POPULATION AGING IN EGYPT: PAST AND FUTURE TRENDS

By

ATEF M. KHALIFA and M. G. EL—ROUBY

INTRODUCTION

Fertility, mortality, and migration determine the amount of population increase or decrease in a specified area. These three factors are, undoubtedly critical in demographic analysis, though, a population must be examined for other characteristics, especially those concerned with its composition. The term population composition is used in the present context to refer to the basic ascribed characteristics by which a poplation may be divided. In the present paper, we are basically concerned with the age composition of the Egyptian population.

Our main objective is the study of the past and future trends in the aging of the population in Egypt and its mechanisms of change. By aging of a population, we mean the increase of the proportion of old and the decrease of the proportion of young people in the total population.

Generally speaking, the age composition of a Population is well-determined by the regimes of fertility and mortality prevailing in the preceding years. On the other hand, the age distribution of a population affects to a great extent the eventual levels of fertility and mortality and hence the rate of growth of that population. Migration generally has a rather minor effect on age patterns of population, particularly in a country like Egypt where international migration is almost nil.

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POPULATION AGING IN EGYPT : PAST TRENDS

Censuses are the basic sources of data for studying the past trends in the Egyptian age composition. A concentration then will be made on the analysis of age compositions obtained from census tables through which one can recognize whether the population is growing older or younger. A sufficiently large period of time is permitted, starting at 1917 census and ending at the last complete census taken in Egypt in 1960. This enables us to trace significant trends of aging.

Two serious problems arose. The first is concerned with the non existence of a unique classification of ages for all censuses taken throughout this period. Thus, a procedure of re-orientation of age groups in five year intervals in all censuses under investigation was introduced. That makes sucessive censuses comparable. The second is concerned with the quality of data themselves. It was not reasonable to set our analysis without making an inspection of the data regarding deficiency or error likely to be found in such data. Thus, appropriate tests of the accuracy of census returns were applied to the data available on Egypt. Census data related to the period 1917—1960 suffered many deficiences. One must be aware of these deficiences in the data if he is to operate on them and draw conclusions. It was preferred in the present study to deal with the data as taken from census tables except for the slight change occurring as a result of re-orientation procedures. Finally, after the data are re-arranged and checked it is convenient to give a summary of the results of the analysis concerning how the population of Egypt was growing in the past few decades, was it growing younger or older.

we consider here some useful tools for tracing the trends of aging in Egypt. These tools are :

a) The analysis of the relative age composition especially that of broad age categories.

b) The use of some measurements as indication of aging. Three measures are being used, the median age, the aging index and the dependency ratio. The aging index may be defined as the number of aged persons (sixty-five years old and over) per 100 children (less than fifteen years old). The dependency ratio may be defined as the number of persons of dependent ages (children and aged) per 100 persons of working ages (from 15 to 64 years of age). Table (1) indicates the percentage age composition in five year age groups for

the total population during the period 1917—1960. Table (2) shows the percentage age composition in broad age classes, the median age, the aging index and the dependency ratio for the total population during the same period.

TABLE 1

Percentage Age Distribution of the Egyptian Population in the Census Years 1917—1960*.

Age Year	1917	1927	1937	1947	1960
0— 4	13.84	14.36	13.27	13.67	15.90
5— 9	14.21	13.15	13.91	12.69	14.62
10—14	10.96	11.17	12.02	11.71	12.23
15—19	9.40	9.16	8.48	10.06	8.29
20—24	8.23	7.78	6.96	7.32	6.91
25—29	7.38	8.67	8.25	7.79	7.33
30—34	7.21	7.54	7.51	6.93	6.35
35—39	6.38	6.62	7.18	6.94	6.65
40—44	4.98	5.58	5.96	6.00	4.40
45—49	4.03	3.73	4.14	4.46	4.40
50—54	3.29	4.06	4.19	4.60	3.64
55—59	2.64	1.61	1.76	1.82	2.46
60—64	2.17	2.08	2.08	2.91	2.60
65—69	1.70	1.60	1.56	0.88	1.28
70—74	1.28	1.09	1.06	1.29	1.16
75 and over	1.30	1.81	1.68	.93	1.03

* Source : The figures in this table are derived from the formal census tables of Egypt.

