embu, Isiolo, Kitui and Machakos have a moderate adoption effect.

The pattern of the proportion differences are the same as in other regions where the differences increase gradually upto the age group 40-44 after which there is also a gradual decrease. The exceptional districts are Isiolo and Marsabit where the increase is upto age 35-39. Then there is a decrease in age group 40-44, then an increase for the age group 45-49 before it falls. This could be due the quality of the data. Looking at the life expectancies in tables 4.13, 4.14, 4.15, 4.16, 4.17 and 4.18 it will be noticed that the life expectancy at birth for Meru is 56.571 years and for Embu it is 56.119 these are the highest in Eastern province, followed by Machakos with a life expectancy at birth of 55.918 years. Isiolo, Kitui and Marsabit have e(o) of 50.561, 48.117 and 49.572 years respectively.

Comparing these life expectancies with those of Kichamu (1986) which he estimated from Child mortality we find that for Embu, though Kichamu's values are higher than ours, the difference is quite small. For Isiolo, the first three age groups Kichamu's values are lower than ours, and for the rest of the age groups, however, Kichamu's values are higher than one year. These estimates are shown in tables 4.13, 4.14, 4.15 4.16, 4.17 and 4.18 below. In Kitui and Machakos our values are higher than those of Kichamu. In Marsabit and Meru the values of life expectancies obtained by Kichamu are much higher.

Table 4.13 MORTALITY ESTIMATION IN EMBU.
Mean age at maternity/paternity are:M(f)=27.9 M(m)=33.6

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994868	0.953571	0.041297	56.902	56.119	0.783
5-9	0.989038	0.938528	0.05051	59.167	58.283	0.884
10-14	0.979807	0.913577	0.06623	55.336	54.433	0.903
15-19	0.964098	0.873579	0.090519	50.968	50.055	0.913
20-24	0.922204	0.798144	0.12406	46.715	45.787	0.928
25-29	0.857092	0.683576	0.173516	42.637	41.691	0.946
30-34	0.760721	0.563162	0.197559	38.55	37.582	0.968
35-39	0.668208	0.447645	0.220563	34.454	33.462	0.992
40-44	0.575601	0.338071	0.23753	30.368	29.501	0.867
45-49	0.483023	0.342432	0.140591	26.339	26.032	0.307
50-54	0.327615	0.140076	0.187539	22.341	22.084	0.257
55-59	0.223827	0.091879	0.131948	18.487	18.275	0.212
60-64	0.144625	0.062447	0.082178	14.729	14.565	0.164
65-69	0.106421	0.053662	0.052759	11.185	11.067	0.118
70-74	0.061732	0.043972	0.01776	7.84	7.769	0.071
75+	-	-		4.549	4.524	0.025

Table 4.14 MORTALITY ESTIMATION IN ISIOLO.
Mean age at maternity/paternity are:M(f)=26.4 M(m)=36.4

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.981344	0.944357	0.036987	50.093	50.561	-0.468
5-9	0.963235	0.893693	0.069542	55.204	55.321	-0.117
10-14	0.918454	0.816928	0.101526	51.978	52.001	-0.023
15-19	0.857927	0.694908	0.163019	47.887	45.961	1.926
20-24	0.803641	0.584284	0.219357	43.874	42.285	1.589
25-29	0.756294	0.5073	0.248994	40.068	39.901	0.167
30-34	0.652343	0.369386	0.282957	36.256	35.071	1.185
35-39	0.568898	0.266039	0.302859	32.437	31.302	1.135
40-44	0.437851	0.163682	0.274169	28.632	27.823	0.809
45-49	0.40285	0.100449	0.302401	24.868	23.013	1.855
50-54	0.254957	0.071378	0.183579	21.111	20.696	0.415
55-59	0.18875	0.048811	0.139939	17.469	16.447	1.022
60-64	0.096205	0.040595	0.05561	13.937	12.338	1.599
65-69	0.06906	0.027548	0.041512	10.615	9.439	1.176
70-74	0.054323	0.029966	0.024357	7.492	6.747	0.745
75+	-	-	-	4.422	4.132	0.29

Table 4.15 MORTALITY ESTIMATION IN KITUI.
Mean age at maternity/paternity are:M(f)=27.4 M(m)=37.7

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.992416	0.948272	0.044144	47.096	48.117	-1.021
5-9	0.983063	0.924989	0.058074	53.491	54.765	-1.274
10-14	0.970828	0.897093	0.073735	50.561	51.886	-1.325
15-19	0.949911	0.851461	0.09845	46.598	47.952	-1.354
20-24	0.901517	0.76219	0.139327	42.687	44.075	-1.388
25-29	0.840747	0.648193	0.192554	38.996	40.428	-1.432
30-34	0.737736	0.491915	0.245821	35.299	36.783	-1.484
35-39	0.658435	0.394495	0.26394	31.598	33.141	-1.543
40-44	0.565378	0.297689	0.267689	27.913	29.526	-1.613
45-49	0.474856	0.224928	0.249928	24.259	24.671	-0.412
50-54	0.348216	0.137614	0.210602	20.603	20.946	-0.343
55-59	0.239074	0.08436	0.154714	17.051	17.334	-0.283
60-64	0.143198	0.05314	0.090058	13.609	13.832	-0.223
65-69	0.102888	0.046568	0.05632	10.377	10.538	-0.161
70-74	0.072089	0.045772	0.026317	7.344	7.445	-0.101
75+	-	-	-	4.363	4.403	-0.04

Table 4.16 MORTALITY ESTIMATION IN MACHAKOS.
Mean age at maternity/paternity are:M(f)=27.4 M(m)=34.6

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.993561	0.947861	0.0457	54.86	55.918	-1.058
5-9	0.986631	0.932756	0.053875	57.971	59.188	-1.217
10-14	0.978305	0.910799	0.067506	54.313	55.561	-1.248
15-19	0.964007	0.876292	0.087715	50.026	51.291	-1.265
20-24	0.928534	0.80008	0.128454	45.845	47.131	-1.286
25-29	0.878753	0.70141	0.177343	41.849	43.165	-1.316
30-34	0.80066	0.574405	0.226255	37.845	39.194	-1.349
35-39	0.730099	0.470064	0.260035	33.833	35.219	-1.386
40-44	0.64126	0.363731	0.277529	29.831	31.262	-1.431
45-49	0.554339	0.286505	0.267834	25.883	26.301	-0.418
50-54	0.412393	0.180557	0.231836	21.958	22.308	-0.35
55-59	0.31655	0.122868	0.193682	18.171	18.486	-0.315
60-64	0.214188	0.075784	0.138404	14.484	14.715	-0.231
65-69	0.15822	0.057957	0.100263	11.009	11.175	-0.166
70-74	0.096015	0.052354	0.043661	7.734	7.837	-0.103
75+	-	-	-	4.512	4.547	-0.035

Table 4.17 MORTALITY ESTIMATION IN MARSABIT.
Mean age at maternity/paternity are:M(f)=27.9M(m)=41.3

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.988111	0.922826	0.065285	51.051	49.572	1.479
5-9	0.970427	0.854864	0.115563	56.034	55.078	0.956
10-14	0.946967	0.783017	0.16395	52.672	51.978	0.694
15-19	0.905724	0.677879	0.227845	48.523	47.848	0.675
20-24	0.856161	0.582463	0.273698	44.459	43.617	0.842
25-29	0.793511	0.481573	0.311938	40.597	39.454	1.143
30-34	0.701003	0.344475	0.356528	36.729	35.456	1.273
35-39	0.616304	0.271312	0.344992	32.851	31.434	1.417
40-44	0.545961	0.177277	0.368684	28.988	27.384	1.604
45-49	0.467778	0.121361	0.346417	25.168	23.316	1.852
50-54	0.351254	0.068181	0.283073	21.361	20.504	0.857
55-59	0.263317	0.047791	0.215526	17.678	16.516	1.162
60-64	0.185891	0.031935	0.153956	14.101	13.191	0.91
65-69	0.107023	0.026755	0.080268	10.733	10.072	0.661
70-74	0.061855	0.025493	0.036362	7.565	7.152	0.413
75+	-	-	-	4.451	4.289	0.162

Table 4.18 MORTALITY ESTIMATION IN MERU.
Mean age at maternity/paterM(f)=26.9 M(m)=33.5

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.992655	0.972474	0.020181	58.325	56.751	1.574
5-9	0.987079	0.955894	0.031185	59.008	57.738	1.27
10-14	0.978721	0.930175	0.048546	55.061	52.859	2.202
15-19	0.957311	0.886471	0.07084	50.638	49.461	1.177
20-24	0.911935	0.810697	0.101238	47.334	45.163	2.171
25-29	0.846233	0.712499	0.133734	43.199	42.023	1.176
30-34	0.750575	0.580021	0.170554	39.054	36.865	2.189
35-39	0.650347	0.464077	0.18627	34.901	33.687	1.214
40-44	0.523094	0.338073	0.185021	30.755	29.505	1.25
45-49	0.396245	0.233636	0.162609	26.668	25.143	1.525
50-54	0.262163	0.138132	0.124031	22.617	21.341	1.276
55-59	0.193575	0.096415	0.09716	18.715	17.661	1.054
60-64	0.124948	0.074052	0.050896	14.907	14.086	0.821
65-69	0.090571	0.055762	0.034809	11.312	10.723	0.589
70-74	0.081102	0.073839	0.007263	7.916	7.559	0.357
75+	-	-	-	4.575	4.447	0.128

MORTALITY ESTIMATION IN NORTH EASTERN PROVINCE.

