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RECENT DEMOGRAPHIC TRENDS IN KENYA  
AND  
THEIR IMPLICATION FOR ECONOMIC AND  
SOCIAL DEVELOPMENT<sup>(1)</sup>

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Dr. J.G.C. Blacker of the Population Studies Center, London School of Hygiene and Tropical Medicine was responsible for estimating the levels of fertility and mortality using data from the 1977 N.D.S. These are given on pages 9 and 10 and Appendix 1 of this paper.

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## 1.0 Introduction

The first part of this paper will briefly outline the relationship between population and development planning. This will be followed by a discussion of fertility and mortality levels and trends for Africa in general and the demographic position that Kenya holds in the Continent in particular.

The next part will consider in some detail fertility and mortality trends in Kenya over the period 1962 to 1972, using available data from the 1962 Population Census, the 1969 Population Census and the 1973 Baseline Demographic Survey. The following section will summarise findings from the 1977 National Demographic Survey with regard to levels and trends in fertility and mortality, and thus the rate of natural increase.

In the light of these findings, the population of Kenya will be projected to 1989, that is the coming decade. These will be compared with the Central Statistical Bureau projections, which were produced earlier and which were based on the 1969 Population Census, assuming constant fertility. The implications of these population projections for some aspects of the country's economic and social development program will conclude the paper.

## 2.0 The Demographic Situation in Africa<sup>(1)</sup>

Africa in general and Kenya in particular has a population growth potential which is perhaps unprecedented in world history. While the crude birth rate is estimated at 30 per thousand population for the world, it is 45 for Africa, or 50 percent higher than the world average. Africa is followed by Latin America where the birth rate is 36 and then Asia where it is 32 per thousand. Europe and North America come at the bottom of the scale with a crude birth rate of 15 per thousand. In other words, Africa's birth rate is three times higher than that of Europe or North America.

For the regions of Africa the crude birth rate varies from 49 for West Africa to 46 for East Africa and 42 for North Africa. Within East Africa, Kenya (53) has the highest birth rate followed by Zambia (50) and Tanzania and Somalia (47).

With regard to mortality, the average crude death rate for the world is 12 per thousand population, compared with 19 for Africa (or about 60 percent higher than the world average). This rate drops to between 9 and 11 for Latin America and Europe. Within East Africa the rate is highest (22) for Tanzania and Somalia, but lowest (13) for Kenya.

The difference between the crude birth rates and the crude death rates are reflected in the crude rates of natural increase. For the world as a whole the rate is 1.8 percent as compared with 2.6 percent for the whole of Africa. Within Africa the natural rate of increase is highest for Kenya (4.0 percent). In other words, Africa has the highest rate of natural increase and Kenya has the highest rate of natural increase in the world.

## 3.0 Relevance of demographic trends to economic development and planning

Early macro-economic models treated population in a very formal way, normally assuming a constant rate of population growth, but since the mid-1950's a number of models have

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(1) All figures quoted in this section - except for Kenya - are from the "1978 World Population Data Sheet of the Population Reference Bureau Inc". Estimated birth and death rates for Kenya are from the 1977 National Demographic Survey of Kenya (Final report under preparation).

been constructed in which population change plays a central role. The effect of population dynamics, on the size of the population among which a given income must be divided, on saving rates and on the composition of investment have been shown to have an important effect on the growth of per capita income. Income is not only directly affected by population size, but also by its growth rate and its age distribution.

It is not the intention of this paper to over-emphasize these relationships. It is enough to mention here that a higher rate of population growth implies a higher level of needed investment to achieve a given per capita income. Further, consumption and saving (investment) are directly affected by the shape of the age distribution of the population. In countries like Kenya with a high rate of population growth, the population pyramid is very broad based signifying relatively high proportions of the population in the younger ages, resulting in turn in high dependency ratios. The latter - other things remaining equal - result in resources to be diverted to more consumption and thus less savings (investment).

On the other hand, economic development has its effect on fertility, mortality and migration. Some elements of economic development are highly specific in their effects on demographic change. For example, the distribution of investment in construction and commodity production among different parts of the country affects internal migration and consequently the residential distribution of the population. The supply of health services, both public and private, and the distribution of eligibility for services (e.g. where people live, in relation to where services are provided, or the cost of services in relation to income) affect both migration patterns and infant and adult survival. The economic and social environment for family formation is specified by the development process and consequently affects fertility.

Development plans guide the economic and organizational resources in the present for the purpose of production in the future. Urban planning, health planning and many other kinds of planning are undertaken to determine whether immediate expenditures will provide facilities for production of goods and services that will be justified by the demands of the population not only presently, but also

in the future. It hardly seems necessary to stress that the same principles that require investment planners to look beyond the period of immediate commitments, require development planners to do the same in relation to population.

Errors in estimating the future size, characteristics, and distribution of a population give faulty signals to decision makers that can lead to costly misallocation of resources.

Clearly, the more children to be educated, the larger the budget required to finance additional materials, facilities, teachers and teacher-training colleges. But the size of the school age population depends not only upon the size of the total population, but also upon its age structure. And, age structure depends largely upon the level of fertility in a population. Thus in most rapidly growing populations the growth in the population under 15 years will be especially high. If the goal is to increase the quality of education or the proportion of eligible children attending school, education may prove to be a heavy burden to the national budget.

Labour force growth follows a similar pattern. Labour force size is a function of population size, age and the sex structure, allowing of course, for the time lag between when a baby is born and when it reaches labour force age. However, labour force size is also a function of age and sex-specific activity rates which may change as jobs become more or less readily available. Thus there are short run feedbacks from employment policy that can eventually affect the underlying demographic trends. In addition, the nature of employment - farm, cottage industry, factory and so on - seem to have an impact on or at least an association with fertility. It is generally acknowledged, for example, that employment opportunities which require a woman to separate her home and employment responsibilities can be direct causes of declines in fertility. Thus economic policy would have an impact on demographic trends.

Another example that shows clearly the relation between economic and demographic factors is population movement and distribution. Short-run policies aimed at coping with the consequences of rural to urban migration may prove counterproductive in the long run. Making strenuous efforts to provide the minimum requirements in health care, education and housing to recent migrants when such services are not equally available in rural area and small towns will almost certainly encourage continued migration to cities. An

economic policy that allows continued industrial development of urban areas with wage and price differentials between rural and urban areas will have the same effect.

#### 4.0 Demographic trends in Kenya 1962 - 1972

The thesis advanced in this chapter, is that, other things remaining equal, fertility tends to rise and mortality tends to decline during the early stages of economic development. It is for this reason that studying demographic trends during this period is particularly useful. There are three sources of data at our disposal, the 1962 Population Census, the 1969 Population Census and the 1973 Baseline Survey.

Data collected in African censuses and demographic enquiries have, for a number of reasons, serious limitations, misstatements of age, misstatements of the number of births and under-reporting of the number of deaths. Further, different censuses and demographic enquiries differ in method of data collection & in the type and quality of field workers employed. Thus indices of fertility and mortality are not strictly comparable. (1)

#### 4.1 Fertility

Our study of trends in fertility will use three broad indicators, namely data on fertility, infertility (more specifically childlessness), and the shape of the age distribution.

The total fertility rate (defined as the number of live births that a woman reaching the end of her reproductive life has given birth to) was estimated at 6.8 (2) children per woman

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(1) While we stress that these limitations should be borne in mind, we need to add that the evidence reached from the following analysis is an indicator of trend rather than an exact measurement of the difference in levels of fertility and mortality throughout the period under consideration, that is between 1962 and 1972.

(2) Kenya Population Census, Volume III African Population Statistics Division, Ministry of Economic Planning and Development, October, 1966, page 68.

according to the 1962 Population Census. This rate rose to 7.6<sup>(1)</sup> by 1969 and to around an estimated 8.0 from the 1973 Baseline Survey (2).

This represents an increase of around 18 percent for the period under consideration. Presumably one of the reasons for the higher number of live births is the decline in the incidence of childlessness, a phenomenon usually accompanying improvements in economic and health conditions. This is shown in the following table:

Table 1. Proportion of Childless amongst Kenyan African women by Age Group

Census Year	Age Group						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1962	79.1	36.6	22.3	17.8	15.3	14.4	13.7
1969	75.5	24.7	11.1	8.1	7.6	7.8	7.9
1973	Baseline Survey (comparable data not available)						

As can be seen from the above the incidence of childlessness has been on the decline between 1962 and 1969.

The remaining piece of evidence regarding the rising trend in fertility is that indicated by the shape of the age distribution. Persistent high levels of fertility give a broad-based age distribution that tapers rapidly with age (particularly where infant mortality is high), while persistent low levels of fertility give a narrow based age distribution.

Conversely, mortality changes of a sort that usually occur have only a slight effect on the age distribution, except where mortality decline is disproportionately affecting infant and child mortality. Thus a change in the growth rate caused by a change in fertility will generally have associated with it a large change in the percent age distribution. In the case of Kenya, sharply rising fertility during the 10 year (1962 to 1972) period has resulted in

(1) 1969 Population Census, Volume IV. Analytical Report, Central Bureau of Statistics, Ministry of Finance and Planning, 1977, page 29.