TABLE 2

Percentage Population Distribution by Broad Age Categories, Median Age, Aging Index, and Dependency Ratio in Egypt in the Census Years 1917—1960

Census Year	Percentage Dist n			Med. age	Index of aging	Dependency ratio
	0—14	15—64	65+			
1917	39.01	55.71	5.28	20.97	13.55	79.51
1927	38.68	56.83	4.49	21.38	11.62	76.01
1937	39.20	56.50	4.30	21.67	10.97	76.97
1947	38.07	58.83	3.10	21.28	8.14	69.98
1960	42.75	53.78	3.47	19.37	8.13	85.99

Regarding the relative age composition of the total population classified by broad categories, we notice that the proportion of population at the youngest ages fluctuated a little during the period 1917—1947, ranging from 38.07 to 39.20 percent (see figure (1). It started at a level of 39.01 percent at 1917, decreased to 38.68 percent at 1927 and then increasd to 39.20 percent at 1937, a level higher than that of 1917. But it decreased again in 1947 to 38.07, its lowest level during the whole period 1917—1960. The biggest change that occured in the proportion of children was at the year 1960 where it reached a maximum value of 42.75 percent. On the other hand the proportion of population at the old ages was always decreasing during the period 1917—1947 starting from a maximum of 5.28 percent until it reached a minimum of 3.10 percent. But the percentage of aged people at 1960 was higher than that of 1937 and lower than the corresponding percentages in the preceding years (see also figure 1). The pattern of change in the proportion of population at medium ages was nearly the same as that place in the proportion of population at young ages but in opposite directions, i.e., when the proportion of

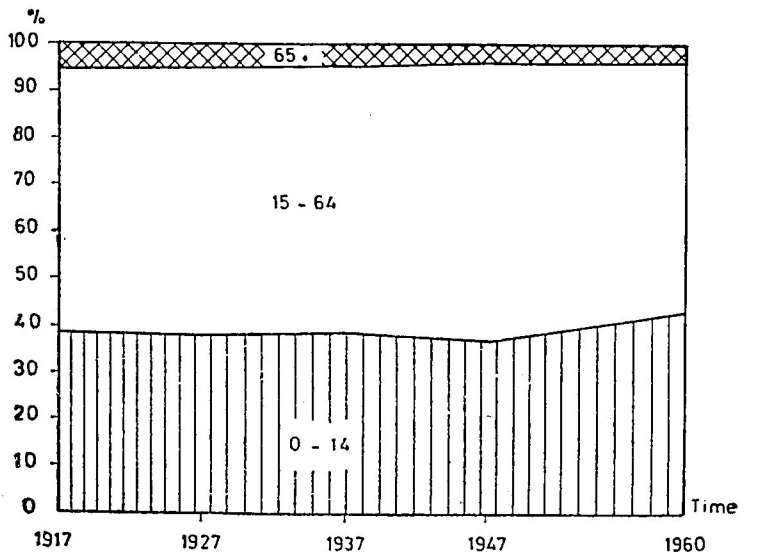

Fig. (1) Relative age distribution of EGYPT in the census years 1917 - 1960

children decreases, that of adults increases and vice versa. Small fluctuations in the proportion of adults were recorded during the period 1917—1947.

The largest amount of change in this proportion took place at 1960 census where it reached 53.78 percent, a minimum level during the whole period 1917—1960. The consequences of the mentioned changes in the relative age distribution immediately appeared in the trends of the other aging measures. For instance, the fluctuations in the median age of the Egyptian population were small during the period 1917—1947, (figure (2)). These fluctuations in median age

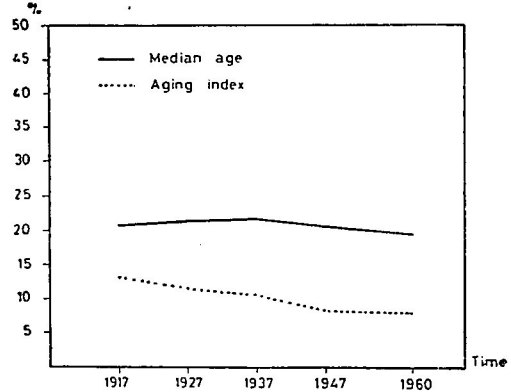

Fig. (2) Median age, aging index in EGYPT in census years 1917 1960

were consistent with those which occurred in the relative age distribution during the same period. For illustration, the median age started at a level of 20.97 years at 1917. Then, it increased slightly at the years of 1927, 1937 and 1947 owing to the growing proportions of adults and the decreasing proportions of children at these years. The level of the median at 1947 was higher than that of 1917 because in the former year, the proportion of adults was higher and that of children was lower than in the latter one. But that level of 1947 was smaller than the corresponding levels of 1927

and 1937. That was due to the large drop in the proportion of aged persons. In addition, the small proportion of children at 1947 has prevented the population from becoming younger. In 1960, the median age was at its lowest level of 19.37 years. That resulted when the proportion of children reached a maximum, the proportion of adults reached a minimum and that of aged was close to minimum. The index of aging which is a more sensitive measure than the median age, was subject to a continuous decline in its value. (figure 2). That gives us the impression that the population of Egypt was growing younger during the period studied.

As for the dependency burden, it is always affected by the distribution of indviduals within a population at different ages. So, we could observe similar changes in the dependency ratio as that which happened in the relative age composition. The fluctuations were small during the period 1917—1947, while the more pronounced change in the ratio occurred at 1960. The dependency ratio started at a level of 79.51 at 1917. It decreased to 76.01 at 1927 as the proportions of both children and old people (which constitute the numerator of the ratio) decreased and that of adults (which constitutes the denominator) increased. The ratio of 1937 was higher than that of 1927 because the proportion of children was higher and that of adults was lower in 1937 census than in 1927 census. The ratio decreased again to minimum because the proportion of adults was at its highest level and those of both children and aged were at their lowest levels. On the contrary, the ratio reached a peak at 1960 with a level of about 86 when the proportion of children was at its highest level and that of adults was at its lowest level.