This province has the highest adoption effect in the country and much higher than the Coast Province where it is highly practiced. This is indicated by the proportions at the age group 0-4. The relationship between the proportions of respondents with mother alive and father alive still holds as in the other provinces, that is, the proportion with mother alive is greater than that with father alive for each age group These proportions are shown in columns (2) and (3) of tables 4.19, 4.20 and table 4.21 for Garissa, Mandera and Wajir respectively. The pattern of proportion differences is similar to the general pattern of other procinces in the sense that these proportion differences increase gradually with age upto a given age group then they start decreasing as the age increases.

Wajir has a life expectancy at birth of 48.428 years while Garissa and Mandera each has an e(o) of 47.761 and 47.539 years respectively. The life expectancies at all ages obtained by Kichamu are much higher by 1 or 2 years. These estimates are again shown in tables 4.19, 4.20 and 4.21 for Garissa, Mandera and Wajir.

Table 4.19 MORTALITY ESTIMATION IN GARISSA.
Mean age at maternity/paternity are:M(f)=27.4 M(m)=35.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.984468	0.972922	0.011546	49.952	47.761	2.191
5-9	0.965921	0.944017	0.021904	55.124	52.477	2.647
10-14	0.934111	0.890142	0.043969	51.911	49.175	2.736
15-19	0.882745	0.801396	0.081349	47.827	45.041	2.786
20-24	0.816485	0.715761	0.100724	43.819	40.971	2.848
25-29	0.744796	0.620408	0.124388	40.019	37.862	2.157
30-34	0.622921	0.477664	0.145257	36.212	34.188	2.024
35-39	0.567152	0.386766	0.180386	32.399	30.251	2.148
40-44	0.454429	0.266691	0.187738	28.601	26.344	2.257
45-49	0.379721	0.211656	0.168065	24.841	23.945	0.896
50-54	0.285314	0.129744	0.15557	21.087	20.339	0.748
55-59	0.211666	0.094841	0.116825	17.451	16.831	0.62
60-64	0.136779	0.066811	0.069968	13.922	13.438	0.484
65-69	0.100471	0.066037	0.034434	10.604	10.253	0.351
70-74	0.078644	0.060897	0.017747	7.486	7.267	0.219
75+	-	-	-	4.419	4.332	0.087

Table 4.20 MORTALITY ESTIMATION IN MANDERA.
Mean age at maternity/paternity are:M(f)=28.3 M(m)=37.0

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.986352	0.970901	0.015451	48.565	47.539	1.026
5-9	0.965407	0.925981	0.039426	54.332	53.073	1.259
10-14	0.937961	0.868473	0.069488	51.256	49.951	1.305
15-19	0.893592	0.777977	0.115615	47.231	45.899	1.332
20-24	0.830785	0.681818	0.148967	43.272	41.908	1.364
25-29	0.778092	0.594889	0.183203	39.526	38.121	1.405
30-34	0.688044	0.461549	0.226495	35.774	34.322	1.452
35-39	0.617476	0.382604	0.234872	32.017	30.511	1.506
40-44	0.526212	0.282111	0.244101	28.274	26.703	1.571
45-49	0.451471	0.216216	0.235255	24.565	24.142	0.423
50-54	0.327161	0.119398	0.207763	20.858	20.505	0.353
55-59	0.233069	0.077464	0.155605	17.262	16.968	0.294
60-64	0.162073	0.063054	0.099019	13.775	13.546	0.229
65-69	0.151815	0.069078	0.082737	10.497	10.331	0.166
70-74	0.077822	0.060382	0.01744	7.419	7.315	0.104
75+	-	-	-	4.393	4.351	0.042

Table 4.21. MORTALITY ESTIMATION IN WAJIR.
Mean age at maternity/paternity are:M(f)=27.8 M(m)=36.5

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.984364	0.968276	0.016088	50.575	48.428	2.147
5-9	0.965478	0.932357	0.033121	52.216	51.007	1.209
10-14	0.931121	0.873585	0.057536	48.106	47.681	0.425
15-19	0.881612	0.791855	0.089757	44.076	43.528	0.548
20-24	0.813568	0.684053	0.129515	40.251	39.436	0.815
25-29	0.737303	0.599284	0.138019	36.419	35.519	0.9
30-34	0.631448	0.453343	0.178105	32.581	31.581	1
35-39	0.545689	0.384488	0.161201	28.756	27.614	1.142
40-44	0.458874	0.259425	0.199449	24.972	23.632	1.34
45-49	0.380406	0.198361	0.182045	22.106	22.036	0.07
50-54	0.255889	0.111651	0.144238	21.197	19.758	1.439
55-59	0.203952	0.073634	0.130318	17.542	16.341	1.201
60-64	0.112456	0.055142	0.057314	13.994	13.052	0.942
65-69	0.104225	0.049365	0.05486	10.656	9.969	0.687
70-74	0.058774	0.048013	0.010761	7.518	7.087	0.431
75+	-	-	-	4.432	4.265	0.167

4.6 MORTALITY ESTIMATION IN NYANZA PROVINCE.

Nyanza province is one of the regions in Kenya with relatively high mortality [Koyugi (1982), Kichamu (1986)]. As it appears from the e(x) values in tables 4.23 for Kisumu, 4.24 for Siaya and table 4.25 for South Nyanza, the life expectancies at birth are 43.974, 41.448 and 41.315 respectively. Kisii has a relatively low mortality as compared to the other districts in Nyanza province.

The proportions of respondents with mother alive are greater than those with father alive at each age group. The proportions not orphaned at age group 0-4 indicate that

Kisumu, Siaya and South Nyanza have a similar and moderate adoption effect while Kisii has a minimal adoption effect. The pattern of the differences in the proportions not orphaned follows that of the other regions. They increase with age upto age group 35-39 and then they start decreasing as the age increases.

As compared to Kichamu's e(x) values we find that the life expectancies for the three districts, Kisumu, Siaya and South Nyanza are higher than those of Kichamu, while those e(x) values for Kisii are lower than those of Kichamu. These estimates for Nyanza Province are shown in tables 4.22 4.23 4.24 and 4.25 below.

Table 4.22 MORTALITY ESTIMATION IN KISII.
Mean age at maternity/paternity are:M(f)=26.1 M(m)=33.8

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.993267	0.941882	0.051385	54.946	53.254	1.692
5-9	0.986304	0.927415	0.058889	58.022	56.076	1.946
10-14	0.974434	0.888129	0.086305	54.357	52.364	1.993
15-19	0.955302	0.829113	0.126189	50.067	48.047	2.02
20-24	0.917516	0.750878	0.166638	45.882	43.827	2.055
25-29	0.864996	0.646752	0.218244	41.883	39.781	2.102
30-34	0.779512	0.521517	0.257995	37.875	35.721	2.154
35-39	0.690177	0.412783	0.277394	33.861	31.644	2.217
40-44	0.589927	0.307143	0.282784	29.856	27.569	2.287
45-49	0.494294	0.232111	0.262183	25.903	25.238	0.665
50-54	0.346981	0.141038	0.205943	21.975	21.419	0.556
55-59	0.246729	0.092483	0.154246	18.185	17.725	0.46
60-64	0.164691	0.065988	0.098703	14.495	14.137	0.358
65-69	0.055138	0.044695	0.010443	11.016	10.761	0.255
70-74	0.119076	0.056505	0.062571	7.739	7.581	0.158
75+	-	-	-	4.514	4.456	0.058

Table 4.23 MORTALITY ESTIMATION IN KISUMU.
Mean age at maternity/paternity are:M(f)=25.7 M(m)=35.1

