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Discussion paper No. 33

DEMOGRAPHIC TRENDS AND EDUCATIONAL NEEDS

D. F. Heisel

November 1966

This paper was originally presented at the Conference on Education, Employment and Rural Development held at Kericho, Kenya from 25th September to 1st October, 1966. It is scheduled for publication as part of the Conference Proceedings.

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DEMOGRAPHIC TRENDS AND EDUCATIONAL NEEDS

by

D. F. HEISEL

This paper will explore some of the implications of demographic trends for educational needs in a developing society such as Kenya. Attention will be rather narrowly focussed on this single relationship; broader economic considerations have been dealt with elsewhere in the literature and need not be repeated here.*

The discussion will begin with a review of the outlines of Kenya's existing demographic characteristics. These are reasonably well known and are quite sufficiently accurate for the analysis that will be presented here.** Then, the dynamics of the age distribution of a human population will be considered. This topic will be more fully explored as the demographic characteristic with the greatest direct relevance for educational needs and policy. Finally, the age distribution will be briefly explored.

Kenya's 9-odd million people are very unevenly distributed through its territory. Despite the fact that urban concentrations are few and small, by world standards, there are very great differences in density of population between regions. Furthermore, given the low level of urbanization, Kenya as a whole is by no means a thinly populated country. The gross density of 15 persons per square kilometer is about the same figure as found in Sweden. It is 50 percent higher than the density of the USSR and just 25 percent lower than that of the US. Kenya's density is, of course, very much higher than those found in wealthy industrial-agricultural countries such as Australia, Canada or New Zealand. On the other hand, Kenya is indeed much less densely populated than the crowded industrial countries of Europe or the congested nations of South Asia.***

* A useful summary, for example, can be found in A. Coale, "Population and Economic Development," in P. Hauser, ed., The Population Dilemma, Prentice Hall, 1963.

** Full results will not be available until the analysis of the 1962 Census is published. In the meantime, we shall depend on fragmentary reports as those presented in D. Etherington, "Projected Changes in Urban and Rural Population in Kenya..." included as a paper for this Conference.

*** It is perhaps more pertinent to consider density in a predominantly agricultural country such as Kenya in terms of rural population in relation to arable land. Using simply figures reported by the FAO, Kenya appears to be relatively crowded. With a rural population of 450 persons per km² of land presently defined as arable, Kenya reaches a figure just less than twice that for Uganda (228). All other reported countries in Eastern Africa have rural population densities on arable land less than Uganda's. Reported in Economic Commission for Africa, "The Demographic Situation in Eastern Africa," E/CN.14/LU/ECOP/2, July, 1965.

The force of mortality has been steadily slackening in Kenya in recent years. On the basis of 1962 census returns, the crude death rate was estimated to be about 20 deaths per thousand living persons per year. From these and other data, an expectation of life at birth of approximately 45 years can be inferred. This is still a comparatively high level of mortality - a death rate about double those typically found in the industrialized countries. However, there is also clear evidence of a sustained decline. Expectation of life at birth may well be rising by as much as 6 months per year.

In contrast, fertility shows no evidence of having moved either up or down. With an estimated crude birth rate of about 50 per thousand, Kenya's fertility is among the higher found in the world today. The estimated birth rate corresponds to an average completed family size of just less than 7 births per woman. (Interestingly, fertility seems, with one exception, to reach maximum levels in the most densely populated areas of the country. It is highest in the Western part of Kenya: South and Central Nyanza and the Western Region. Among the thickly populated sections, only Central Province shows slightly more moderate levels of fertility. It is lowest along the Coast.)

As in most countries in the modern world, migration across international boundaries is of relatively slight demographic importance. Nor is there reason to anticipate any notable increase. Neither large scale movements of people in or out can be reasonably expected. Internal movement seems to be substantial but it does not have any direct effect on population growth. It is relevant only in so far as it has an influence on fertility or mortality.

The combined effects of fertility, mortality, and migration have produced in Kenya a very young average age. Just a little less than half of the population consists of children less than 15 years of age. At the same time, the proportion in the older ages, say 60 or more years, is very small. It is not likely to be much over 5 percent. This age distribution is typical of the less developed countries and is in sharp contrast to the urban industrial nations. In the latter, one is likely to find something like a quarter of the population 0 to 14 and considerably higher proportions in the older ages.

Finally, the rate of population increase in Kenya is currently very close to 3 percent per year. The unimportance of migration makes this rate largely a result of the high level of fertility and the moderate level of mortality. The rate is among the higher found in the world today. It implies a doubling of the population about every 24 years. Again, the contrast with the urban-industrial nations is sharply marked. In Northern and Western Europe populations tend to grow at about 1 percent per year; in Eastern and Southern Europe (and in Japan) the rate is even lower.