(2) Demographic Baseline Survey Report, 1973 (DSU Kenya). The Carolina Population Center, the University of North Carolina at Chapel Hill, May, 1976, pages 39-40.

an increasing share of the total population under 15 years of age, as shown below.

Table 2. Proportion of the population under 15 years (both sexes) for 1962, 1969 and 1972

Age Group	1962 Census	1969 Census	1973 Baseline Survey
0-4	17.7	19.4	20.8
5-9	15.7	16.3	17.0
10-14	12.7	12.5	13.0
0-14	46.1	48.2	50.8

Source: Figures for 1962 are derived from Table IV.3 Kenya Population Census 1962, p.p. 27-28. Figures for 1969 and 1972 are derived from Table II.3 Demographic Baseline Survey Report, 1973.

The rising trend in fertility in Kenya has shaped the age distribution. The population is becoming increasingly younger; that is, it is becoming more and more broad-based with increasing proportions in the younger ages. This has major implications for educational planning, health planning, as well as for other sectors of an economic plan.

Finally, using data from the various fertility histories collected during the 1973 Baseline Survey, it was possible to reconstruct cross sectional fertility distributions for women over 12 years of age. The results of this analysis show that the total fertility rate has risen gradually from 6.1 for the time period 1941-1945 to 7.9 in 1972. There is little doubt that part of these variations are accounted for by memory lapses which primarily affect the recollections of older women -- those who had their children in the earlier years. The fact remains, however, that the total fertility rate has reached 7.9 by 1972 as shown in the table below.

Table 3 Total fertility rates by time periods

<u>Period</u>	<u>TFR</u>
1941 - 1945	6.1
1946 - 1950	6.6
1951 - 1955	6.6
1956 - 1960	7.0
1961 - 1965	7.5
1966 - 1970	7.7
1972	7.9

In other words, there is little doubt that fertility has in fact been rising during the past two decades and that the total fertility rate stood at around 8.0 at the time of the 1973 Baseline Survey. It can be added, however, that judging from Table 3, there seems to be a decline in the rate of increase in the total fertility rate, a not unexpected finding, considering the high levels fertility has now reached.

#### 4.2 Trends in Mortality

Little will be said about mortality in view of the fact that data on deaths are perhaps the least reliable not only in Kenya, but in Africa in general. However, there is strong evidence from the analysis of mortality data provided by the 1962 Census, the 1969 Census and the 1973 Baseline Survey, that mortality in Kenya has been on the decline between 1962 and 1972.

One source of information on mortality is given by the proportion of children dying of children ever born by the age of their mother.<sup>(1)</sup> These proportions are given below for 1962, 1969 and 1972.

Table 4 Proportions of children dying by age group of mother - 1962, 1969 and 1972

<u>Age Group</u>	<u>1962</u>	<u>1969</u>	<u>1972<sup>(2)</sup></u>	<u>1972 as % of 1962</u>
15-19	0.146	0.128	0.107	73
20-24	0.170	0.147	0.131	77
25-29	0.205	0.174	0.153	75
30-34	0.238	0.202	0.167	70
35-39	0.269	0.231	0.187	70
40-44	0.308	0.263	0.237	77
45-49	0.338	0.304	0.259	77

(1) These proportions can be converted into standard indices of infant and child mortality.

(2) Two schedules were used in 1973, namely "A" and "B" schedules. Use is made here of data from the "B" schedule which in fact shows higher mortality than those indicated by the "A" schedule.

No attempt will be made here to arrive at levels of mortality where data - as mentioned above - are the least reliable. What is important for our purpose is evidence of trends in mortality. The above table indicates that infant and child mortality - which are good indicators of declines in overall mortality - have declined between 1962 and 1972. It is important to emphasize that from a policy perspective, there are many similarities between declining infant mortality and increasing fertility. From the perspective of education or health policy increasing children due to either declining infant mortality or increasing fertility have similar social and economic implications.

#### 5.0 Findings on fertility and mortality levels from the 1977 National Demographic Survey

A more comprehensive National Demographic Survey was carried out in Kenya in 1977 which had a much larger coverage than the more limited 1973 Demographic Baseline Survey. The total fertility rate was estimated at 8.1 births per woman and the crude birth rate was estimated as 53.4 per thousand population. The comparison of the total fertility rate of 8.1 with that of 7.6 derived from the 1969 Census suggests that fertility had been rising by about 0.8 percent per annum.

With regard to mortality, the expectation of life at birth was estimated to be 51.2 years for males and 55.8 years for females, which may be compared with a corresponding figure of 46.9 for males and 51.2 for females obtained from the 1969 Census. Most of this improvement in the average expectation of life at birth is due to the reduction of infant and child mortality. The infant mortality rate in 1977 has been estimated at about 53 infant deaths per thousand children born compared with 119 from the 1969 Census, a phenomenal improvement of about 30 percent in a short eight year period. However, adult mortality has also shown improvement, although less spectacular : the expectation of life at age 15 increased slightly from 46.9 to 47.7 years for males and from 49.7 to 51.1 years for females. As of 1977, the crude death rate for Kenya was down to 14.2 deaths per thousand population.

#### Rate of natural increase as estimated in 1977

The crude birth rate of 53.4 and the crude death rate of 14.2 imply a rate of natural increase of 39.2 per thousand population or 3.92 percent per annum. This rate of growth will double the population in about 18 years. This is the highest rate of population growth in Africa. Other countries whose

data have been examined have shown similar levels of fertility and mortality, but nowhere has such high fertility and low mortality been found in conjunction. For example a total fertility rate of about 8.0 was obtained for Malawi from their Population Change Survey of 1970-1971, but mortality there was much higher. In Botswana the mortality rate from the 1971 Census gave expectation of life of over 50, but the total fertility rate was only about 6.5

The question may now be asked: What are the possible reasons for the rise in fertility in recent years.<sup>(1)</sup> The following are some possible explanations. With better health conditions there is a tendency for miscarriage rates to decline. Previously high miscarriage frequency lead to either low parity (reflecting early sterility), or for some women, to complete childlessness. With improvements in health facilities, the drop in miscarriage and childlessness rates results in more livebirths.

We have already noted a significant decline in the percentage of women without children between 1962 and 1969. Further decline in the incidence of childlessness is apparent from the following table which compares the data from the 1977 National Demographic Survey with data from the 1969 Census.

Table 5 Proportion of childless women 1969 & 1977

<u>Age Group</u>	<u>1969</u>	<u>1977</u>
15-19	75.5	72.8
20-24	24.7	23.5
25-29	11.1	7.0
30-34	8.1	4.4
35-39	7.6	5.0
40-44	7.8	3.8
45-49	7.9	4.5

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(1) This subject will be dealt with at some length in another paper under preparation entitled "Some Aspects of the Determinants of Fertility in Kenya", due to be published by the Population Studies and Research Institute, University of Nairobi.

As can be shown from the above table the proportion of childless women has declined drastically between 1969 and 1977. This is particularly important for women who are either nearing the end of their reproductive life or have completed their reproductive life, where the proportion childless in 1977 is almost half that of 1969.

Not only have the proportion of childless women declined during the period under consideration, but also the proportion of women with low birth orders has declined as given in the following table.

Table 6. Proportion of women with 1, 2 or 3 children by age group for women aged 30 to 49 in 1969 and 1977

<u>Age Group</u>	<u>1 child</u>		<u>2 children</u>		<u>3 children</u>	
	<u>1969</u>	<u>1977</u>	<u>1969</u>	<u>1977</u>	<u>1969</u>	<u>1977</u>
30-34	4.3	3.1	5.7	3.8	8.1	7.3
35-39	3.6	2.1	4.5	3.0	5.9	4.8
40-44	4.0	2.4	4.3	2.7	5.3	3.5
45-49	4.0	2.3	4.0	3.0	5.2	3.5

As shown above, the proportion of women at all ages between 30-49, with low parities has declined between 1969 and 1977. On the other hand the proportion of women with high parities (8 or more children), has increased for the same age groups of women between 1969 and 1977 as shown in the following table :

Table 7. Proportion of women with 3 and more children by age groups for women aged 30-49 in 1969 and 1977

<u>Age Groups</u>	<u>1969</u>	<u>1977</u>
30-34	19.1	20.1
35-39	34.4	39.9
40-44	42.0	50.5
45-49	44.9	53.7

Just the above tables support earlier findings that fertility in Kenya, has - beyond any doubt - risen during the eight years between 1969 and 1977. In the second place, the above tables throw some light on the source of the "rise" in fertility. As mentioned earlier, better health and economic conditions - in the absence of changes in people's attitudes towards family size - are by themselves conducive to higher fertility. Women who were childless are now more likely to be capable of bearing children. Also other women who desire large families are physically better able to have the number of children they want.