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.992121	0.958061	0.03406	41.462	43.974	-2.512
5-9	0.982408	0.928429	0.053979	50.702	52.484	-1.782
10-14	0.969125	0.882007	0.087118	47.686	50.032	-2.346
15-19	0.941851	0.819361	0.12249	43.952	46.287	-2.335
20-24	0.895793	0.731421	0.164372	40.231	42.571	-2.34
25-29	0.844685	0.629491	0.215194	36.747	39.102	-2.355
30-34	0.741726	0.492531	0.249195	33.264	35.644	-2.38
35-39	0.636531	0.374587	0.261944	29.782	32.197	-2.415
40-44	0.495642	0.253611	0.242031	26.326	28.792	-2.466
45-49	0.366841	0.159492	0.207349	22.891	23.815	-0.924
50-54	0.210575	0.082013	0.128562	19.444	20.229	-0.785
55-59	0.137204	0.047655	0.089549	16.0777	16.739	-0.6613
60-64	0.078651	0.038191	0.04046	12.842	13.366	-0.524
65-69	0.047009	0.019843	0.027166	9.815	10.201	-0.386
70-74	0.049288	0.042403	0.006885	6.989	7.233	-0.244
75+	-	-	-	4.227	4.319	-0.092

Table 4.24. MORTALITY ESTIMATION IN SIAYA.
Mean age at maternity/paternity are:M(f)=26.8 M(m)=40.1

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.992564	0.960809	0.031755	40.277	41.448	-1.171
5-9	0.981893	0.933267	0.048626	49.357	50.828	-1.471
10-14	0.969111	0.891673	0.077438	47.047	48.599	-1.552
15-19	0.945997	0.826611	0.119386	43.361	44.961	-1.6
20-24	0.895049	0.715071	0.179978	39.681	41.329	-1.648
25-29	0.831467	0.580643	0.250824	36.244	37.937	-1.693
30-34	0.712039	0.426361	0.285678	32.808	34.565	-1.757
35-39	0.604595	0.319226	0.285369	29.374	31.216	-1.842
40-44	0.477745	0.207871	0.269874	25.968	27.913	-1.945
45-49	0.346897	0.133418	0.213479	22.582	23.451	-0.869
50-54	0.212242	0.072361	0.139881	19.181	19.899	-0.718
55-59	0.125538	0.043735	0.081803	15.856	16.408	-0.552
60-64	0.067215	0.025504	0.041711	12.665	13.064	-0.399
65-69	0.041034	0.021001	0.020033	9.683	9.953	-0.27
70-74	0.029861	0.020565	0.009296	6.905	7.073	-0.168
75+	-	-	-	4.195	4.261	-0.066

Table 4.25. MORTALITY ESTIMATION IN SOUTH NYANZA.
Mean age at Maternity/Paternity are:M(f)=26.1 M(m)=35.8

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.989829	0.951797	0.038032	39.476	41.315	-1.839
5-9	0.977461	0.922947	0.054514	48.861	50.904	-2.043
10-14	0.962267	0.880149	0.082118	46.623	48.778	-2.155
15-19	0.937752	0.822838	0.114914	42.969	45.196	-2.227
20-24	0.893601	0.736766	0.156835	39.317	41.605	-2.288
25-29	0.836873	0.633376	0.203497	35.911	38.199	-2.288
30-34	0.725763	0.482703	0.24306	32.507	34.844	-2.337
35-39	0.632748	0.376394	0.256354	29.106	31.543	-2.437
40-44	0.498822	0.259456	0.239366	25.734	28.296	-2.562
45-49	0.374832	0.174121	0.200711	22.381	23.397	-1.016
50-54	0.221677	0.092893	0.128784	19.009	19.859	-0.85
55-59	0.144959	0.057857	0.087102	15.712	16.389	-0.677
60-64	0.089249	0.044078	0.045171	12.551	13.061	-0.51
65-69	0.060559	0.032909	0.02765	9.598	9.957	-0.359
70-74	0.048155	0.034589	0.013566	6.851	7.077	-0.226
75+	-	-	-	4.173	4.261	-0.088

MORTALITY ESTIMATION IN RIFT VALLEY PROVINCE.

In the Rift Valley province, the level of mortality varies from one district to another. Most districts have a relatively low mortality. The average life expectancy at birth for the province is estimated at 52 years. Looking at each district we find that Uasin Gishu has the highest life expectancy at birth of 57.56 years. This is greater than the value obtained at the national level. The estimates for Uasin-Gishu district are shown in the table 4.26 below.

Table 4.26. MORTALITY ESTIMATION IN UASIN GISHU
Mean age at Maternity/Paternity are:M(f)=26.6 M(m)=33.7

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994399	0.962437	0.031962	56.679	57.562	-0.883
5-9	0.988556	0.943595	0.044961	59.021	60.038	-1.017
10-14	0.980461	0.923691	0.05677	55.226	56.246	-1.02
15-19	0.961416	0.883939	0.077477	50.868	51.901	-1.033
20-24	0.923974	0.823461	0.100513	46.622	47.671	-1.049
25-29	0.880456	0.738976	0.14148	42.554	43.625	-1.071
30-34	0.819371	0.632359	0.187012	38.475	39.571	-1.096
35-39	0.753181	0.521331	0.23185	34.388	35.512	-1.124
40-44	0.653518	0.405006	0.248512	30.312	31.468	-1.156
45-49	0.560523	0.310931	0.249592	26.291	26.643	-0.352
50-54	0.403769	0.196388	0.207381	22.301	22.596	-0.295
55-59	0.289093	0.127226	0.161867	18.454	18.698	-0.244
60-64	0.164963	0.082603	0.08236	14.704	14.894	-0.19
65-69	0.124835	0.062232	0.062603	11.166	11.302	-0.136
70-74	0.102661	0.078091	0.02457	7.829	7.911	-0.082
75+	-	-	-	4.545	4.573	-0.028

In columns (6) of table 4.26, the life expectancies at all ages for Uasin Gishu district are higher than those of Kichamu by a year or less. Since Kichamu's values were estimated from child mortality this difference could be due to an under estimation of chid deaths in the district.

From this table the proportion differences of respondents with mother alive in column (2) and those with father alive in column (3) are shown in column (4). The pattern is that these proportions increase gradually with age upto age group 45-49 then they start decreasing from age 50 onwards. The proportion difference at age group 0-4 shows that the adoption effect is moderate in the district.

The districts, Laikipia, Kericho, Nakuru, Narok, Kajiado and Trans Nzoia in the Rift Valley Province have a less varied mortality pattern. This is indicated by the life expectancies at birth. The table 4.27 here below shows that the life expectancy at birth in Laikipia district is estimated at 56.21 years. This value is lower than that estimated by Kichamu. Infact the e(x) values at all other ages are lower than those those of Kichamu.

The difference in the proportion of respondents with mother alive and those with father alive has a slightly different pattern from that of Uasin Gishu. This proportion difference increases with age upto age group 40-44 then starts decreasing from age 45 onwards. The adoption effect is quite low, this is shown by the difference in the proportions at age age group 0-4 which is 0.0537.

Table 4.27. MORTALITY ESTIMATION IN LAIKIPIA.
Mean age at Maternity/Paternity are:M(f)=27.3 M(m)=30.1

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.993892	0.940097	0.053795	58.929	56.211	2.718
5-9	0.988193	0.919043	0.06915	60.361	57.341	3.02
10-14	0.979653	0.897631	0.082022	56.364	53.291	3.073
15-19	0.958667	0.864872	0.093795	51.917	48.781	3.136
20-24	0.922118	0.792871	0.129247	47.593	44.443	3.15
25-29	0.870915	0.708207	0.162708	43.434	40.225	3.209
30-34	0.806744	0.588474	0.21827	39.264	35.991	3.273
35-39	0.736654	0.494634	0.24202	35.085	31.738	3.347
40-44	0.637553	0.367153	0.2704	30.915	27.483	3.432
45-49	0.512449	0.271751	0.240698	26.805	25.728	1.077
50-54	0.363841	0.165705	0.198136	22.731	21.829	0.902
55-59	0.278615	0.106721	0.171894	18.809	18.064	0.745
60-64	0.162238	0.069043	0.093195	14.981	14.401	0.58
65-69	0.118828	0.051664	0.067164	11.364	10.949	0.415
70-74	0.078551	0.070511	0.00804	7.947	7.698	0.249
75+	-	-	-	4.585	4.499	0.086