For the present, the trends of fertility, mortality, and migration appear to be unlikely to change very much. Since migration will probably remain a minor factor, fertility and mortality will continue to be the significant determinants of population growth and the age distribution

/in Kenya.

in Kenya. Mortality will almost certainly decline further. Experience in comparable countries suggests that a further decline of perhaps 25 percent or more in the crude death rate can be brought about through the continued application of existing medical practices and facilities. In other words, further gains in health are available through public health programmes (particularly in preventive medicine) using existing medical technology and without the introduction of the very expensive curative facilities characteristic of the most advanced medical practice found in the wealthiest urban-industrial countries. Moreover, these latter medical procedures will themselves also, without doubt, continue to expand.

On the other hand, the existing patterns and level of fertility gives little reason to expect any change without the intervention of some new exogenous factors. The birthrate cannot rise very much from its present level; it is only in rather special circumstances that numbers as high as 60 per thousand are achieved. For a whole national population, 55 seems to be a rough realistic maximum. Thus, a 10 percent rise in the birthrate is about as much as is possible. (It is worth noting, though, that some rise might well occur. If health conditions continue to improve, more women will survive further into their childbearing years, childbearing itself will become less hazardous, and the incidence of sterility and sub-fecundity will decline. Any of these could lead to higher fertility.)

A reduction in fertility is equally unlikely, if there is no introduction of any new factors. Barring a disastrous and unforeseen rise in mortality, a significant fertility decline can come only as a result of a reduction in the amount of time individuals - especially women - are exposed to the risk of conception or of an increase in the use of measures to prevent births. More simply stated, childbearing will decline only if people engage in less sexual intercourse or if they take steps so that intercourse doesn't result in a birth. The former could result from a rise in the average age at marriage or from a radical alteration of the structure of the family. Neither of these seems especially likely.

The wider use of measures to prevent births is similarly unlikely, without the intervention of outside influence. These measures would take one or more of three forms of birth limitation: sterilization, abortion, or contraception. Sterilization is not uncommon in Kenya but has usually been restricted in its use to situations where further childbearing would be medically dangerous to a woman. (This statement does not apply with full accuracy to the Asian population, but since Asians are demographically unimportant the qualification can be ignored.) There is no evidence to indicate that sterilization will acquire more than medical importance for the majority of the population. Therefore, it is unlikely to effect the course of fertility in Kenya.

It is not possible to speak with quite such assurance about the future course of abortion. In recent years many societies in many parts of the world have experienced a rapid upsurge in the use of this means to prevent births. There is no justification for asserting flatly that a similar trend could not develop in Kenya. Research currently in progress indicates the knowledge of how to induce an abortion is widespread through the

/population

population of this country. There is no way of estimating accurately the current incidence, though the very high level of fertility indicates that the rate cannot be extremely high. Moreover, it must be remembered that abortion is generally illegal, dangerous (especially given the methods most commonly known), and contrary to commonly accepted values. Of course, there are by no means unassailable barriers to a change in the rate. However, there is no evidence just now of rising incidence of abortion of such a magnitude as to substantially lower fertility.

In most countries currently experiencing a decline in fertility (as well as those where fertility is already low) contraception is playing a major role. In Kenya, however, practice of contraception is still very infrequent. This state of affairs will probably continue in the near future. Incomplete results of research in progress show that knowledge of effective modern contraceptives is extremely scanty. (There seems to be widespread demand for more information about contraception and greater availability of facilities in rural Kenya, though.) However, unless a broad programme of education and encouragement in family planning is introduced, it is difficult to see how any significant change can take place in the near term.

Taking probable trends in migration, mortality, and fertility into account, it is clear that Kenya's present high rate of population growth is likely to continue in the near future. Indeed, if mortality falls at an expected pace, the rate of population growth will rise substantially.

With these prospects in view, it will be useful to try to determine what the implications are for the specifically educational needs of the society. In order to do so, we shall consider the impact on the age distribution of trends in mortality and fertility which might plausibly be expected in a population such as Kenya's. The age distribution is the appropriate point of focus since it determines the limits of demand for education. That is, the age distribution specifies the number of young people who can possibly enter into any formal educational process as well as their numbers relative to those in other age groups.

This is a problem of acute significance in a developing country where the average age is low, as in Kenya. Not only is the economy confronted with the heavy demands of constructing a new educational institution (whatever the curriculum), it also must carry out this development with extraordinarily larger numbers of clients relative to the size of the total population. And all this must be done in the face of competing imperative demands for scarce capital.