Another factor which is related to development as it affects fertility (although indirectly, as it works itself through health) is education. Evidence from Kenya and other African countries, <sup>(1)</sup> shows that women with few years of education (roughly primary education) have higher fertility than women with no education. Beyond 5 or 6 years of education, fertility tends to decline. This is obvious from the following tables using data from the 1969 Population Census and the 1977 National Demographic Survey.

Table 8 Mean number of live births per woman by educational attainment for women aged 25-49

Years of school completed	25-29	1969 Population Census			
		30-34	35-39	40-44	45-49
None or not stated	3.70	5.09	5.97	6.40	6.65
Standard I to IV	3.89	5.64	6.49	7.19	7.89
Standard V to VIII	3.42	5.21	6.51	7.25	7.62
Form I to IV	1.99	3.25	3.88	3.63	3.65
Form V and over	1.11	1.92	2.46	2.67	2.28

Years of school completed	1977 National Demographic Survey				
	25-29	30-34	35-39	40-44	45-49
None or not stated	3.85	5.58	6.55	7.23	7.42
Standard I - VIII	3.72	5.70	7.27	7.71	8.13
Form I - IV	2.61	3.87	4.90	4.25	5.32
Form V to VI	1.28	3.30	2.57	X X	X X
University	1.24	1.96	2.21	X X	X X

X = number of women too small

Data from both sources confirm what was said above that women with primary education (that is, standard I to standard VIII) have, by and large, higher fertility than women with "no education". Further, the 1969 Population Census shows that there is practically no difference in fertility between women with 1 to 4 years of education and women with 5 to 7 years of education. In other words, while primary education make it possible for a women to be more conscious of the importance of hygiene and all other basic health requirements, which help prevent pregnancy wastage, secondary education is probably a

(1) For example according to the 1973 National Demographic Survey of Tanzania, women aged 35-44 with no years of education had an average of 4.7 live births as compared with 5.3 live births for women with 1-4 years of education, 4.7 live births for women with 5-8 years of education and 3.9 live births for women with 9-13 years of education. The Demography of Tanzania, Roushdi A. Henin, Editor. An Analysis of the 1973 National Demographic Survey of Tanzania. A joint publication of the Central Bureau of Statistics and the Demographic Unit, University of Dar-es-Salaam. Table 7.10, page 116.

pre-requisite for a woman to change her attitude towards family size.

The data from the 1977 National Demographic Survey also tell the same story. While women with 1 to 8 years of education have higher fertility than women with no education, fertility declines drastically with secondary school education.

In view of these findings, an attempt is made in the following section to throw some light on the possible contribution of recent developments in the field of education to the rise in fertility.

Table 9. Female population by educational attainment according to the 1977 National Demographic Survey

(1) Age Group	(2) Total	(3) Never attended	(4) St. 1-8	(5) Form 1-4 & 5-6	(6) University
15-19	100	24.5	64.9	10.6	-
20-24	100	40.2	44.6	15.1	0.1
25-29	100	53.7	39.4	6.7	0.2
30-34	100	66.9	29.6	3.2	0.3
35-39	100	76.7	21.4	1.7	0.2
40-44	100	83.7	14.9	1.7	0.1
45-49	100	89.0	9.6	1.3	0.1

Columns (3) and (4) provide the more interesting part of the table from the point of view of how far recent developments in female education are affecting fertility. On the one hand, column (3) shows that the proportion of females who never attended school systematically declines from the older to the younger cohorts, meaning of course, that more and more of the younger generations are now attending school. However, of those who attend school the majority are in the standard 1-8 whose fertility is highest.

#### 6.0 Some aspects of fertility and mortality differentials

We have already noted that the results from the recent National Demographic Survey suggest a rising trend for Kenyan fertility in conjunction with a continuing decline in mortality. The net result of these factors is, of course, a steady increase in the Kenyan growth rate, an increase which can be anticipated to continue over the next decade. The impact of this changing growth rate on the nation's demographics is highlighted in another section of this paper.

### 6.1 Fertility differentials

It is of some importance to conjecture further about how the changing profile of the Kenyan population can be expected to affect future birth rates, death rates and ultimately, population size.

We have emphasized earlier that differentials in fertility levels both by educational level and between the rural and urban sector are of some significance. When these differentials are considered in conjunction with the knowledge that the population of Kenya is gradually becoming more educated and more urban, it should be apparent that the long run direction of fertility and population growth for Kenya should be downward. Of course, as already noted the short term trend reflecting primarily improvements in health, nutrition and sanitation may well be in the opposite direction. In addition, it is unclear at this point in history when the fertility decline will begin. Of course, the timing of fertility decline will be affected at least somewhat by the effectiveness of the national family planning program.

As noted earlier, the overall level of fertility in Kenya, as measured by the total fertility rate, has risen in recent years from an estimated 7.6 births per woman in 1969 to about 8.1 children per woman in 1977. <sup>(1)</sup> As may be seen in table 10, however, there are considerable variations both between the urban and rural sector and between the different provinces in Kenya. Urban completed fertility is systematically lower than rural fertility in every province in Kenya. Also, the highest fertility in Kenya is found in the Western province, with Nyanza, Central and Rift Valley provinces also having above average fertility. The lowest (rural) fertility in Kenya may be evidenced in the East with below average fertility also present along the Coast.

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(1) These overall estimates were determined through the use of various demographic techniques given in appendix 1. They are significantly higher than the unadjusted estimates in the 1969 Census and the 1977 National Demographic Survey. However, all other fertility estimates cited in this report were not adjusted upwards and thus the levels noted in this paper are not consistent with the 7.6 and 8.1 estimates. It is felt, however, that the differentials cited here are realistic and not significantly affected by the presumed overall undercount of births.

Table 10. Mean number of live births per woman by province, urban-rural residence and age group of mother

<u>RURAL</u>							
<u>Age Group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	
15-19	0.29	0.33	0.30	0.47	0.26	0.43	
20-24	1.77	1.81	1.84	2.10	1.62	2.01	
25-29	3.63	3.97	3.79	4.07	3.52	3.80	
30-34	5.55	5.90	6.01	5.77	5.17	5.56	
35-39	6.79	6.97	7.20	6.90	6.51	6.36	
40-44	7.18	7.60	8.40	7.59	6.63	7.14	
45-49	7.70	7.73	8.93	7.46	6.77	7.13	
15-49 age standardized	3.71	3.89	4.06	3.96	3.46	3.70	

<u>URBAN</u>							
<u>Age Group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Nairobi</u>
15-19	0.29	0.43	0.43	0.40	0.22	0.32	0.34
20-24	1.40	1.75	1.86	1.96	1.35	1.88	1.74
25-29	3.02	3.47	3.18	3.79	2.81	3.18	3.10
30-34	4.48	5.10	4.88	5.80	4.77	4.19	4.51
35-39	4.76	6.22	7.75	6.14	7.51	4.24	5.28
40-44	4.62	6.97	7.00	6.32	-	5.05	5.61
45-49	5.77	6.48	6.92	6.65	-	4.40	6.15
15-49 age standardized	2.80	3.48	3.63	3.60	2.26	2.76	3.07

These differentials in fertility undoubtedly reflect not only variations in fertility attitudes between the different tribal groups in Kenya, but in addition, differences in values regarding marriage including variations in age at first union, ideas regarding polygamy and tendencies and values in connection with marital dissolution. To the extent all of these values are conditioned by the educational process they are susceptible to change. In addition, values acquired through education can affect attitudes and behaviours in ways which are not always consistent in terms of their effect on marriage and fertility. For example, increasing education is generally associated with a tendency to delay marriage and childbearing. Also, increasing education for women, associated with the greater probability of employment in the modern sector can lead to changing values regarding family roles and childbearing. Thus increasing education usually implies lower fertility.

However, more education also is known to be associated with a decline in polygamous marriages. To the extent that women in monogamous marriages have a greater average number of children, increasing education in this regard may perhaps have a mild positive effect on fertility levels.

Also, the overall association between educational attainment and urbanization confounds the question of what represents the "true" determinants of fertility levels. Urban women on the average, have more education and are much more likely to be employed in the modern sector of the economy. Both of these are factors which are associated with later marriage and delayed fertility. However, urban families also often have access to better health care and nutrition, factors which are known to be associated with not only lower mortality, but also with a more fecund and fertile population.

Finally, as will be shown, urban women are significantly more likely not to be living with a husband during their prime childbearing years. This may reflect a greater tendency for families living in urban areas to break up. In addition, some women without husbands are more likely to need to support themselves and their families. Thus, there may be some tendency of there women without husbands, whether separated, widowed, or divorced, to migrate to the cities in search of gainful employment. Of course, since most of Kenya is and will remain rural for quite some time, the extent to which improving health facilities are extended into rural areas remains the most crucial question. As availability of health care in rural areas becomes more widespread (which is already occurring), more women become fecund as shown in the first part of this paper.