Table 4.28. MORTALITY ESTIMATION IN KERICHO
Mean age at Maternity/Paternity are:M(f)=26.2 M(m)=29.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994551	0.951818	0.042733	56.909	55.377	1.532
5-9	0.988671	0.933554	0.055117	59.171	57.441	1.73
10-14	0.978649	0.904948	0.073701	55.339	53.573	1.766
15-19	0.958142	0.856112	0.10203	50.971	49.184	1.787
20-24	0.922804	0.786705	0.136099	46.717	44.903	1.814
25-29	0.883013	0.699689	0.183324	42.641	40.788	1.853
30-34	0.823643	0.581721	0.241922	38.552	36.657	1.895
35-39	0.750676	0.477612	0.273064	34.456	32.514	1.942
40-44	0.659397	0.371369	0.288028	30.371	28.372	1.999
45-49	0.553525	0.276821	0.276704	26.341	25.737	0.604
50-54	0.403122	0.178319	0.224803	22.341	21.846	0.495
55-59	0.284527	0.106654	0.177873	18.488	18.071	0.417
60-64	0.180624	0.083369	0.097255	14.731	14.406	0.325
65-69	0.123386	0.055162	0.068224	11.185	10.953	0.232
70-74	0.088211	0.062133	0.026078	7.841	7.709	0.132
75+	-	-	-	4.549	4.501	0.048

Table 4.29. MORTALITY ESTIMATION IN NAKURU
Mean age at Maternity/Paternity are:M(f)=26.9 M(m)=29.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994646	0.936861	0.057785	55.592	55.362	0.23
5-9	0.989338	0.919811	0.069527	58.404	58.142	0.262
10-14	0.981257	0.898969	0.082288	54.685	54.416	0.269
15-19	0.962557	0.861543	0.101014	50.369	50.097	0.272
20-24	0.927535	0.804858	0.122677	46.161	45.885	0.276
25-29	0.880877	0.714323	0.166554	42.137	41.854	0.283
30-34	0.816234	0.602523	0.213711	38.103	37.813	0.29
35-39	0.746088	0.507092	0.238996	34.061	33.762	0.299
40-44	0.640338	0.388359	0.251979	30.028	29.722	0.306
45-49	0.539872	0.289431	0.250441	26.051	25.957	0.094
50-54	0.380822	0.175001	0.205821	22.099	22.021	0.078
55-59	0.275586	0.114255	0.161331	18.287	18.228	0.059
60-64	0.168118	0.077502	0.090616	14.575	14.525	0.05
65-69	0.106066	0.049946	0.05612	11.074	11.038	0.036
70-74	0.092497	0.062907	0.02959	7.773	7.752	0.021
75+	-	-	-	4.526	4.518	0.008

In tables 4.28 and 4.29 above we have presented the mortality estimates for Kericho and Nakuru. In these districts the life at birth is 55.38 and 55.35 years respectively. This values are slightly higher than the national figure. We could explain this by the fact that both Kericho and Nakuru are better placed in terms of agricultural productivity which may lead to better nutritional facilities in the districts. The e(x) values estimated by Kichamu from child mortality are even higher as compared to those in column (6) which were estimated from the adult mortality information.

Comparing the proportions of respondents with mother alive with those of respondents with father alive, we find that those with mother alive are higher. Their differences increase with age upto age group 40-44 in each case, then they start decreasing from age group 45-49 onwards. The adoption effect is quite low in these districts, the proportion difference at age group 0-4 are 0.0427 for Kericho and 0.0578 for Nakuru.

In tables 4.30 and 4.31 below we have also shown the mortality estimates for Narok and Kajiado. These districts have a similar pattern to that of Kericho and Nakuru. The life expectancy at birth in Narok is estimated to be 55.97 and that in Kajiado is estimated at 54.90. In table 4.32 we have the estimates for Trans Nzoia. The life expectancy at birth in Trans Nzoia is 54.74 years.

Table 4.30. MORTALITY ESTIMATION IN NAROK
Mean age at Maternity/Paternity are:M(f)=26.7 M(m)=32.2

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994571	0.946728	0.047843	56.888	55.965	0.923
5-9	0.990777	0.920126	0.070651	59.159	58.116	1.043
10-14	0.982391	0.887895	0.094496	55.329	54.265	1.064
15-19	0.969166	0.847372	0.121794	50.962	49.885	1.077
20-24	0.933521	0.785588	0.147933	46.709	45.615	1.094
25-29	0.896959	0.688973	0.207986	42.632	41.516	1.116
30-34	0.824776	0.568984	0.255792	38.545	37.404	1.141
35-39	0.747078	0.450224	0.296854	34.451	33.279	1.172
40-44	0.639776	0.340441	0.299335	30.365	29.161	1.204
45-49	0.530305	0.253373	0.276932	26.336	25.972	0.364
50-54	0.375238	0.162058	0.21318	22.338	22.032	0.306
55-59	0.278355	0.115164	0.163191	18.484	18.239	0.245
60-64	0.181818	0.089985	0.091833	14.728	14.533	0.195
65-69	0.133486	0.068474	0.065012	11.183	11.044	0.139
70-74	0.114708	0.093836	0.020872	7.839	7.755	0.084
75+	-	-	-	4.549	4.519	0.03

Table 4.31. MORTALITY ESTIMATION IN KAJIADO
Mean age at Maternity/Paternity are:M(f)=26.5 M(m)=32.0

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.995318	0.939633	0.055685	58.551	54.902	3.649
5-9	0.989975	0.909726	0.080249	60.141	56.073	4.068
10-14	0.982626	0.877993	0.104633	56.174	52.034	4.14
15-19	0.961764	0.827852	0.133912	51.743	47.532	4.211
20-24	0.924735	0.750808	0.173927	47.431	43.186	4.245
25-29	0.880791	0.646091	0.2347	43.287	38.961	4.326
30-34	0.797101	0.516354	0.280747	39.133	34.717	4.416
35-39	0.730707	0.396142	0.334565	34.969	30.453	4.516
40-44	0.634535	0.306918	0.327617	30.815	26.181	4.634
45-49	0.536861	0.233562	0.303299	26.72	25.274	1.446
50-54	0.370175	0.137781	0.232394	22.661	21.449	1.212
55-59	0.283167	0.099128	0.184039	18.751	17.751	1
60-64	0.180111	0.062373	0.117738	14.935	14.156	0.779
65-69	0.112998	0.047681	0.065317	11.331	10.774	0.557
70-74	0.089431	0.062153	0.027278	7.928	7.591	0.337
75+	-	-	-	4.579	4.459	0.12

Table 4.32. MORTALITY ESTIMATIONIN TRANS NZOIA
Mean age at Maternity/Paternity are:M(f)=26.6 M(m)=34.7

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994171	0.973752	0.020419	53.677	54.741	-1.064
5-9	0.987081	0.956928	0.030153	57.287	58.525	-1.238
10-14	0.976946	0.934689	0.042257	53.734	55.005	-1.271
15-19	0.956581	0.892697	0.063884	49.496	50.785	-1.289
20-24	0.913557	0.817855	0.095702	45.356	46.669	-1.313
25-29	0.857347	0.722381	0.134966	41.407	42.753	-1.346
30-34	0.779579	0.605591	0.173988	37.451	38.832	-1.381
35-39	0.705011	0.497346	0.207665	33.486	34.908	-1.422
40-44	0.605601	0.392165	0.213436	29.534	31.004	-1.47
45-49	0.510122	0.295982	0.21414	25.631	26.051	-0.42
50-54	0.369017	0.187443	0.181574	21.747	22.099	-0.352
55-59	0.266974	0.125115	0.141859	17.997	18.287	-0.29
60-64	0.149547	0.071914	0.077633	14.348	14.575	-0.227
65-69	0.110497	0.058322	0.052175	10.912	11.074	-0.162
70-74	0.096804	0.081115	0.015689	7.675	7.773	-0.098
75+	-	-	-	4.491	4.526	-0.035

The e(o) values for Narok and Kajiado in tables 4.30 and 4.31 are lower than those of Kichamu. In Kajiado the e(o) value is much lower, this could be due to the quality of the data in the district. The e(o) value in Trans Nzoia district is greater than that of Kichamu by about one year. The rest of the e(x) values in Narok and Kajiado are lower than those of Kichamu. For Trans Nzoia the e(x) values are all greater than those of Kichamu.

The difference in proportions of respondents with a surviving mother and a surviving father follow the same pattern. In Trans Nzoia, table 4.32 above, the difference in proportions increases with age upto age group 45-49, then they start decreasing from age 50 onwards, and in Narok, table 4.30, the difference in proportion increases with age upto age group 40-44 then they start decreasing from age 45 onwards, while in Kajiado, table 4.31, these proportions increase with age upto age group 35-39, which is qute low as compared to the rest, the they start decreasing from age 40 onwards. The proportion difference at age group 0-4 indicate that the adoption effcet is highest in Trans Nzoia and lowest in Kajiado, followed by Narok.