From the preceding analysis, one cannot find a clear specific trend for the aging of the Egyptian population during the period studied. It has been shown, as some demographers proved, that the age composition of the population of Egypt has a stable shape. This is the case in most developing countries with rather highly constant birth rates and rather low death rates. In Egypt the birth rate was fluctuating around 40 per thousand during the period 1917—1960. Its lowest level was 37.6 per thousand in 1942 and its highest level was 45.4 per thousand in 1930. The death rate was decreasing particularly, in the period 1947—1960. It scored 29.4, 21.4 and 16.9 per thousand in the years 1917, 1947 and 1960 respectively. Table (3) contains some selected annual vital rates in Egypt during the period 1917—1960.

TABLE 3

Rates of Birth, Death, Natural Increase, and Infant Mortality, in Egypt for Some Selected Years

(per thousand)

Years	BR	DR	Natural rate of increase	I.M.R.
1917	40.1	29.4	10.8	251
1927	44.0	25.2	18.8	152
1937	34.4	27.1	16.2	165
1947	43.8	21.4	22.4	127
1960	42.9	16.9	26.1	109

The only remarkble change was recorded in 1960 census which was characterized by larger proportions of people at young ages and smaller proportions at old ages, than those occurred in the preceding years. Thus the median age of population in 1960 was at its lowest level during the period studied and the corresponding index of aging was at its lowest level in the same period.

POUPULATION AGING IN EGYPT : FUTURE TRENDS

We shall now investigate the phenomenon of aging in Egypt in a future time under a variety of assumptions concerning future levels of fertility and mortality. The analysis of such phenomenon is usually initiated on population projection procedures. Hence, a component projection model has been applied with the aid of electronic computers to estimate the male and female populations at successive intervals of five years for a period of one hundred years.

Taking the 1960 population census in Egypt as our initial point, five alternative assumptions concerning the future levels of vital conditions are considered. These assumptions are :

1. A gradual decline in mortality would occur while fertility would remain unchanged at the levels of 1960. The estimated decline in mortality was as follows :

(i) A decline in the infant mortaility rate by an amount of five percent of its initial level.

(ii) A decline in the specific death rate for ages 1—4 by an amount of two percent of its level of 1960.

(iii) A decline in the remaining age-specific death rates by an amount of one percent of their initial levels. All these reductions were assumed to take place every five years for a period of fifty years, after which the rates were fixed at their last levels.

2. The age-specific death rates were assumed to be fixed at their levels of 1960, while fertility rates were reduced by an amount of five percent of their initial levels. This reduction in fertility also occurred every five years for a period of fifty years from 1960, after which the rates settled at their last levels.

3. Both fertility and mortality were subjected to a simultaneous decline in their levels. In this case, the reduction in mortality was similar to that occurring in case one, while the reduction in fertility was the same as that of case two.

4. Constant fertility and mortality conditions at their levels prevailed in 1960 all over the whole period.

5. Attainment of a replacement level, i.e., reducing the net reproduction rate to one, it was assumed that the population of Egypt would achieve a replacement level at about the year 2000, i.e., after forty years of the starting point 1960. The age-specific fertility rates were thus assumed to be represented in a straight line relationship, within the period 1960—2000, having a negative slope nearly equal to —.075. In addition, the age-specific death rates were subject to a gradual decline, similar to that experienced in case one.

To recognize the true directions of the effects of the demographic variables on population age composition, the five proposed cases will be compared. Doing so, we shall attempt to investigate the consequences of each case on the process of aging and the vital characteristics. Therfore, our discussion is divided into three main parts, population age composition, aging measures, and the vital rates.

(A) *The Age-Composition :*

Regarding the relative age composition, it has been shown that a decline in mortality had only a minor effect on it. A small amount of decrease in the proportion of population under fifteen years old, and

a small amount of increase in the proportion of population at older ages, were observed. The initial levels were 42.50, 54.39 and 3.12 percent for children, adults and aged persons, respectively. After a period of fifty years, they became 41.22, 54.98 and 3.80 percent. The case of declining fertility showed larger changes in the age structure than those recorded in the case of reduced mortality. The proportion of poplation at the mentioned age categories became 28.49, 66.14 and 5.36 percent. From these figures, we can see that a large fall in the proportion of children compared with a big rise in the proportion of people at other ages has taken place. The manipulation of a simultaneous decline in fertility and mortality was an indicative example of not only the combined effect of the scedules on population age composition, but also the effect of each of them separately. It was demonstrated that declining mortality affects the population age composition much less than does declining fertility, and in the opposite direction. Declining mortality with such effect has caused more children to live and survive, thus constituting a larger proportion of population. The recorded age distribution, in the case of simultaneous decline in fertility and mortality, was 30.09, 64.62 and 5.29 percent for the three broad age categories. (see Figures3 A — C).