#### Variations in marriage patterns

As may be noted in Figure 1, rural women at most ages are more likely to have ever been married as well as to be currently married than their urban counterparts. Tables 11 and 12 also indicate that there are major regional differences in ages at which women marry for the first time. For example, rural women in Nyanza and Coast provinces marry, on the average, at decidedly earlier ages than women in the other provinces. This information on earlier marriages is consistent with the evidence from table 10 which indicates that women in these two provinces begin childbearing at the earliest ages. Also, the generally early age at marriage for the rural compared with the urban women (figure 1) coincides with the earlier noted rural-urban fertility differential.

FIGURE 1. PERCENT OF THE FEMALE URBAN AND RURAL POPULATIONS  
EVER MARRIED AND CURRENTLY LIVING WITH HUSBANDS  
BY AGE GROUPS

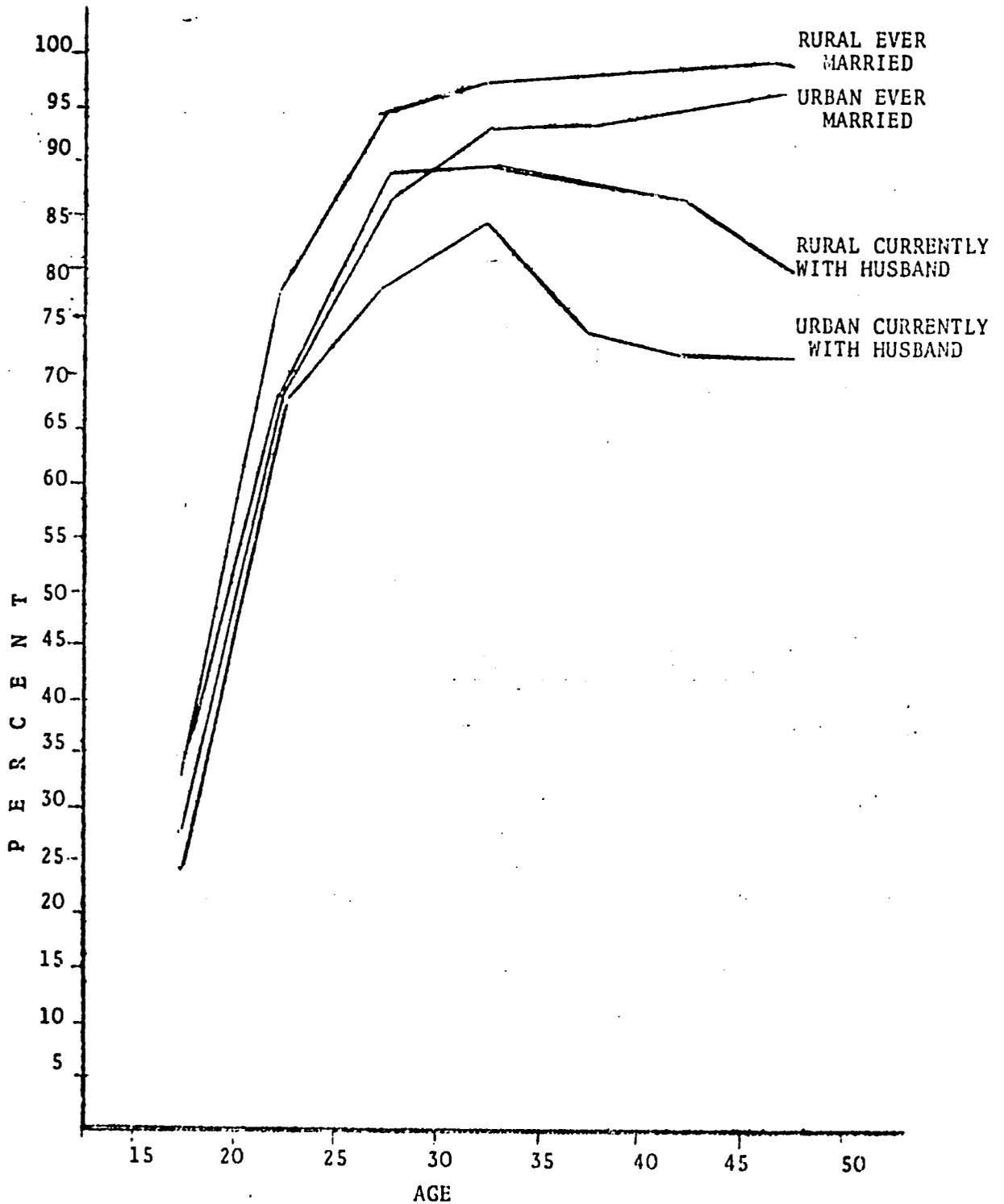


Table 11 Percentage of rural female population ever married by age and province

<u>Age Group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Total</u>
15-19	16.3	29.6	31.1	45.8	12.3	46.0	27.8
20-24	70.7	80.5	84.3	88.6	65.3	88.5	78.7
25-29	92.8	94.4	96.3	98.5	91.1	97.4	94.7

Table 12. Percentage of all rural women living with a husband by age and province

<u>Age Group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Total</u>
15-19	14.7	29.3	31.0	44.6	11.0	41.5	24.4
20-24	65.8	76.7	80.7	85.4	60.3	81.5	74.5
25-29	85.6	88.5	91.9	94.1	84.2	93.6	89.0
30-34	89.7	88.1	94.7	90.9	87.1	91.6	90.0
35-39	86.1	85.0	90.0	89.3	90.0	86.4	87.9
40-44	82.9	84.7	93.3	89.3	80.9	83.9	85.8
45-49	78.9	73.0	86.4	81.4	79.6	77.3	79.4
15-19 age standardized	64.8	70.2	75.1	78.3	62.7	75.8	

Table 13. Percentage of rural women currently married to polygamous husbands by age and province

<u>Age Group</u>	<u>Coast</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Eastern</u>	<u>Nyanza</u>	<u>Total</u>
15-19	30.8	4.6	11.4	26.9	13.6	38.4	22.6
20-24	37.3	6.0	12.5	28.8	9.0	28.7	18.6
25-29	32.1	9.1	11.2	27.7	13.3	32.8	19.1
30-34	36.3	9.8	17.0	30.7	19.4	35.3	23.0
35-39	39.0	15.2	18.4	23.9	21.0	36.7	24.0
40-44	41.3	20.4	17.0	23.8	24.4	34.9	25.0
45-49	39.6	23.5	14.1	29.6	24.8	32.5	25.7
15-49 age standardized	35.4	10.6	13.7	27.7	16.0	34.3	21.9

The evidence with regard to polygamy is somewhat more ambivalent. As table 13 indicates, there are significant variations in the extent of polygamy between the various provinces. Controlling for age variations between the provinces, it may be seen that polygamy is most prevalent in the Coast and Nyanza provinces and least common in the Central province and the Rift Valley. At least some of this regional variations reflects religious differences between the different areas in Kenya. The Muslim influence on the Coast, which is known to be associated with the lesser secular education, undoubtedly is at least partly responsible for the higher level of polygamy in that area. The lesser levels of polygamy in some of the other regions is perhaps associated with the greater impact of Christianity, particularly Catholicism. The relevance of education may be seen in table 14 which shows that among younger women there is a slightly greater tendency for monogamous women to have at least some schooling. Also, the least reported education for the younger women is for the Coast province which has the highest level of polygamy in Kenya.

The direct impact of polygamy on fertility by the end of the childbearing period may be clearly noted in tables 15 and 16. For every province in Kenya, the average woman in a monogamous marriage has borne more children than her polygamous counterpart. Indeed these data are consistent with the notion that perhaps one of the reasons for the recent rise in Kenyan fertility has been a secular increase in monogamy over the last decade.

Of course, the direction of causality between the prevalence of polygamous marriages and lower fertility is somewhat complex. For example, men who are unable to bear a satisfactory number of children with their first wife may be somewhat more likely to enter into polygamous unions with the hope that they will be more successful with a subsequent wife. Thus first wives may be a somewhat "selected out" population and include a disproportionate number of women who are unable to bear children. This is consistent with the evidence from table 16 which shows that women in polygamous marriages are somewhat more likely than women in monogamous marriages to be childless. It is also generally consistent with the evidence in table 17 which shows the highest level of childlessness in the Coast province. Of course, other factors such as the general level of health and nutrition also are associated with the probability of childlessness. This is consistent

Table 14. Percentage of 25 to 29 and 45 to 49 year old rural women with no education by type of marriage

<u>Age</u> <u>25-29</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Total</u>
Monogamous	39.1	57.6	55.4	73.4	54.4	82.1	57.1
Polygamous	31.3	80.9	57.6	74.9	76.4	96.6	69.6
<u>Age</u> <u>45-49</u>							
Monogamous	79.9	96.9	83.0	94.2	91.0	97.6	88.8
Polygamous	80.0	92.3	89.0	94.7	95.3	97.7	91.6

Table 15. Number of children ever born to 45 to 49 year old rural women by type of marriage

	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Total</u>
Monogamous	7.79	7.79	8.43	7.16	6.91	7.58	7.68
Polygamous	6.68	7.14	7.36	6.55	6.34	6.65	6.85

Table 16. Percentage of 45 to 49 year old rural women childless by type of marriage

	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>	<u>Total</u>
Monogamous	0.7	1.6	1.0	3.9	3.1	2.3	2.3
Polygamous	6.7	3.8	4.8	6.6	7.1	6.2	5.8

Table 17. Percentage of women childless by province and age group (rural only)

<u>Age group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>
25-29	6	4	10	10	7	4
30-34	4	2	6	7	3	6
35-39	5	3	6	7	3	7
40-44	5	1	2	5	6	6
45-49	3	3	3	5	6	7
25-29 age standardized	4.8	2.8	3.5	4.6	5.0	5.7
includes "not stated"						

Table 18. Percentage of women married more than once by province and age group (rural only)

(1977)

<u>Age group</u>	<u>Central</u>	<u>Rift</u>	<u>Western</u>	<u>Nyanza</u>	<u>Eastern</u>	<u>Coast</u>
15-19	3	0.2	10	4	4	8
20-24	2	2	10	9	4	11
25-29	4	3	15	12	7	22
30-34	4	1	15	13	11	24
35-39	3	2	16	11	9	26
40-44	2	4	14	10	12	30
45-49	2	3	13	12	14	30
15-49 age standardized	3.0	1.9	12.8	9.4	7.1	18.6

with the high level of childlessness in the East, an area with below average health care.