We now look at the districts, Nandi, Elgeyo/Marakwet, Samburu, Turkana, Baringo and West Pokot. The estimates that have been obtained in these districts are gievn in tables 4.33, 4.34, 4.35, 4.36, 4.37 and 4.38 in that order.

Table 4.33. MORTALITY ESTIMATION IN NANDI
Mean age at Maternity/Paternity are:M(f)=26.2 M(m)=29.8

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994605	0.969673	0.024932	54.032	53.916	0.116
5-9	0.988846	0.948381	0.040465	57.494	57.358	0.136
10-14	0.976836	0.921981	0.054855	53.909	53.771	0.138
15-19	0.956122	0.875807	0.080315	49.656	49.515	0.141
20-24	0.918476	0.803306	0.11517	45.504	45.361	0.143
25-29	0.874228	0.711126	0.163102	41.541	41.394	0.147
30-34	0.805788	0.592227	0.213561	37.571	37.419	0.152
35-39	0.744697	0.479855	0.264842	33.591	33.436	0.155
40-44	0.638581	0.363905	0.274676	29.623	29.463	0.16
45-49	0.553343	0.269821	0.283522	25.706	25.661	0.045
50-54	0.398319	0.154872	0.243447	21.811	21.773	0.038
55-59	0.288951	0.096947	0.192004	18.049	18.018	0.031
60-64	0.180968	0.065174	0.115794	14.391	14.365	0.026
65-69	0.123091	0.043668	0.079423	10.941	10.924	0.017
70-74	0.078472	0.048403	0.030069	7.693	7.682	0.011
75+	-	-	-	4.497	4.493	0.004

Table 4.34. MORTALITY ESTIMATION IN ELGEYO/MARAKWET
Mean age at Maternity/Paternity are:M(f)=26.6 M(m)=28.1

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport- -ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994371	0.979677	0.014694	50.547	51.703	-1.156
5-9	0.986273	0.961012	0.025261	55.471	56.859	-1.388
10-14	0.972248	0.934922	0.037326	52.203	53.636	-1.433
15-19	0.951271	0.893211	0.05806	48.093	49.552	-1.459
20-24	0.908141	0.824826	0.083315	44.064	45.247	-1.183
25-29	0.863837	0.731945	0.131892	40.241	41.431	-1.19
30-34	0.790171	0.613631	0.17654	36.411	37.611	-1.2
35-39	0.712785	0.518895	0.19389	32.572	34.094	-1.522
40-44	0.611274	0.382907	0.228367	28.748	30.329	-1.581
45-49	0.471291	0.256135	0.215156	24.965	25.385	-0.42
50-54	0.303828	0.150398	0.15343	21.192	21.542	-0.35
55-59	0.212226	0.095031	0.117195	17.538	17.827	-0.289
60-64	0.132034	0.055314	0.07672	13.991	14.216	-0.225
65-69	0.095805	0.045033	0.050772	10.654	10.817	-0.163
70-74	0.068234	0.050145	0.018089	7.517	7.617	-0.1
75+	-	-	-	4.431	4.469	-0.038

In Nandi and Elgeyo/Marakwet districts, the life expectancies at birth were found to be 53.92 and 51.70 years respectively, using the adult mortality information. However, the values estimated by Kichamu using child mortality data were found to be 54.03 for Nandi and 50.54 for Elgeyo/Marakwet. The tables show that Kichamu's values are higher than ours in Nandi district and lower than ours in Elgeyo/Marakwet district.

The differences in proportions not orphaned at age group 0-4 indicate that the adoption effect is highest in Elgeyo Marakwet (0.0146) and moderate in Nandi district (0.024) The diference in the proportions of the respondents with mother alive and those with father alive in the rest of the age groups show that the pattern is similar to that in other districts.

Table 4.35. MORTALITY ESTIMATION IN SAMBURU
Mean age at Maternity/Paternity are:M(f)=27.7 M(m)=39.8

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.991821	0.926198	0.065623	58.398	53.891	4.507
5-9	0.983091	0.881078	0.102013	60.051	55.021	5.03
10-14	0.975305	0.842562	0.132743	56.097	50.976	5.121
15-19	0.954721	0.780151	0.17457	51.671	46.472	5.199
20-24	0.914208	0.690114	0.224094	47.365	42.114	5.251
25-29	0.864424	0.585104	0.27932	43.227	37.875	5.352
30-34	0.783333	0.456041	0.327292	39.079	33.615	5.464
35-39	0.731121	0.350569	0.380552	34.922	29.332	5.59
40-44	0.608929	0.234501	0.374428	30.774	25.037	5.737
45-49	0.504676	0.163374	0.341302	26.685	24.901	1.784
50-54	0.382792	0.086038	0.296754	22.631	21.138	1.493
55-59	0.287211	0.060139	0.227072	18.727	17.493	1.234
60-64	0.185059	0.054421	0.130638	14.916	13.955	0.961
65-69	0.117647	0.032369	0.085278	11.318	10.628	0.69
70-74	0.057781	0.034857	0.022924	7.921	7.5001	0.4209
75+	-	-	-	4.576	4.425	0.151

Table 4.35 above shows the mortality estimates for for Samburu district. These estimates could be criticised due to the data quality. This is because the population living in this district is a nomadic one and therefore the mortality data collected could highly erroneous. However, from the available data sets it was found that the life expectancy at birth in the district was estimated at 53.89 years. This value is abit too high. Kichamu's value for e(o) is even much higher than ours, he found it to be 58.39 years.

Adoption effect in this area is quite low; the proportions differences follow the same pattern as in other regions.

Table 4.36. MORTALITY ESTIMATION IN TURKANA.
Mean age at Maternity/Paternity are:M(f)=27.5 M(m)=36.5

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.984237	0.933913	0.050324	49.621	47.587	2.034
5-9	0.973901	0.904619	0.069282	54.937	52.472	2.465
10-14	0.951467	0.865425	0.086042	51.757	49.206	2.551
15-19	0.905352	0.781076	0.124276	47.687	45.088	2.599
20-24	0.815498	0.654872	0.160626	43.691	41.033	2.658
25-29	0.715855	0.536724	0.179131	39.904	37.168	2.736
30-34	0.599171	0.417938	0.181233	36.001	33.286	2.715
35-39	0.519505	0.349819	0.169686	32.021	29.658	2.363
40-44	0.404274	0.265772	0.138502	28.524	26.075	2.449
45-49	0.324057	0.209293	0.114764	24.776	23.873	0.903
50-54	0.248655	0.147173	0.101482	21.033	20.279	0.754
55-59	0.202074	0.118951	0.083123	17.407	16.779	0.628
60-64	0.143949	0.098915	0.045034	13.888	13.398	0.49
65-69	0.130885	0.092365	0.03852	10.579	10.223	0.356
70-74	0.147217	0.127697	0.01952	7.471	7.248	0.223
75+	-	-	-	4.413	4.325	0.088

Table 4.37. MORTALITY ESTIMATION IN BARINGO
Mean age at Maternity/Paternity are:M(f)=26.5 M(m)=30.3

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.991875	0.964282	0.027593	45.103	45.362	-0.259
5-9	0.980321	0.938253	0.042068	52.343	52.675	-0.332
10-14	0.964288	0.904248	0.06004	49.609	49.955	-0.346
15-19	0.932791	0.838914	0.093877	45.726	46.082	-0.356
20-24	0.875788	0.743966	0.131822	41.881	42.245	-0.364
25-29	0.825839	0.639611	0.186228	38.257	38.634	-0.377
30-34	0.737386	0.513251	0.224135	34.631	35.022	-0.391
35-39	0.652131	0.411334	0.240797	31.002	31.411	-0.409
40-44	0.535341	0.307272	0.228069	27.393	27.822	-0.429
45-49	0.411629	0.194098	0.217531	23.813	23.932	-0.119
50-54	0.281887	0.125319	0.156568	20.227	20.328	-0.101
55-59	0.193098	0.076181	0.116917	16.737	16.821	-0.084
60-64	0.126958	0.054131	0.072827	13.364	13.431	-0.067
65-69	0.091101	0.038608	0.052493	10.199	10.248	-0.049
70-74	0.063597	0.048195	0.015402	7.233	7.263	-0.03
75+	-	-	-	4.319	4.331	-0.012

The tables 4.36 and 4.37 above give the estimates obtained in Turkana and Baringo district. From these tables in column (6) we have the life expectancies at all ages. The life expectanccy at birth for Turkana is 47.59 and that for Baringo is 45.36 years. This indicate that mortality is quite high in these districts though not as high as in Coast and Nyanza Provinces. The e(o) values obtained by Kichamu are also given in column (5) and he found that for Turkana e(o) is 49.62 and that of Baringo is 45.10 years. In Baringo, Kichamu's values for e(x) are lower than ours, while in Turkana the opposite is the case. West Pokot is also among those regions with a relatively high mortality rate. In table 4.38 below column (6), the life expectancy at birth is 43.41 years. The e(o) estimated from