The analysis can best be carried out by means of the stable population model. By this means it is possible to infer the implicit age distribution of any population essentially unaffected by migration, given any levels of mortality and fertility.* What will be done here is to

/examine

* The model was originally developed by A.J. Lotka and reported in his paper "On the True Rate of Natural Increase," Journal of the American Statistical Association, Vol. 20, Sept. 1925. It has more recently been extended and amplified in, for example, J. Bourgeois-Pichat, "Utilisation de la Notion de Population Stable pour Mesurer la Mortalite et la Fecondite des Populations des Pays Sous-Developpes," Bulletin de l'Institute International de Statistique, Vol. 36, 1958, and A. Coale and P. Demeny, Regional Model Life Tables and Stable Populations, Princeton, 1966. For the present analysis, the Females North model life table was adopted from the Coale-Demeny volume.

examine the age distributions that will result from the various kinds of changes that could be reasonably anticipated in Kenya. The examination will provide a picture of the implications of demographic trends apart from historical accidents.

Table 1 indicates that in a stable population that is increasing at 3 percent per year, with an expectation of life at birth of 45 years for females, and a gross reproduction rate of 3.5 (that is, an average completed family size of just slightly less than 7.0 children) we would expect to find a birthrate of 49.7 and a death rate of 19.7. The percent under age 15 should be 46.7. This is indeed a very nice fit with the empirical estimates for Kenya. There are undoubtedly minor discrepancies. These might result from some of the parameters assumed for purposes of constructing the model. However, an even greater source of discrepancies are the inaccuracies in the empirical estimates. In any case, they are trivial in magnitude and do not effect any conclusions we might draw.

Let us now see what happens with an improvement in mortality. If the expectation of life at birth goes from 45 to 55 years, an increase of about 22 percent, the rate of population growth rises to about 3.6 percent per year. That implies doubling of the population in just less than 20 years. The crude birth rate declines by merely one point (as a result of an increase in the number of years lived on the average by members of the population). However, the most interesting and important point is that the age distribution alters but little. Indeed, changes in mortality in general have only a very slight effect on the age distribution. The shifts in the age distribution which do occur increase the proportion in the younger years. Further increases in expectation of life at birth continues the observed trends and do not alter the conclusions in any way.

Gains in longevity are a universally supreme social value. Furthermore, they have a direct economic impact on development by increasing the efficiency of education. In a society with moderate to high mortality, a substantial proportion of those born are quickly lost. Hence, investments of any sort made in these children are also lost. Thus, in a society with an expectation of life at birth of 45 years, about 13 children out of every 100 born will not survive to their first birthday and some 10 more will die before reaching age 5. Where expectation of life at birth has reached 65 years, only about 5 will die before age 1 and just 2 more before age 5. Affecting the efficiency of formal education in a society with an expectation of birth of 45, of every 100 children who do survive to age 5, about 5 will die before the age of 15, about 23 before the age of 40, and only some 57 will reach the end of their working years at age 60. If the expectation of life at birth has reached 65 years, some 98 percent of those surviving the age of 5 will be alive to enter the labour force at age 15, 91 percent will reach age 40, and 78 percent will remain at age 60.

These are real and significant gains. When unaccompanied by declines in fertility, though, gains in longevity carry with them certain costs. Not only does the rate of population increase rise - possibly to extreme levels - but the age distribution shifts to an even slightly more disadvantageous form. The burden placed on members of the population in the more productive years of life of supporting persons in the relatively unproductive years becomes just a bit heavier. This can be seen by the small increases in the

/proportions

TABLE I
SELECTED CHARACTERISTICS OF VARIOUS STABLE POPULATIONS

GROSS REPRODUCTION RATE	EXPECTATION OF LIFE AT BIRTH	CRUDE BIRTH RATE	CRUDE DEATH RATE	RATE OF POPULATION INCREASE	PERCENTAGE AT GIVEN AGES				DEPENDENCY RATIO
					0-14	15-59	60+	5.14	
3.50	45	49.7	19.7	3.0	46.7	49.2	4.0	27.5	103
3.50	55	48.7	12.7	3.6	48.5	47.5	3.8	28.6	110
3.50	65	47.3	7.3	4.0	49.4	46.8	3.8	29.2	114
2.50	55	36.6	13.2	2.3	39.8	53.5	6.8	24.3	87
2.50	65	36.0	8.2	2.8	40.9	52.4	6.7	25.1	91
1.75	55	25.8	15.2	1.1	30.6	57.8	11.6	19.4	73
1.75	65	25.5	10.5	1.5	31.7	56.8	11.6	20.1	76

proportions of children and, more directly relevant to the present discussion, in the proportions in the primary school years, 5 to 14. Similarly, increases in the dependency ratio (the number of dependents, 0-14 and 60 or more per 100 persons in the working years, 15-59) reflect the increased burden across the whole age span. It is quite plausible to expect that improvements in longevity will increase the proportion of dependents by some 10 percent in the foreseeable future. Gains in efficiency are to a large extent wiped out, then.