But when mortality and fertility conditions were fixed at their levels levels of 1960, as made in case four, we did not observe any significant changes in the relative age distribution. The differences between the levels at successive time points were negligible. The Egyptian age composition was nearly stabilized at levels af about forty, fifty-six, and four percent for children, middle-aged and aged persons, respectively (see Fig 3 D). The more notable change in population age composition occurred in case of producing NRR = 1. The proportion of children was at its lowest level while the proportions of people at both medium and old ages were at their highest. That was due to the larger amount of reduction in fertility levels maintained in this case rather in other cases. The age composition attained the levels of 24.99, 68.88 and 6.12 percent after the passage of fifty years from the initial time point. (see Fig 3—E).

The distribution of individuals at different ages reveals several important aspects and characteristics of population. One of these characteristics is the burden presented by children and aged persons on the productive elements of the population. From the study of the various assumptions about the future fertility and mortality

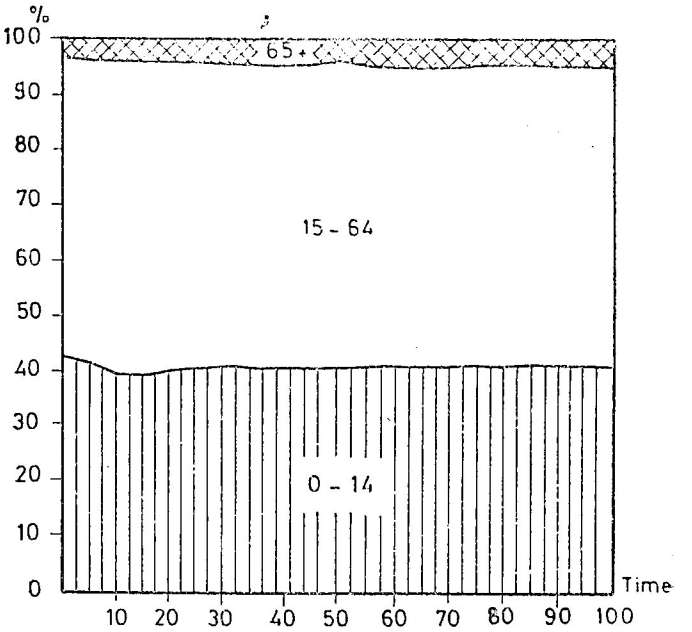

Fig. (3-A) Relative age distribution assuming a decline in mortality and constant fertility

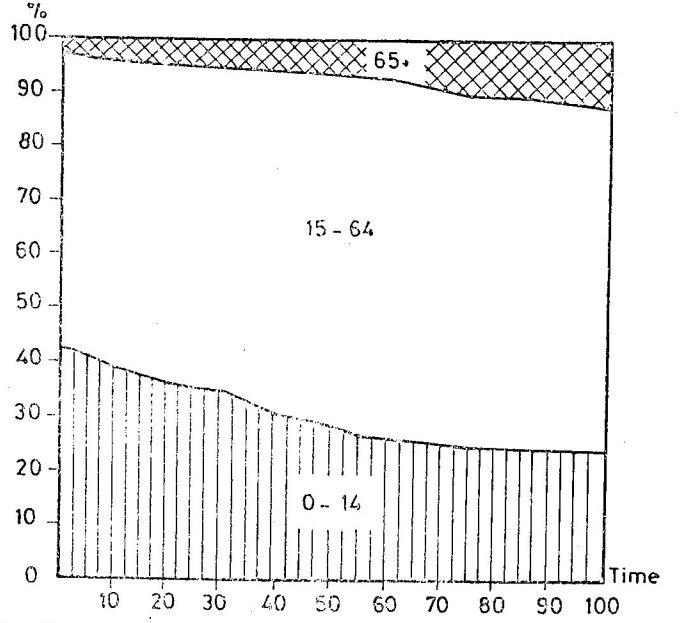

Fig (3-B) Relative age distribution assuming a decline in fertility and constant mortality

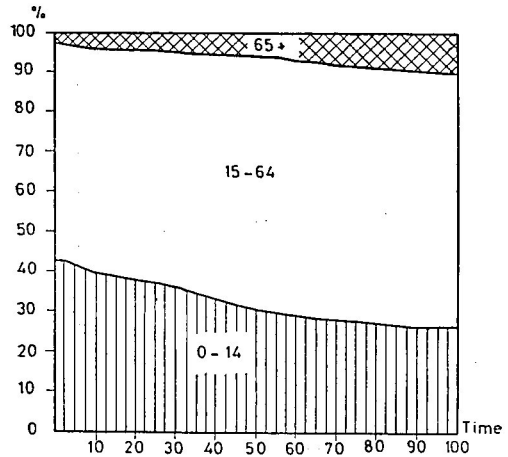

Fig.(3-C) Relative age distribution assuming a simultaneous decline in both fertility and mortality