Table 4.38. MORTALITY ESTIMATION IN WEST POKOT.
Mean age at Maternity/Paternity are:M(f)=26.7 M(m)=35.8

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport-ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.991461	0.974571	0.01689	42.255	43.407	-1.152
5-9	0.980801	0.946563	0.034238	50.592	52.118	-1.526
10-14	0.963693	0.911317	0.052376	48.107	49.712	-1.605
15-19	0.934365	0.844123	0.090242	44.341	45.989	-1.648
20-24	0.871113	0.729781	0.141332	40.591	42.289	-1.698
25-29	0.805505	0.616619	0.188886	37.077	38.841	-1.764
30-34	0.701661	0.481891	0.21977	33.563	35.403	-1.84
35-39	0.639993	0.396027	0.243966	30.049	31.977	-1.928
40-44	0.517174	0.280325	0.236849	26.559	28.593	-2.034
45-49	0.419648	0.211048	0.2086	23.092	23.669	-0.577
50-54	0.280973	0.120458	0.160515	19.614	20.105	-0.491
55-59	0.193133	0.088793	0.10434	16.221	16.634	-0.413
60-64	0.126033	0.071133	0.0549	12.956	13.284	-0.328
65-69	0.093899	0.053293	0.040606	9.899	10.141	-0.242
70-74	0.069855	0.056273	0.013582	7.043	7.196	-0.153
75+	-	-	-	4.248	4.305	-0.057

child mortality is found to be 42.26 years. It can also be seen that Kichamu's e(x) values estimated from information on child mortality in column (5) are all lower than ours.

The proportions of respondents with mother alive and and respondents with father alive given in tables 4.36, 4.37 and 4.38 in columns (2) and (3) indicate that those proportions with mother alive are greater than those with father alive. The difference in these proportions, given in column (4) of the above tables follow a similar pattern. In Turkana, table 4.36, the proportion differences increase with age upto age group 30-34, then they start decreasing from age 35 onwards. In the other districts, Baringo and West Pokot, the proportion differences increase with age upto age group 35-39, which is higher than that in Turkana, then they start decreasing from age 40 onwards. At age group 0-4, the proportion difference for West Pokot is 0.0168, and for Baringo it is 0.0275, while that of Turkana is 0.0503. These indicate that the adoption effect is highest in West Pokot and Baringo and lowest in Turkana.

4.8 MORTALITY ESTIMATION IN WESTERN PROVINCE

Mortality in western province is not as high as in the neighbouring regions of Nyanza province, that is, Siaya, Kisumu and South Nyanza. This is indicated by the life expectancies at birth estimated in tables 4.39, 4.40 and 4.41 given below.

Table 4.39. MORTALITY ESTIMATION IN BUNGOMA.
Mean age at Maternity/Paternity are:M(f)=26.6 M(m)=34.9

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.994596	0.980675	0.013921	49.135	54.202	-5.067
5-9	0.986316	0.961445	0.024871	54.661	58.225	-3.564
10-14	0.973379	0.932133	0.041246	51.528	54.755	-3.227
15-19	0.952699	0.890945	0.061754	47.479	50.559	-3.08
20-24	0.918086	0.822967	0.095119	43.501	46.463	-2.962
25-29	0.870238	0.743268	0.12697	39.731	42.571	-2.84
30-34	0.808098	0.631492	0.176606	35.957	38.675	-2.718
35-39	0.732044	0.529588	0.202456	32.177	34.775	-2.598
40-44	0.643018	0.419448	0.22357	28.411	30.896	-2.485
45-49	0.535125	0.316137	0.218988	24.681	25.933	-1.252
50-54	0.391967	0.203191	0.188776	20.954	22.001	-1.047
55-59	0.250127	0.114009	0.136118	17.341	18.206	-0.865
60-64	0.138627	0.07005	0.068577	13.837	14.511	-0.674
65-69	0.091556	0.05172	0.039836	10.542	11.029	-0.487
70-74	0.066617	0.053221	0.013396	7.447	7.746	-0.299
75+	-	-	-	4.404	4.516	-0.112

In Bungoma, table 4.39 shows that the life expectancy at birth is estimated to be 54.20 years. This value is much higher than that estimated by Kichamu from child mortality. The rest of the e(x) values at all ages are also higher than those of Kichamu but the absolute difference gets smaller with age. The proportions of respondents with mother alive is greater than that of respondents with father alive, columns (2) and (3) of table 4.39. Adoption effect seems to be quite high in Bungoma since the proportion difference at age group 0-4 is 0.0139.

Table 4.40. MORTALITY ESTIMATION IN KAKAMEGA
Mean age at Maternity/Paternity are:M(f)=26.8 M(m)=35.6

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.992957	0.978158	0.014799	47.957	51.627	-3.67
5-9	0.986068	0.957713	0.028355	53.978	56.786	-2.808
10-14	0.975181	0.929866	0.045315	50.962	53.564	-2.602
15-19	0.955924	0.885897	0.070027	46.963	49.481	-2.518
20-24	0.91525	0.812943	0.102307	43.025	45.482	-2.457
25-29	0.866589	0.723986	0.142603	39.304	41.701	-2.397
30-34	0.782977	0.598412	0.184565	35.576	37.917	-2.341
35-39	0.681915	0.476604	0.205311	31.843	34.133	-2.29
40-44	0.571529	0.365048	0.206481	28.125	30.371	-2.246
45-49	0.460702	0.26788	0.192822	24.441	25.392	-0.951
50-54	0.312101	0.164573	0.147528	20.754	21.548	-0.794
55-59	0.209586	0.098733	0.110853	17.175	17.832	-0.657
60-64	0.113009	0.056497	0.056512	13.707	14.221	-0.514
65-69	0.072585	0.039085	0.0335	10.448	10.821	-0.373
70-74	0.050616	0.041841	0.008775	7.388	7.618	-0.23
75+	-	-	-	4.381	4.471	-0.09

Kakamega seems to have a similar mortality pattern to that of Bungoma. The life expectancy at birth in kakamega district is 51.63 years. This is approximately equal to that value estimated at the national level of 51.29 years.

The proportions not orphaned shown in columns (2) and (3) have a pattern similar to that of other districts, that is, those proportions with mother alive are greater than those with father alive at all ages. The difference in these proportions increase with age upto age group 40-44, then they decrease from age 45 onwards. The proportion difference at age group 0-4 is 0.0147 and this implies quite a high adoption effect in Kakamega district (table 4.40).

Table 4.41. MORTALITY ESTIMATION IN BUSIA
Mean age at Maternity/Paternity are:M(f)=26.2 M(m)=36.2

Age group (1)	Proportions with: Mother alive (2)	Father alive (3)	Diff' in Proport--ions (4)	KICHAMU e(x) Combined Sexes (5)	MUDAKI e(x) Combined Sexes (6)	Diff' in e(x) (5)-(6) (7)
0-4	0.991853	0.974658	0.017195	41.088	42.011	-0.923
5-9	0.975942	0.943941	0.032001	49.866	51.106	-1.24
10-14	0.95578	0.901898	0.053882	47.484	48.793	-1.309
15-19	0.923722	0.838433	0.085289	43.765	45.111	-1.346
20-24	0.868848	0.738866	0.129982	40.057	41.445	-1.388
25-29	0.806376	0.624178	0.182198	36.588	38.032	-1.444
30-34	0.685593	0.468486	0.217107	33.121	34.629	-1.508
35-39	0.592845	0.363477	0.229368	29.653	31.238	-1.585
40-44	0.464451	0.252191	0.21226	26.212	27.889	-1.677
45-49	0.364988	0.181666	0.183322	22.793	23.269	-0.476
50-54	0.225397	0.093365	0.132032	19.361	19.764	-0.403
55-59	0.133869	0.054854	0.079015	16.007	16.344	-0.337
60-64	0.067575	0.033493	0.034082	12.786	13.052	-0.266
65-69	0.043112	0.023402	0.01971	9.773	9.781	-0.008
70-74	0.039523	0.033161	0.006362	6.963	7.087	-0.124
75+	-	-	-	4.217	4.265	-0.048

The mortality estimates for Busia district are given in table 4.41 above. These estimates show that Busia has the highest mortality rate in western province. The life expectancy at birth in the district is 42.01 years. This approximately equal to that estimated in Siaya and South Nyanza districts. The e(x) values estimated here are all higher than those of Kichamu.