Thus, reductions in mortality afford no relief from the sharply disadvantageous age distribution. To the contrary, they slightly increase the burden. Investments must continue to be made in members of the population who cannot significantly contribute to increased productivity. A nation such as Kenya must continue to develop with a burden of dependency which no presently industrialized society has ever had to cope with.

It is also instructive to consider the implications of population growth and the age distribution for education in terms of the sheer numbers involved, as well as the proportions. To do this, an analysis will be adapted from the Report of the Population Council Mission to the Kenya Government.*

Consider a population of 10 million with characteristics described by line 1 of Table 1. (That is, a population quite similar to Kenya's.) There would be 1.5 million children 5 - 9 years of age. Assume that the rate of population growth rises from 3 percent to 3.5 percent per year over a 25 year period, as would occur if mortality falls at a very moderate pace while fertility remains constant. The numbers of children 5 - 9 years of age are shown in the first column of Table 2. The second column shows the number enrolled in school, assuming that 60 percent are enrolled at the outset and that the number of students grows by 4 percent per year through the 25 year period. The third column shows the number of children not enrolled in school. It also shows that after 25 years of educational expansion, there would be 50 percent more children lacking any formal education than there was at the outset.

The rise in the rate of population growth assumed in the above analysis is in fact slower than Kenya's current progress in mortality reduction implies. Needless to say, the more rapid increase in rate of growth which can be realistically expected would increase the number of uneducated much more rapidly. If the rate of growth rose to 4 percent per year over the same period (that is, if mortality fell to the levels not experienced by the industrialized nations in 25 years), the number of uneducated would then rise to double the number at the outset.

The preceding paragraphs have explored the implications of variations in mortality alone. Let us now consider what would happen if fertility also declines.

* R. Anderson, et al, Report to the Ministry of Economic Planning and Development, Republic of Kenya, on Population Growth and Family Planning in Kenya, Unpublished.

Lines 4 through 7 of Table 1 show the characteristics of the stable populations which would result if fertility declined along with mortality.* Lines 4 and 5 consider the situation if fertility fell by just less than 30 percent; lines 6 and 7 if the decline was 50 percent. Both possibilities leave fertility and the rate of population growth at substantially higher levels than are found in the urban-industrial world today. Both projections of decline are modest when compared with those taking place in some underdeveloped countries today. And both would lead to declines in the dependency ratio of at least 20 percent under what would be expected if mortality alone changes as expected.

TABLE 2

PROJECTIONS OF NUMBERS IN SCHOOL AND NOT IN SCHOOL

YEAR	POPULATION 5-9 (THOUSANDS)	IN SCHOOL (THOUSANDS)	NOT IN SCHOOL (THOUSANDS)
0	1,500	900	600
5	1,740	1,100	640
10	2,040	1,340	700
15	2,390	1,630	760
20	2,820	1,990	830
25	3,330	2,430	900

Therefore, if a society such as Kenya wishes to reduce the burden of welfare costs attendant upon a disadvantageous age distribution and thus to increase capital available for other more immediately productive forms of investment, fertility reduction is essential. For the formal educational institution it can mean a more rapid decrease in the number and proportion of those without school - with no added investment in the educational apparatus of the nation. Within the family, greater resources can be concentrated on fewer individuals.

Finally, it is relevant to add that fertility reduction is a realistic aspiration for Kenya. It has already been mentioned that desire for assistance in this area appears to be widespread through the population. The costs of the kind of national programme which would be likely to have a significant impact are not at all impossible. Experience in countries currently conducting successful national programmes run on the order of Shs.35 per person per year or, generously estimated, some £200,000 per year. Foreign assistance is available for this purpose. The cost is not negligible. But, it must be weighed against the cost of not engaging in such a programme.

* The implicit age distribution resulting after a change in fertility will not be reached at once. Slight oscillations in the age distribution will continue to be observed for some time. However, for practical purposes they damp out quickly and can be ignored. See the analysis reported in United Nations, The Aging of Populations and its Economic and Social Implications. Population Studies, No.26. New York, 1956.