As with polygamy, the direction of causality between marital breakdown, remarriage and fertility is somewhat unclear. Marriages which do not generally culminate in child bearing may be more likely to be terminated. Also, women who have been married more than once have probably spent a larger proportion of their childbearing years outside of a stable union. Both of these factors would suggest a below average fertility for women who have been married more than once. Indeed data from the National Demographic Survey show that women at the end of their childbearing period (ages 45-49 in 1977) had an average of about 7.6 reported children ever born if they had been married once but only 6.5 children if married more than once.

As may be noted in Table 18, there are significant provincial variations with respect to a tendency to divorce and remarry. Not unexpectedly, the Muslim Coastal area has the highest (age standardized) incidence of remarriage, fully 50 percent higher than the next highest province which is the Western province. The lowest incidences of remarriage are in the Rift Valley and the General province, which not coincidentally, also have the lowest level of polygamy. Undoubtedly, a mixture of religious influence and somewhat above average educational attainment for women in these latter areas are at least partly responsible for these regional variations.

To the extent that increasing industrialization and urbanization contribute to higher levels of marital dissolution, it may be anticipated that future Kenyan fertility may be dampened slightly by a prospective higher level of family breakdown.

## 6.2 Mortality differentials

As mentioned earlier, there is little doubt that mortality has declined between 1969 and 1977, judging from the 1977 National Demographic Survey data. Further, the survey has provided data on child and parental survival by province which can be converted into infant, child and adult mortality indices which can be used to compare mortality levels between the various provinces. The latter are being produced and will appear under a separate publication that will - amongst others - relate mortality to a number of socio-economic variables at the cluster and provincial levels. The data from the Integrated

Rural Survey as well as data from the 1977 National Demographic Survey. In what follows, a few words will be said about mortality differentials by province.

Table 19. Proportion of surviving children by age of mother

<u>Age</u>	<u>Rift</u>	<u>Central</u>	<u>Nairobi</u>	<u>Eastern</u>	<u>Western</u>	<u>Nyanza</u>	<u>Coast</u>
20-24	0.93	0.93	0.92	0.92	0.85	0.85	0.82
25-29	0.91	0.90	0.90	0.91	0.84	0.82	0.83
30-34	0.89	0.90	0.90	0.87	0.79	0.77	0.80
35-39	0.87	0.85	0.89	0.85	0.76	0.76	0.81
40-44	0.84	0.83	0.83	0.84	0.74	0.70	0.76
45-49	0.81	0.81	0.81	0.79	0.67	0.68	0.76

Judging from the above table, it seems that infant and child mortality is lowest in Central, Rift Valley, Nairobi and Eastern provinces, highest in the Western, and Nyanza provinces and intermediate in the Coast province. The situation with regard to adult mortality is generally indicated in the following table, which indicates the proportion of the fathers of the respondents who have survived in the different provinces.

Table 20 Proportion of fathers surviving to male respondents by province and age of respondent

<u>Age</u>	<u>Western</u>	<u>Nairobi</u>	<u>Rift Valley</u>	<u>Eastern</u>	<u>Central</u>	<u>Coast</u>	<u>Nyanza</u>
5-9	0.989	0.961	0.950	0.950	0.946	0.943	0.919
10-14	0.928	0.932	0.895	0.912	0.912	0.908	0.896
15-19	0.883	0.866	0.882	0.857	0.875	0.851	0.814
20-24	0.805	0.825	0.802	0.818	0.797	0.796	0.767
25-29	0.711	0.752	0.701	0.670	0.695	0.643	0.633

With the exception of the Western province<sup>(1)</sup>, adult mortality seems to follow the same pattern by province as child survival. The factors behind these differences no doubt, reflect differences in economic and social conditions, differences in nutritional levels, distances from health centers and so on.

(1) As mentioned above, a full analysis of mortality data based on child and parental survival (based on survival of father and mother of male and female respondents) is being carried out.

Rural-Urban mortality differentials

Judging from the following table which indicates the proportion of surviving children by age of mother, urban mortality is apparently slightly lower than rural mortality. This is certainly consistent with much of the discussion we have already presented in this paper on differentials in health care between the urban and rural areas. This urban-rural differential in mortality also reflects the higher socio-economic status of the average urban respondent.

Table 21. Proportion of surviving children by age of mother by rural and urban residence

<u>Age group</u>	<u>Urban</u>	<u>Rural</u>
20-24	0.90	0.89
25-29	0.89	0.87
30-34	0.87	0.84
35-39	0.85	0.82
40-44	0.81	0.79
45-49	0.77	0.75

In general, the mortality differentials noted in this section are consistent with what is known about variations in health care, and nutrition and socio-economic wellbeing between the different sectors of the country. Thus, as the availability of medical, health and nutritional assistance becomes more evenly distributed across the country, it may be anticipated that regional differentials in child and adult mortality will diminish and ultimately disappear.

Having dealt with the fertility and mortality situations at the time of the 1977 National Demographic Survey of Kenya, the implied population projections for the nation in 1979, 1984 and 1989 are given in the following and final part of this chapter.

7.0 The revised projection (1)

Recent evidence from the 1977 National Demographic Survey suggests clearly that fertility levels in Kenya have continued to rise and mortality at all ages is declining. Both these phenomena reflect continued improvements in health care and nutrition and access to medical assistance for much of the population.

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(1) See Appendix 2 for Methodology.

The earlier basic projections prepared by the Central Bureau of Statistics<sup>(1)</sup> assumed constant fertility (7.6 children per woman, the rate based on the 1969 Census). The 1977 National Demographic Survey suggests that fertility may have risen to a level of 8.1 children per woman by the late 1970's. Accordingly the revised projections assume a gradual rise in the total fertility rate to 8.1 by 1979 and a continuation of fertility at that level until 1989. The declining mortality assumption in the revised projections approximately parallels the decline projected in the earlier Central Bureau of Statistics' projection.

It is useful to contrast the age and sex breakdowns of the population of Kenya from 1979 to 1989 produced earlier by the Central Bureau of Statistics with the revised projections based on the 1977 National Demographic Survey. In general, continued higher fertility has a number of major social and economic implications for the shorter and longer term future of Kenya.

#### 7.1 Comparison of the original and revised population projections by age, and sex for 1979, 1984 and 1989

For each year the revised projection of the total population is higher than the original projection. This is entirely the result of the revised fertility findings from the 1977 National Demographic Survey. Because the original projections assume no rise in fertility, the youthful population is considerably increased in the revised projections. The projected total population for 1979 is over 300,000 greater in the revised projection (15,346,000 compared with 15,524,200) is 900,000 greater for 1984 (19,563,000 compared with 18,659,200) and is over 1.5 million greater in 1989 (24,016,100 compared with 22,505,400).

The increase in population for 1979 occurs primarily for those under 10. For 1984, the increase occurs for those under 15 and for 1989 the increase occurs for those under 20. The adult population projections are similar for both sets of projections with the adult projections actually higher in some cases in the original projections.

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(1) Kenya Statistical Digest September 1972 Vol. X - No. 3  
Central Bureau of Statistics, Ministry of Finance and  
Planning.