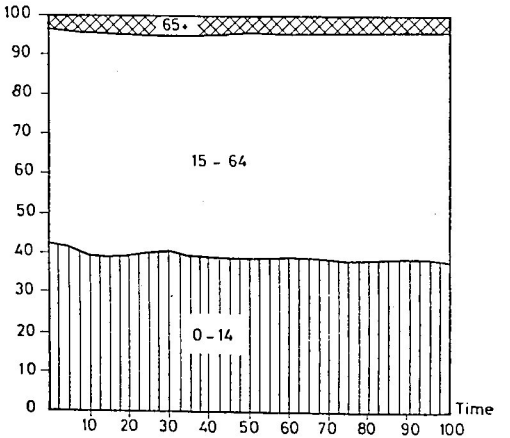

Fig. (3-D) Relative age distribution in case of constant fertility and mortality

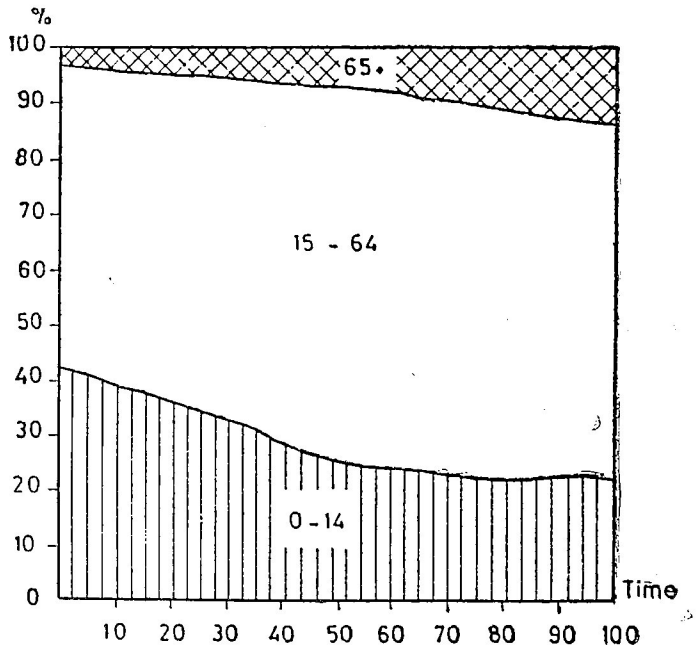

Fig. (3-E) Relative age distribution in case replacement level

conditions, it was evident that the dependency load borne by the proportion of population in the productive ages fell significantly in cases of declining fertililty. That was due to the fact that any reduction in fertility would reduce the number of young people. And since this number always constitutes a large proportion of population, then such reduction in fertility would produce a lighter burden of dependency. As fertility was the only changeable element, the dependency ratio fell sharply from 83.87, the initial level, to 51.18 after a period of fifty years. When the decline in mortality was considered, the ratio rose to 54.75 in case of simultaneous decline in both fertility and mortality and to 81.89 in case of only a decline in mortality. Such a rise in the dependency burden in the latter case was attributed to the effect of declining mortality in making both young and old people live longer and constitute a larger proportion in the population.

The drop in the dependency ratio is at most when the net reproduction rate was put to equal one, owing to the larger decrease in the proportion of children and the larger increase in the proportion of adults. In this case, the ratio reached a minimum of 45.17.

In case of constant sequences of vital conditions, the burden of dependency was 76.38, lighter than the corresponding one in case of single decline in mortality. This can be ascribed to the relatively falling fertility of the preceding years in the former case.

(B) *Aging Measures :*

The changes in the relative age composition of population reflect their outcomes on the median age and other indices of aging. The small fluctuations in the percentage distribution, under the assumption of reduced mortality, resulted in similar fluctuations in median age and the index of aging. They increased only from 19.29 and 7.33 to 19.50 and 9.21 during a period of fifty years. In case of declining fertility, the measurements of aging were subject to larger amounts of change. Both the median age and the aging index attained higher levels of 27.13 and 18.81, owing to the decrease in the proportion of children and the increase in the proportion of people at older ages. The result of such decline in fertility was to produce an older population. When we experienced a simultaneous decline in fertility and mortality, we could realize the true directions of the effects of each of them on the process of aging. The decline in fertility caused the population of Egypt to become older, but the decline in mortality has prevented it from becoming much older. For demonstration, the median and the aging index reached 26.07 and 17.57 at year 2010, rather lower than the corresponding levels achieved in case of declining fertility. These two measures were at their highest levels in case of attaining a replacement level, because the sequence of fertiltiy rates were subject to larger amounts of reduction. They reached to 29.59 and 24.49 at the end of fifty years. Again, the measurements of aging attained rather stable levels in case of constant vital conditions. (see Fig 4 A-B).