From table 4.41 above, the proportions of respondents a surviving mother are greater than those with a surviving father. The pattern of proportion differences follows that in Bungoma, and at age group 0-4, the proportion difference is 0.0171, this also implies that the adoption effect in Busia is quite high.

CHAPTER V

SUMMARY AND CONCLUSION

Introduction.

In this thesis a study of adult mortality based on orphanhood information has been carried out. Proportions of the respondents with mother alive and father alive have been calculated. Conditional probabilities of survival have also been calculated. As a pre-condition to estimating male adult probabilities of survival, the median ages at marriage and the mean age at maternity were required. These were used to calculate the mean age at paternity, after which the conditional probabilities of survival were calculated.

With the help of Coale-Demeny Life Tables, Kenya's Life tables were constructed using the information of both childhood and adulthood mortality. This work has been done at the national and district levels.

At the national level, both the Synthetic and the Age Specific Growth Rate techniques were used to adjust the proportions not orphaned allowing for the possible changes in mortality and fertility between 1969 and 1979. In applying the synthetic cohort approach, two sets of data are at either 5-years or 10-years apart. In our case, for the 5-years apart, the 1969 and 1979 sets of data were averaged to be the set of data for the synthetic (hypothetical) cohort for 1974.
The advantage of the age specific growth rate technique over the synthetic approach is that the time interval between two

have used the age specific growth rate technique on data which is 10 years apart, that is, the 1969 and 1979 censuses. If we used the 1962 and 1969 censuses, then the synthetic approach would fail to work since the intercensal period is 7 years instead of 5 or 10. In this thesis, these two adjustments are equally good.

The methods used for calculating conditional probabilities in this thesis are due to Brass-Hill and Trussell-Hill which give more or less the same results. Some of these results have been compared with those done by other colleagues in the Institute.

5.2 DISCUSSION AT THE NATIONAL LEVEL

What follows is the summary of both adjusted and un-adjusted proportions of respondents with mother alive and father alive at the national level. (Tables 5.1 and 5.2 below).

Table 5.1 KENYA
A summary of proportions of respondents with mother alive obtained by various techniques.

AGE GROUP	1969	1979	SYNTHETIC 10-Yr	COHORT 5-Yr	ASGR.
0-4	0.992168	0.993154	0.993154	0.993154	0.992907
5-9	0.980572	0.985257	0.985257	0.985746	0.984572
10-14	0.964359	0.973312	0.974279	0.975634	0.973866
15-19	0.930382	0.951511	0.956057	0.955917	0.953306
20-24	0.87774	0.910652	0.919106	0.920934	0.919367
25-29	0.806808	0.858825	0.878328	0.874778	0.877501
30-34	0.713472	0.774451	0.803490	0.799026	0.812425
35-39	0.62756	0.692742	0.737404	0.721738	0.753954
40-44	0.508782	0.579802	0.629356	0.609169	0.657738
45-49	0.396104	0.472275	0.521328	0.50416	0.5655
50-54	0.264609	0.328638	0.374512	0.358848	0.425321
55-59	0.202214	0.232259	0.276922	0.258838	0.341598
60-64	0.125967	0.138769	0.172347	0.148721	0.221028
65-69	0.099394	0.096775	0.111153	0.101573	0.166857
70+	0.068402	0.068387	0.075337	0.067479	0.115579

Table 5.2 KENYA
A summary of proportions of respondents with father alive obtained by various techniques.

AGE GROUP	1969	1979	SYNTHETIC 10-Yr	COHORT 5-Yr	ASGR.
0-4	0.954453	0.956334	0.956334	0.956334	0.955863
5-9	0.933932	0.93521	0.93521	0.936131	0.935811
10-14	0.88462	0.9038	0.905581	0.904418	0.900467
15-19	0.744118	0.854697	0.855866	0.863912	0.835895
20-24	0.739183	0.779289	0.796185	0.835187	0.834505
25-29	0.633434	0.683647	0.785239	0.701948	0.747291
30-34	0.511372	0.557028	0.587250	0.578685	0.631099
35-39	0.409568	0.450553	0.486268	0.470236	0.531455
40-44	0.294694	0.332543	0.362232	0.348784	0.408803
45-49	0.207148	0.242145	0.266376	0.257225	0.313437
50-54	0.14947	0.145649	0.164355	0.157472	0.213324
55-59	0.128535	0.094191	0.110104	0.092979	0.146238
60-64	0.103074	0.060153	0.058615	0.051493	0.084629
65-69	0.076821	0.044205	0.032393	0.033769	0.047678
70+	0.046698	0.048874	0.028522	0.037074	0.034433

In table 5.1, it is clearly seen that there is an increase in proportions of respondents with mother alive between 1969 and 1979. This has been justified by the two adjustment techniques; namely the Synthetic and Age specific growth rate technique. A similar situation holds true for the case of respondents with father alive shown in table 5.2 above. This clearly indicates that there has been a mortality decline between the ten year period of 1969 and 1979.

Between the two adjustment techniques, for ages less than 24 years the values obtained by the synthetic method are higher than those obtained by the other technique. However, for ages greater than 25 years, the values obtained by the age specific growth rate technique are higher.

From the two tables, 5.1 and 5.2 above, we now compare the proportions of respondents with mother alive and father alive age-wise. It is found that the former is greater than the latter. This implies that there are more widows than widowers and that male adult mortality seems to be much higher than female adult mortality.

As for the conditional probabilities of survival given in the tables 5.3 and 5.4 below, it is found that the values from the 1979 census are higher than those estimated from the 1969 census. This is also an indication of a decline in mortality within the ten year period.

Table 5.3 KENYA
A summary of conditional probabilities l(25+n)/l(25) corresponding to table 5.1. (Using Brass-Hill method).

AGE GROUP (1)	25+n (2)	1969 (3)	1979 (4)	SYNTHETIC 10-Yr (5)	COHORT 5-Yr (6)	ASGR. (7)
5	30					
10	35	0.974953	0.980774	0.981137	0.981951	0.980554
15	40	0.956478	0.967281	0.969238	0.970179	0.968179
20	45	0.923973	0.944074	0.949331	0.949549	0.847129
25	50	0.875113	0.904828	0.914524	0.915747	0.914663
30	55	0.808363	0.852666	0.872864	0.869248	0.87275
35	60	0.718186	0.770477	0.800275	0.795267	0.809581
40	65	0.630896	0.682715	0.727812	0.711744	0.745411
45	70	0.505494	0.562713	0.612187	0.59248	0.643079
50	75	0.368705	0.422559	0.470511	0.453864	0.61698
55	80	0.236385	0.271835	0.316995	0.299905	0.375977
60	85	0.148584	0.155529	0.191094	0.168461	0.242642

Note:- ASGR - is the Age Specific Growth Rate Technique.

Table 5.4 KENYA
A summary of conditional probabilities l(35+n)/l(35) corresponding to table 5.2. (Using the Brass-Hill method).

AGE GROUP	35+n	1969	1979	SYNTHETIC COHORT 10-Yr	5-Yr	ASGR.
5	40					
10	45	0.918988	0.922653	0.923364	0.923452	0.92168
15	50	0.86408	0.890074	0.891683	0.893095	0.882416
20	55	0.743822	0.837601	0.842335	0.8574	0.83558
25	60	0.736258	0.757472	0.793688	0.804793	0.814611
30	65	0.620065	0.640454	0.7177	0.6599	0.707655
35	70	0.48451	0.501029	0.534141	0.521648	0.578693
40	75	0.344412	0.352445	0.383151	0.369267	0.429488
45	80	0.215641	0.228616	0.252031	0.243523	0.299166
50	85	0.139995	0.110107	0.12678	0.120732	0.176451
55	90	0.121651	0.070142	0.084751	0.062839	0.114886

Next, we wish to compare the life expectancies obtained by the patching method with those constructed by;

(i) Nyokangi (1984) and Kizito (1985) who used two consecutive censuses with incomplete vital registration data in one case and two censuses only in the other case,

(ii) Kichamu (1986) who used the information on child mortality.

These e(x) values are shown in tables 5.5(a) and 5.5(b) below. In table 5.5(a), the technique used by Nyokangi and Kizito does not have values for e(o). So comparison can only be made from age 5 onwards.

For females, the e(x) values estimated in this thesis lie between those estimated by Nyokangi and Kizito, methods (i) and (ii), upto age 45. From age 50 onwards our e(x) values are lowest. Method (ii), however, gives a bit too high values at each age (except 70).

For males, our values lie between the values of the methods (i) and (ii) of Nyokangi/Kizito upto age 30 and are lowest for the rest of the ages. It is noticeable, however, that the values estimated in this study and those estimated by method (ii) for Nyokangi/Kizito, are much closer.