Table 22. Old and revised projected populations by age & sex  
for 1979, 1984 and 1989 (000)

	<u>Old estimate</u>		<u>1979</u>	<u>Revised</u>	
	M	F		M	F
0-4	1,568.6	1,549.8		1,739.5	1,711.2
5-9	1,235.4	1,201.2		1,258.4	1,251.5
10-14	1,010.9	936.9		973.6	975.3
15-19	316.2	793.6		807.6	809.0
20-24	647.9	679.7		664.7	663.8
25-29	501.3	590.9		545.7	544.1
30-34	432.4	461.1		442.4	440.0
35-39	355.8	373.2		357.5	353.0
40-44	291.8	303.8		304.8	302.3
45-49	245.2	232.8		220.0	217.9
50-54	186.8	196.0		191.3	183.9
55-59	157.1	139.9		134.5	144.9
60+	323.4	292.6		272.1	334.1
TOTAL	7,772.8	7,751.4		7,912.0	7,936.0
TOTAL M+F	15,524.2			15,848.0	

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	<u>Old estimate</u>		<u>1984</u>	<u>Revised</u>	
	M	F		M	F
0-4	1,893.9	1,871.3		2,170.6	2,135.3
5-9	1,501.1	1,459.7		1,641.3	1,628.2
10-14	1,241.1	1,150.3		1,229.7	1,229.6
15-19	974.0	947.2		956.4	962.5
20-24	769.3	807.1		786.7	792.4
25-29	594.9	701.1		644.6	647.8
30-34	515.3	549.3		527.9	530.7
35-39	424.0	444.8		427.0	428.0
40-44	346.1	360.3		343.0	342.0
45-49	293.5	278.7		289.3	290.5
50-54	221.4	232.2		205.4	206.7
55-59	188.6	168.0		174.2	175.9
60+	381.2	344.8		301.3	495.9
TOTAL	9,344.4	9,314.8		9,697.4	9,865.6
TOTAL M+F	18,659.2			19,563.0	

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	<u>Old Estimate</u>		<u>1989</u>	<u>Revised</u>	
	M	F		M	F
0-4	2,292.9	2,265.5		2,674.3	2,630.8
5-9	1,821.5	1,771.3		2,063.3	2,042.9
10-14	1,510.7	1,400.1		1,608.8	1,604.6
15-19	1,194.3	1,161.3		1,210.0	1,215.6
20-24	919.4	964.6		933.9	944.5
25-29	707.4	833.8		764.9	774.9
30-34	612.6	653.0		624.9	633.7
35-39	506.5	531.5		510.6	517.5
40-44	413.3	430.1		410.6	415.6
45-49	349.3	331.5		326.3	329.6
50-54	265.9	273.9		270.7	276.5
55-59	224.4	199.8		187.4	193.2
60+	454.5	411.3		354.9	496.0
TOTAL	11,272.7	11,232.7		11,940.8	12,075.3
TOTAL M+F	22,505.4			24,016.1	

## 7.2 Effect on the age structure

In general, both increasing fertility and declining mortality increase the share of the population of children in a society. Increased fertility boosts the child population because of the increase in the number of births each year. In addition, declining mortality increases the child population because the most significant declines in mortality occur in the infant and early childhood years thus boosting the infant and child survivors each year. Therefore, though the revised projections have little effect on the adult population in the short run, the child population is boosted each year, by both an increase in the number of babies born and an increase in the number of these babies that survive to adulthood.

## 7.3 Effects of population under five

The original population projections for the population under five for 1979 was 3,116.4 thousand as opposed to a revised projection for 1979 of 3,450.7 thousand, a difference of over 330,000 or an increase of about 11% for this population sub group. The same trends appear for 1984 and 1989. The original projections project the population under five for 1984 and 1989 as 3,765.2 thousand and 4,558.4 thousand. However, the revised projections are 4,305.9 thousand and 5,305.1 thousand, an increase of 14.4% and 16.4% respectively.

It needs to be remembered that the population under five in the short run has no investment value. It is strictly a consumption good. Therefore an increase in the size of that group draws scarce resources away from needed investment. An increase in the relative size of this group can only retard the rate of development in industry, agriculture and other sectors.

The revised projections have both long and short term implications for social and economic planning. In the short run an increase in the number of babies born requires an increase in medical services connected with the birth process. As the increased number of babies grows, an increased amount of nutritional assistance needs to be offered. In the longer term as this increased population under five ages and enters school, there will be increased pressure on the number of school buildings, the number of teachers and the amount of school supplies.

#### 7.4 Effects on population under fifteen and the school age populations

The proportion of population under 15 reflects the same effects of the revised fertility assumptions. The original projections for the percent of population under 15 for 1979, 1984, and 1989 respectively are 48.3, 48.9 and 49.2. For the revised projections the percent of the population under 15 for 1979, 1984 and 1989 are 49.9, 51.3 and 52.6 respectively. As expected, school age population (5-14) reflects similar effects of the change in fertility assumptions. The school age population for the revised projections are 1.7%, 7.0% and 12.5% higher than the original projections for 1979, 1984 and 1989 respectively.

The economic value of children over five is somewhat ambiguous. For the younger part of this group the consumption costs in terms of education and medical care are high. As they approach their teen years (or even earlier in rural areas) their investment value, primarily in terms of their contribution to the agricultural sector, increases.

With regard to the school population (roughly aged 5-14), little needs to be added, except that both the current and capital budgets of the Ministry of Education will have to be increased to meet the increased numbers in both primary and secondary schools. In fact it would have been useful if data were available on enrollment rates together with teacher/student ratios, to throw some light on these issues, e.g. the number of class-rooms, the required output of the teacher training colleges, salaries etcetera.

In the long term these children will have to secure job training and will need to be able to find jobs. The pressure on the job market in the 1990's promises to be extraordinary. As educational levels increase, the potential for frustration among youths who do not find jobs may also increase.

#### 7.5 Effects on adult population

While the population of young people are dramatically increased in the revised projections, the adult population in the original and the revised projections remain about the same reflecting the similarity in the mortality assumptions of the two sets of projections. This is also true for the projections of women of child bearing age (15-49) in 1979, 1984 and 1989.

The fact that the adult population remains about the same, while the child population increases dramatically in the revised projection means that a relatively fixed number of adults will need to financially support and provide other kinds of care for more young people than ever before. Thus within the family, there is more pressure on the same amount of resources to feed, clothe, and educate a larger number of children. From the societal perspective an increased number of teachers, doctors, and other providers of services will have to come from an adult population that has not grown. People who can provide these services must be educated today to fill the increased demands of tomorrow.

Also reflecting the obvious imbalance in the age structure, the next two decades will witness enormous pressures on the labour force, as large numbers of youth with only modest education seek employment both in the farms and in the modern sector. Limited rural job opportunities suggest that there will be increasing pressure on the urban job sector. This implied rural to urban migration will also accelerate an already deteriorating housing situation in the urban areas. It will also put more pressure on urban educational and job training institutions which at present are having difficulties coping with the transitional employment needs of a rapidly urbanising and industrialising society.

#### 7.6 Effects on dependency ratios

Because the adult population remains about the same in both projections and because there are dramatic increases in the young population between the original and the revised projections, there are also dramatic changes in the projections of the dependency ratios. The dependency ratio  $\frac{\text{Pop 0-14} + \text{Pop 60+}}{\text{Pop 15-59}}$  rises gradually in the original projection from 110 in 1979 to 112 in 1984 to 113 in 1989. It rises more dramatically in the revised projection from 112 in 1979 to 122 in 1984 to 128 in 1989. These dependency ratios are almost unprecedented not only in Africa, but also in the world.

The population 0-14 is primarily a consuming population. Because it is so large in relationship to the potential labour force age group, there is a negative effect on the supply of resources available for capital investment in the economy.

The implications of the revised projections of the dependency ratios are profound for social and economic planning. The same

number of adults must provide for the needs of a much greater population of children than they do today. The economic, medical, educational, and social demands that will be made are staggering. More demands will be placed on mothers who on the average will be caring for more children spaced closer together. They will need greater assistance if their children are not to suffer educationally, socially and in terms of their physical well-being.

Table 23. Selected Population Characteristics under the Original and revised assumptions.

	1979		1984		1989	
	Original	Revised	Original	Revised	Original	Revised
Population under 5 (000)	3,118.4	3,450.7	3,765.2	4,305.9	4,558.4	5,305.1
% of population under 15	48.3	49.9	48.9	51.3	49.2	52.6
School age population (age 5-14) (000)	4,384.4	4,458.8	5,352.2	5,728.8	6,503.6	7,319.5
Working age population (age 15-59) (000)	7,405.4	7,332.2	8,815.8	8,731.1	10,577.6	10,539.5
Women of child-bearing age (15-49) (000)	3,435.0	3,330.0	4,088.5	3,993.8	4,905.8	4,831.4
Dependency ratio	110	112	112	122	113	128
Child/woman ratios	908	1036	921	1073	929	1098

## 8.0 Conclusion

All of the evidence we have presented in this paper is consistent with the idea that in the years ahead, fertility in Kenya will continue at very high levels whereas mortality will continue to decline. In this regard, the demographic trend in Kenya parallels that of many other countries at similar stages of development. One important difference, however, between Kenya and most other developing societies lies in the fact that the combination of the current high level of fertility with rapidly declining mortality is virtually unprecedented in demographic history. Indeed, it is estimated that Kenya's average annual growth rate may have reached four percent. If this rate continues, the population of Kenya will double approximately every 17.3 years. Thus, if the current population of Kenya is about 16 million, it could expect to reach 32 million by about 1996 and 64 million by 2013. While a growth rate of four percent can obviously not be sustained indefinitely the longer this phenomenally high rate continues the greater will be the pressure on social and economic institutions and resources in the decades ahead.