(c) *The Vital Rates :*

As for the changes in the various vital rates considered under the proposed five assumptions, we notice the following :

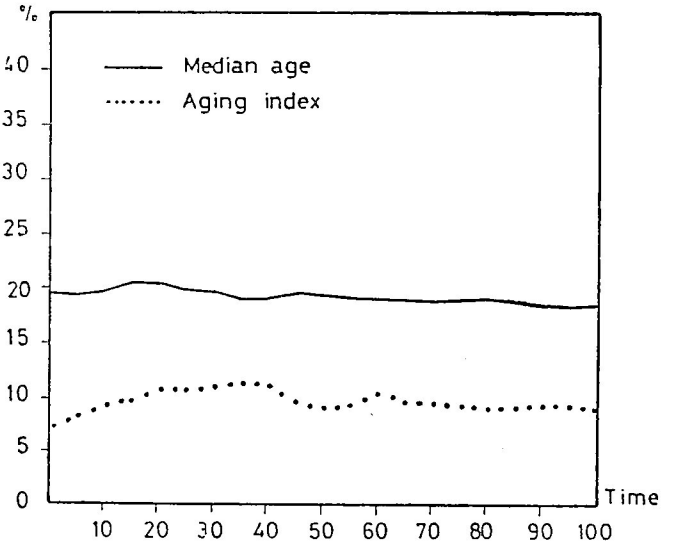

Fig (4-A) Median age, aging index assuming declining mortality_

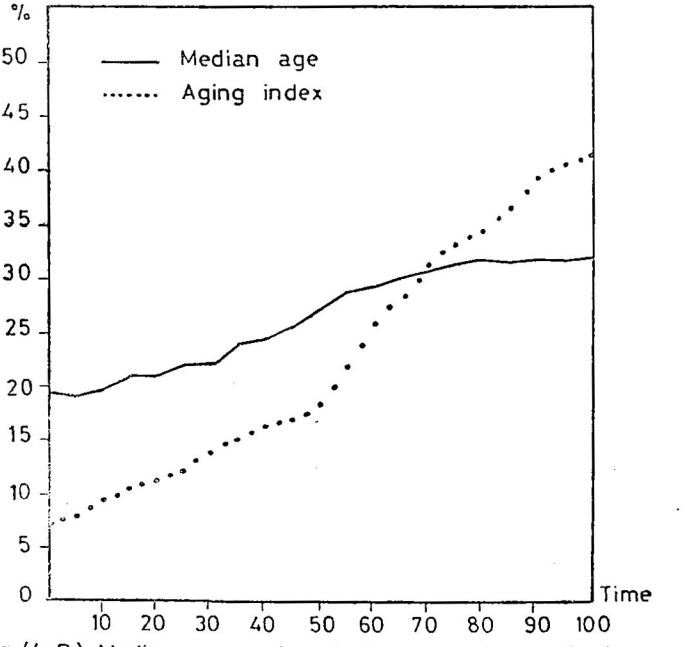

Fig (4-B) Median age, aging index assuming a decline in fertility

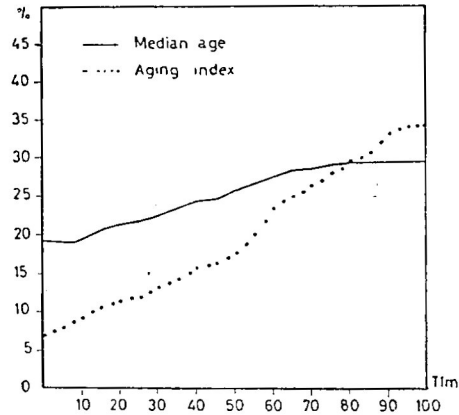

Fig.(4-C) Median age, aging index assuming a simultaneous decline in both fertility and mortality