For the combined case, comparison is made between values estimated in this thesis and those estimated by Kichamu from child mortality, these are shown in table 5.5(b) below. The life expectancy at birth, e(o), estmated in this thesis is is slightly lower than that estimated by Kichamu. This could be explained by the fact that there is under-estimation of child deaths. Between ages 5 and 40 our values are higher than those of Kichamu. From age 45 onwards, our values and those estimated by Kichamu from child mortality are exactly the same.

Table 5.5 (a). KENYA.
Comparison of e(x) values by different techniques. (1979).

Age	MUDAKI Patching Method FEMALE	NYOKANGI/KIZITO Methods (i) FEMALE	NYOKANGI/KIZITO Methods (ii) FEMALE	MUDAKI Patching Method MALE	NYOKANGI/KIZITO Methods (i) MALE	NYOKANGI/KIZITO Methods (ii) MALE
0	54.18	-	-	50.79	-	-
5	58.55	60.23	58.54	55.45	59.2	54.81
10	55.21	56.49	54.4	52.08	55.05	50.13
15	51.14	52.22	48.99	47.91	50.58	46.3
20	47.02	48.05	42.47	43.87	46.15	43.24
25	43.04	44.02	37.58	40.13	41.84	40.14
30	39.12	40.14	34.9	36.34	37.82	36.16
35	34.17	36.23	33.44	32.51	33.89	33.63
40	30.21	32.46	30.66	28.67	30.05	31.52
45	26.25	28.49	27.88	24.63	26.35	27.78
50	22.28	24.72	23.63	20.89	22.74	23.86
55	18.41	21.23	20.33	17.31	19.5	20.56
60	14.65	17.48	17.75	13.83	16.13	17.46
65	11.11	14.7	14.61	10.56	13.31	14.35
70	7.78	11.47	12.33	7.47	10.23	11.43
75	4.52	8.54	6.26	4.42	7.55	6.21

Table 5.5(b). KENYA.
Comparison of e(x) values by different techniques. (1979).

Age	MUDAKI Patching Method (Combined sexes).	KICHAMU Based on Child Mortality Method (Combined sexes).
0	51.29	51.82
5	56.36	56.21
10	53.13	52.82
15	49.04	48.66
20	45.03	44.59
25	41.23	40.71
30	37.43	36.83
35	33.08	32.94
40	29.23	29.06
45	25.23	25.23
50	21.41	21.41
55	17.72	17.72
60	14.13	14.13
65	10.75	10.76
70	7.57	7.58
75	4.45	4.46

DISCUSSION AT THE DISTRICT LEVEL:

In table 5.6 we have shown the proportions of respondents aged 0-4 with mother alive and father alive. In general the information of these respondents are unreliable hence discarded. This is so because of adoption effect. In this thesis, however, we have decided to use this information as a measure of the degree of adoption effect in various regions. Variations in these measures will explain the extent of cultural norms on adoption. The measure of the adoption effect shall be the difference between the proportion of the respondents aged 0-4 with mother alive and father alive.

Table 5.6
Proportions with Mother/Father alive at age group 0-4, and e(o) values for different regions by two techniques, (1979).

Region:	Proportions with: Mother alive. Age group 0-4	Father alive.	Diff'in Prop'tion	e(o) MUDAKI	e(o) KICHAMU.	e(o) Average
KENYA	0.993154	0.956334	0.03682	51.29	51.82	51.56
NAIROBI	0.995821	0.962317	0.033504	56.82	57.13	56.98
KIAMBU	0.994369	0.925185	0.069184	57.71	58.75	58.23
KIRINYAGA	0.993871	0.945661	0.04821	55.59	56.14	55.87
MURANGA	0.994535	0.940049	0.054486	58.67	58.33	58.5
NYANDARUA	0.994559	0.924721	0.069838	60.17	59.52	59.85
NYERI	0.994038	0.940463	0.053575	60.45	64.15	62.3
KILIFI	0.993546	0.974401	0.019145	40.88	41.37	41.13
KWALE	0.992218	0.972604	0.019614	45.42	43.14	44.28
LAMU	0.989993	0.972021	0.017972	44.06	43.51	43.79
MOMBASA	0.994794	0.983498	0.011296	51.76	52.6	52.18
TAITA	0.993301	0.948421	0.04488	51.69	51.09	51.39
T.RIVER	0.987331	0.975191	0.01214	42.03	43.36	42.69
EMBU	0.994868	0.953571	0.041297	56.12	56.9	56.51
ISIOLO	0.981344	0.944357	0.036987	50.56	50.09	50.33
KITUI	0.992416	0.948272	0.044144	48.12	47.1	47.61
MACHAKOS	0.993561	0.947861	0.0457	55.92	54.86	55.39
MARSABIT	0.988111	0.922826	0.065285	49.57	51.51	50.54
MERU	0.992655	0.972474	0.020181	56.75	58.33	57.54
GARISSA	0.984468	0.972922	0.011546	47.76	49.95	48.86
MANDERA	0.986352	0.970901	0.015451	47.54	48.57	48.05
WAJIR	0.984364	0.968276	0.016088	48.43	49.72	49.08
KISII	0.993267	0.941882	0.051385	53.25	54.95	54.1
SIAYA	0.992564	0.960809	0.031755	41.45	40.28	40.87
S.NYANZA	0.989829	0.951797	0.038032	41.32	39.86	40.59
KISUMU	0.992121	0.958061	0.03406	43.97	41.46	42.72
KAKAMEGA	0.992957	0.978158	0.014799	51.63	47.96	49.79
BUNGOMA	0.994596	0.980675	0.013921	54.21	49.14	51.68
BUSIA	0.991853	0.974658	0.017195	42.01	41.09	41.55
BARINGO	0.991875	0.964282	0.027593	45.36	45.1	45.23
MARAKWET	0.994371	0.979677	0.014694	51.71	51.51	51.61
LAIKIPIA	0.993892	0.940097	0.053795	56.21	58.3	57.26
NAKURU	0.994646	0.936861	0.057785	55.36	55.59	55.48
KERICHO	0.994551	0.951818	0.042733	55.38	56.91	56.15
NANDI	0.994605	0.969673	0.024932	53.92	54.03	53.98
NAROK	0.994571	0.946728	0.047843	55.96	56.89	56.43
SAMBURU	0.991821	0.926198	0.065623	53.89	58.4	56.15
T.NZOIA	0.994171	0.973752	0.020419	54.74	53.68	54.21
KAJIADO	0.995318	0.939633	0.055685	54.91	58.55	56.73
W.POKOT	0.991461	0.974571	0.01689	43.41	42.26	42.84
TURKANA	0.984237	0.933913	0.050324	47.59	49.62	48.61
U.GISHU	0.994399	0.962437	0.031962	57.56	56.68	57.12

Using the difference in proportions, table 5.6 above, gives very interesting results. The districts with the highest adoption effect are down at the Coast (Mombasa, Lamu, Tana River and Kilifi) and Western Province. In North Eastern, we have Garissa and in Rift Valley Province we have West Pokot and Elgeyo Marakwet. This phenomenon can be explained by the cultural norms in the respective regions.

Table 5.6 also compares the life expectancies obtained in this thesis with those estimated by Kichamu from information on child mortality.

The urban centres such as Nairobi and Mombasa have lower life expectancies at birth in this thesis. Kichamu's results in this case are higher in those urban centres. This could be due to under-reporting over the children dead in urban areas. The same case of under-reporting holds true for districts such as Samburu, Turkana, Narok, Kajiado, Garissa, Mandera, Wajir etc. Culturally people from these regions do not talk about the dead. Hence under-reporting is eminent. On the other hand people from Nyanza and Western Provinces mourn their dead for a very long time and thus there is a possibility of over-reporting. This could be an explanation to the lower life expectancies obtained at birth in this study as compared to those by Kichamu.

In Central Province, Nyeri seems to have under-reporting while in other districts the reporting is more or less constant.

FURTHER WORK

1. A study of adult mortality from information on widowhood is recommended.
2. Adult mortality on the information of orphanhood by differentials such as Education, Residence and Marrital Status.
3. At the district level the Synthetic Approach and the Age Specific Growth Rate technique need to be applied.

RECOMMENDATION:

1. Data Collection.

Better or improved data collection on the information on survival of parents need to be done, since there is less over or under-estimation of deaths of adults compared to child deaths.

2. Adoption Effect.

The cultural norms of adoption should be encouraged to lessen the burden of the government to take care of the young ones in Childrens' Homes.

3. Age at Marriage.

Though demographically there is an advantage of reducing fertility by raising age at marriage, however, there is the risk of having even more widows than widowers, as is the case in this study. So the government should not stress on raising age at marriage.

FOOT-NOTES/REFERENCES

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