The capital resources of Kenya, will over the remaining years of the 20th Century be strained to the limits, reflecting the economic and social move towards industrialisation as well as a continued high population growth rate. In the short run, these economic pressures will be particularly severe because of the enormous educational training needs of the country's ever and burgeoning youth population. In the longer run, it is hoped that this youth population, as it reaches adulthood will meet the economic needs for trained personnel. In any event, the economy will be faced with many crucial decisions over the next few years in allocating its limited financial resources between the consumption needs of its dependent population and the production requirements of the industrial, agricultural, and other sectors.

APPENDIX 1

THE 1977 NATIONAL DEMOGRAPHIC SURVEY

Notes on Analytical Methodology

1. Fertility

Fertility was estimated by means of "relational Gompertz model" which was fitted to the data on current fertility (births reported as occurring in 1976 and 1977), using the techniques of Bill Brass and Basia Zaba. When fitted to the current data the reported rates for women over 40 were excluded as they were regarded as unreliable, being inflated either by age mis-reporting or what is called the "grand-mother effect" - i.e. children living with their grandparents being shown as the offspring of the grandmother. The reported rates are shown below.

The same model was then fitted to the average parities, and when inflated proportionately to give a total fertility rate of 8.1 it was found to give an excellent fit to the reported values up to the 30-34 age group. The steps of the calculation are shown below, where  $Y_s(X)$  is the standard log-logs and  $Y_f(X)$  the fitted log-logs. The fitted current rates and average parities by single years of age are also shown below as is the comparison with the reported value.

2. Infant and child mortality

Estimates of  $q(2)$ ,  $q(3)$  and  $q(5)$  were made from proportions of children dead to mothers aged 20-24, 25-29 and 30-34 using Brass' method. Trussell's method was tried, but gave less consistent results. Graduated values of  $q(2)$  were obtained by averaging the differences between the logits of these estimates and those of the "African Standard Life Table". Value of  $l_2$  of 895 for females and 890 for males were obtained, the estimates being rounded to nearest figures ending in 0 or 5 to facilitate the estimation of  $f$ .

3. Adult mortality

Adult mortality for males was based on widowhood data, and for females on the orphanhood data. The singular mean age at marriage for males and females, needed for the widowhood calculations were 26.25 and 20.43 respectively. The proportions of women with first husband alive, and the proportion of females with mothers alive were converted into survivalship probabilities using the standard method of Bill Brass and

Ken Hill. Beta estimates were than obtained by the method using the expectations of life described in the paper by John Blacker. Population Studies (March 1977). The parameters for the logit model life tables (African Standard) so obtained were:

	<u>Males</u>	<u>Females</u>
$l_2$	880	895
$\lambda$	0.87	0.95
$\mu$	-0.2313	-0.3709

#### 4. Graduation of the Age Distribution

Adult females (15+) were graduated using Brass' logit difference method. (A good account of this method may be found in Vol. IV of the 1969 Uganda Census Report). The stable population calculated from the estimated age specific fertility and mortality rates were used as the standard. But the method could clearly not be used for children under 15. For these, the women were back-projected for 15 years, and the numbers of births calculated for 1977, 1972, 1967 and 1962 assuming that fertility had been rising by 0.8% per annum. Births in the intervening years were calculated by fitting parabolae to the logarithms of the totals at the 5-year intervals. The survivors from these births in 1977 were then calculated by applying the 1977 mortality rates for the period 1972-77, the 1969 rates for the period 1962-67, and an average of these rates for the period 1967-72. The total number of female children (sex ratio at birth 1.0275, derived from CEB data) under 15 so obtained agreed with the reported numbers to within less than 1%.

Males were graduated by applying the sex ratios by age group derived from the model life tables and the sex ratio at birth of 1.0275. This gave a total male population about 3% bigger than the reported total. Adjustments were therefore made using the migration model described in the Uganda Report, Vol. IV.

Reported current age-specific fertility  
rates (births occurring in 1976 and 1977)

Age group	f
12-14	0.0042
15-19	0.1346
20-24	0.3649
25-29	0.3609
30-34	0.3157
35-39	0.2311
40-44	0.1327
45-49	0.0564
50-54	0.0122
55-59	0.0079
60-64	0.0049
TOTAL	8.1191

Relational Gompertz fertility model fitted with  
 $\alpha = -0.091$  &  $\beta = 1.008$  to NDS 1 data on

(a) Current fertility and (b) average parity.

(a)

Age	$Y_s(X)$	$Y_f(X)$	$f(X)/f$	$f(X)$	TFR = 771
				0.0005	0.0008
14½	-1.923	-2.029	0.0005	0.0909	0.1402
19½	-0.775	-0.872	0.0914	0.2279	0.3514
24½	-0.041	-0.132	0.3193	0.2404	0.3707
29½	+0.630	+0.540	0.5597	0.2043	0.3150
34½	+1.392	+1.312	0.7640	0.1499	0.2428
39½	+2.479	+2.408	0.9139	0.0748	0.1153
44½	+4.532	+4.477	0.9887	0.0113	0.0183

(b)

Age	$Y_f(X)$	$Y_f(X)$ f	$f(X)/f$	Reported P	Implied TFR	Fitted P TFR = 3.1
15-19	-1.0789	-1.1785	0.0388	0.3288	8.47	0.3142
20-24	-0.3119	-0.4054	0.2232	1.8285	9.19	1.8075
25-29	+0.3538	+0.2656	0.4645	3.7168	8.00	3.7627
30-34	+1.0663	+0.9838	0.6881	5.5521	8.07	5.5733
35-39	+1.9534	+1.8780	0.8582	6.6710	7.77	6.9516
40-44	+3.4132	+3.3495	0.9655	7.2542	7.51	7.8206
45-49	+6.0564	+6.0139	0.9976	7.4619	7.48	8.0802

Relational Gompertz model by single year of age

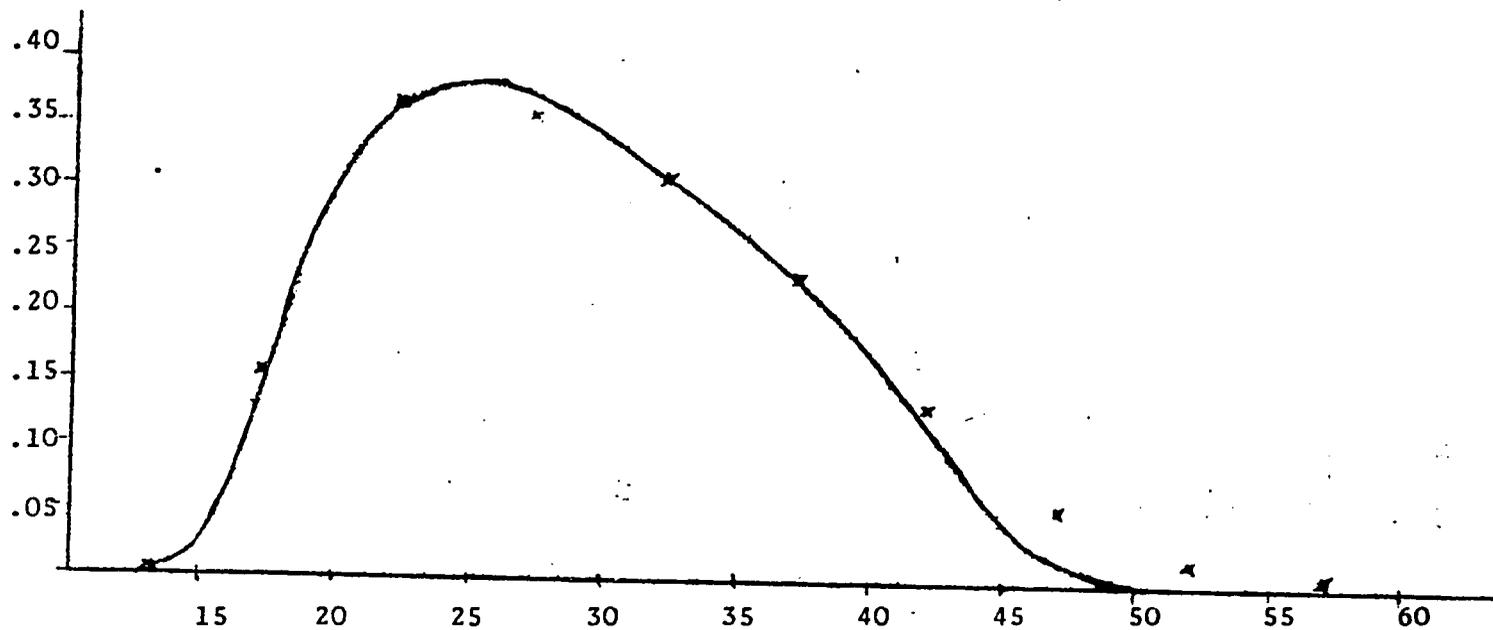
Current age specific rates  
TFR = 7.7.