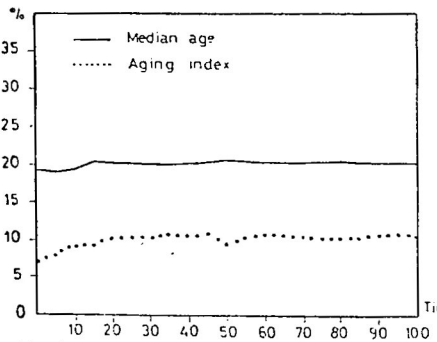

Fig.(4-D) Median age, aging index in case of constant fertility and mortality

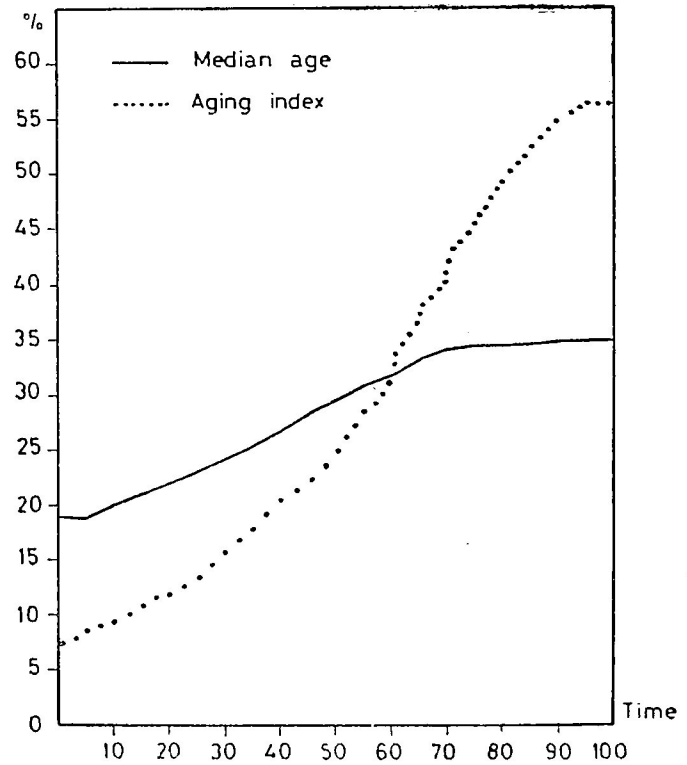

Fig. (4-E) Median age, aging index in case of replacement level

If the rates of fertility and mortality remain unchanged, the situation will remain almost as it was in 1960. The birth, death, and growth rates will attain the values 42.22, 18.00, and 24.20 per thousand after fifty years, nearly the same levels of 1960. This means that the population of Egypt would grow at still high rate, scoring about forty five, forty three, and eighty eight millions at 2010 for males, females, and total population respectively.

If we permit for a decline only in mortality the crude death rate will largely decrease, while the crude birth rate will continue at a level very close to the initial one. Consequently, the population will

grow at a higher rate. For example, the levels of these rates will be 41.22, 13 .80, and 27.4 per thousand at 2010 for birth, death, and growth rates respectively. By this high rate of growth, the population will count about fortyeight millions of males, fortysix millions of females, and a total number of population equal to nintyfive millons. This high growth of population would impose a heavy burden on the society, it would force the government to devote most of resources for the provision of basic services for these growing numbers of population. This in turn would require huge investments for the implementation of considerable projects which need more capital and technological skill. But if the decline occurred with respect to fertility, the crude birth rate would sharply fall to 26.10 per thousand, while the crude death rate would change to 15.90 per thousand, the lowest levels among all cases except that of producing NRR = 1. With such pattern of growth, the total population at 2010 would number about sixtyfour millions of which 32.4 millions would be males, and 31.6 millions would be females.

In case of a simultaneous decline in both fertility and mortality, all the vital rates would be highly affected. The crude birth rate would fall to 25.89 per thousand, and the crude death rate would fall to 12.96 per thousand. And since the drop in the birth rate is larger than the drop in the death rate, the rate of growth would fall to 12.8 per thousand. It follows that the number of males, females and total population would almost be 34.5, 33.5 and 68 millions respectively, higher than those recorded in case of single decline in fertility but very lower than those produced in case of declining mortality.

On the other hand, the assumption of reducing NRR to 1 showed more pronounced changes in the vital characteristics of population due to the larger reductions maintained in fertility rates. The rates of birth, death, and natural increase levelled of 21.77, 14.02, and 7.8 per thousand respectively, at 2010. It is worth mentioning that the rate of growth did not immediately go to zero as the net reproduction rate was reduced to one. In this case, the numbers of males, females and total population scored 29.4, 29.0, and 58 millions respectively (see Fig. 5 (A-E)).