Average parities  
TFR = 8.1

11	-	31	0.3225	11	-	31	5.0707
12	0.0001	32	0.3076	12	-	32	5.4095
13	0.0011	33	0.2921	13	0.0001	33	5.7326
14	0.0100	34	0.2757	14	0.0012	34	6.0395
15	0.0445	35	0.2589	15	0.0117	35	6.3291
16	0.1063	36	0.2411	16	0.0584	36	6.6011
17	0.1719	37	0.2230	17	0.1700	37	6.8544
18	0.2364	38	0.1983	18	0.3507	38	7.0887
19	0.2852	39	0.1885	19	0.5991	39	7.2970
20	0.3271	40	0.1580	20	0.8987	40	7.4951
21	0.3509	41	0.1286	21	1.2424	41	7.6611
22	0.3659	42	0.1006	22	1.6110	42	7.7962
23	0.3745	43	0.0735	23	1.9954	43	7.9020
24	0.3778	44	0.0490	24	2.3889	44	7.9792
25	0.3797	45	0.0300	25	2.7858	45	8.0307
26	0.3765	46	0.0185	26	3.1847	46	8.0622
27	0.3694	47	0.0107	27	3.5802	47	8.0816
28	0.3612	48	0.0054	28	3.9683	48	8.0929
29	0.3507	49	0.0014	29	4.3478	49	8.0985
30	0.3374	50	-	30	4.7162	50	8.1000

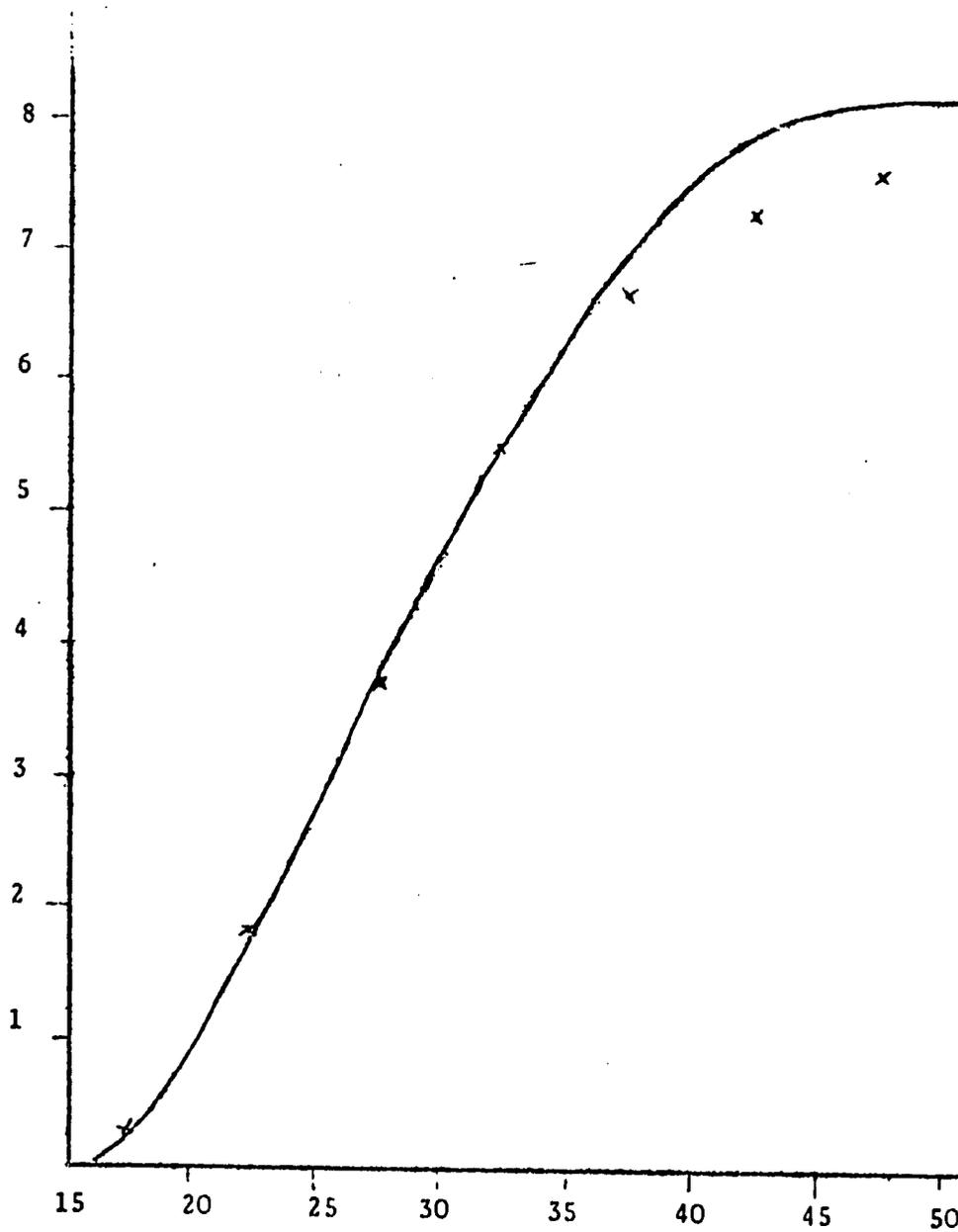
RELATIONAL GOMPERTZ FERTILITY MODEL FITTED TO AGE SPECIFIC FERTILITY  
RATES BASED ON BIRTHS REPORTED AS OCCURING IN 1976 AND 1977

MODEL TFR = 7.71



CUMULATED FERTILITY MODEL FITTED TO AVERAGE PARITIES

MODEL TFR = 8.1



Projections Methodology

1. Life table survival ratios

Life table survival ratios were made for 1969 from the 1969 life table in Vol. IV.<sup>(1)</sup> Similar survival ratios were made from life tables based on data from the 1977 National Demographic Survey. Survival ratios were interpolated between these, to arrive at survival ratios for 1974 and they were extrapolated to arrive at survival ratios for 1984. It was assumed for the purpose of the revised projections that mortality declined linearly from 1969 to 1989, so that the expectation of life at birth rose linearly from 49.1 years in 1969 to 58.1 in 1989.

2. Application of survival ratios to population

Survival ratios for 1969 were applied to the graduated 1969 age distribution to arrive at the population 5 and over for 1974. Survival ratios for 1974 were then applied to this population to arrive at a population 10 and over for 1979. Similarly survival ratios were applied to this population to arrive at a population 15 and over for 1984. 1984 Survival ratios were applied to this population to arrive at a population 20 and over for 1989.

3. Fertility rates

Corrected age specific fertility rates from the 1969 Population Census (T.F.R. 7.6) were used for 1969 and age specific fertility rates arrived at from the 1977 National Demographic Survey (T.F.R. 3.1) were used for 1979. These two sets of rates were used for interpolation purposes to arrive at age specific fertility rates for 1974. The 1979 rates were used for 1984 and 1989.

4. Application of fertility rates to female age specific population

The 1969 age specific fertility rates were applied to the 1969 female population in the reproductive ages to arrive at an estimate of births in 1969. The 1974 fertility rates were applied to the 1974 female population and the 1979 rates were applied to the 1979 female population to arrive at similar estimates of births for 1974 and 1979. The 1979 rates were applied to the 1984 and 1989 female population to arrive at birth estimates for those years.

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(1) 1969 Population Census Vol. IV Analytical Report, Bureau of Statistics, Ministry of Finance & Planning.

5. Interpolations of birth estimates

Interpolations of birth estimates were done to arrive at estimates of births for each year between 1969 and 1974, 1974 and 1979, 1979 and 1984, and 1984 and 1989. Populations aged 0-4 in 1974, 1979, 1984 and 1989 were then cumulated.

6. Infant survival ratios

Infant survival ratios :  $L_x \frac{0-4 \text{ males \& females}}{10,000}$

were made from the 1969 and 1979 life tables and interpolated for 1974 and extrapolated for 1984. These ratios were applied to the appropriate 5 year birth estimates to arrive at the 0-4 year old survivors as of 1974, 1979, 1984 and 1989.

7. The proportion males of this group was set at 0.5011.

8. Males and females 0-4 were then placed in appropriate populations (1974, 1979, 1984, 1989) and life table 'survival' ratios were applied to "survive" them to the next 5 year age group in the next population.

SUMMARY TABLE POPULATION PROJECTIONS  
FOR KENYA 1969 - 1989

YEAR	TOTAL POPULATION	CRUDE BIRTH RATE PER 1000	CRUDE DEATH RATE PER 1000	% RATE OF NATURAL INCREASE
1969	10,942,705	49.63	17.11	3.249
1974	13,059,307	52.64	15.73	3.691
1979	15,847,979	54.62	14.20	4.042
1989	19,563,003	52.85	12.66	4.019
1989	24,016,077	51.98	10.42	4.156