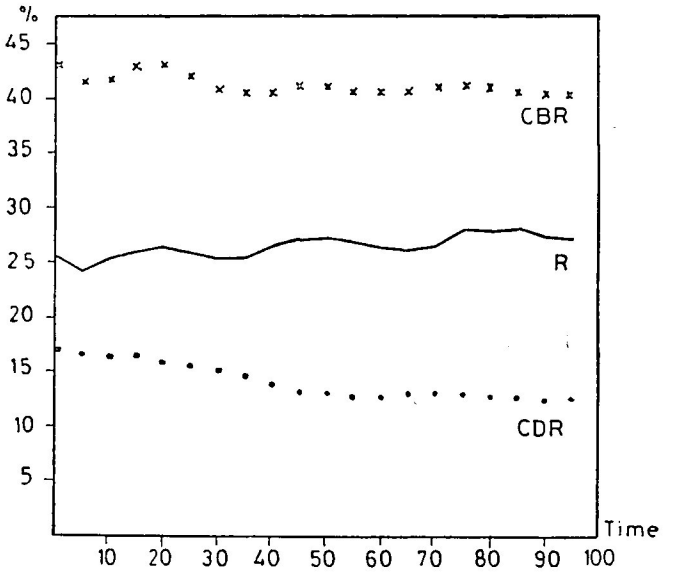

Fig. (5-A) Crude birth, death and growth rates assuming a decline in mortality

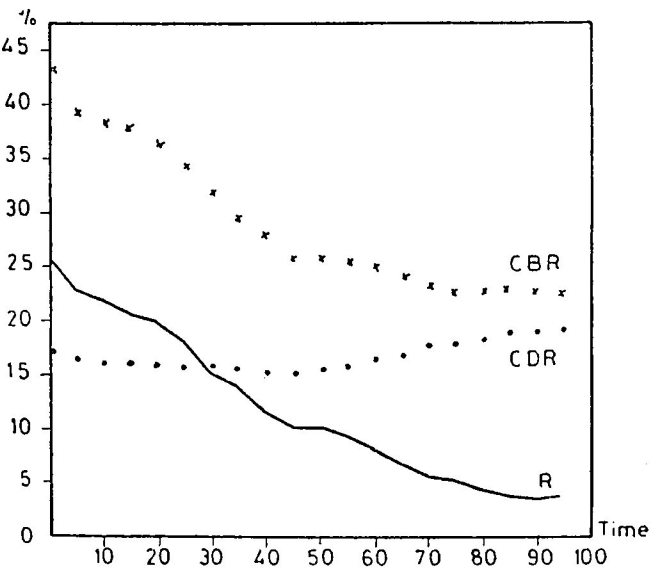

Fig. (5-B) Crude birth, death and growth rates assuming a decline in fertility

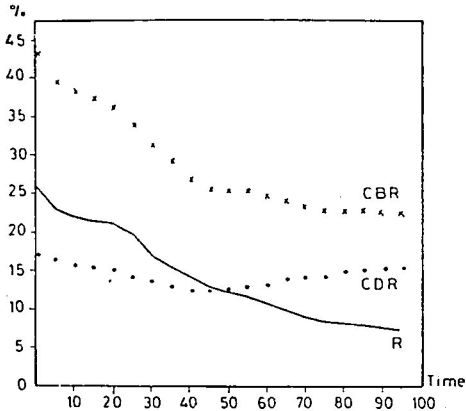

Fig.(5-C) Crude birth, death and growth rates assuming a simultaneous decline in both fertility and mortality

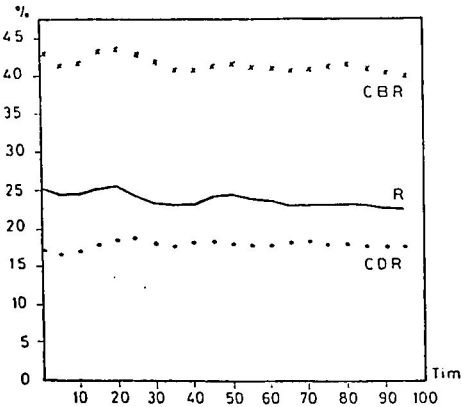

Fig.(5-D) Crude birth, death and growth rates in case of constant fertility and mortality

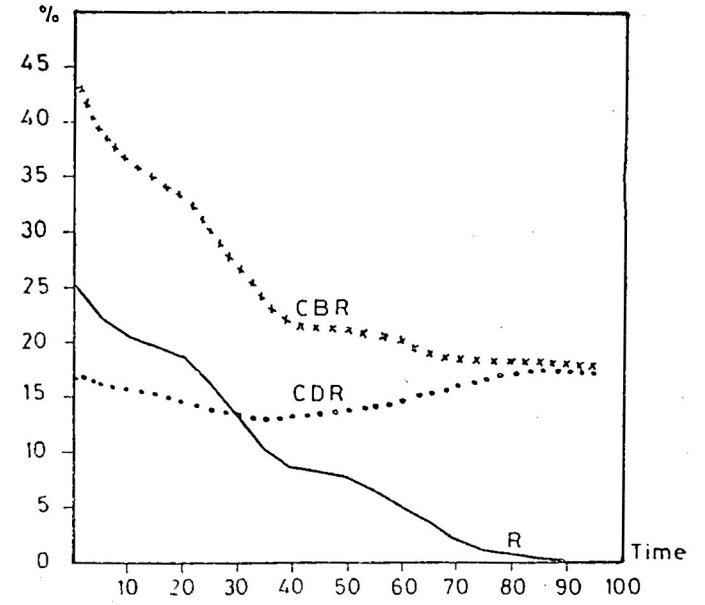

Fig. (5-E) Crude birth, death and growth rates in case of replacement level

SUMMARY

Our main objective was to trace the past trends in the population aging in Egypt and to investigate the possible future trends under alternative assumptions.

Regarding the past trends, the age composition of Egypt had a rather stable shape, particularly through the period 1917-1947. Also, the aging measures were settled at certain levels with minor fluctuations. The only remarkable change was recorded at 1960 census, which was characterized by a larger proportion of young people and a smaller proportion of old people. That yielded a population somewhat younger. Future trends show different variations according to the assumptions exercised. Five alternative assumptions were used constituting different possible changes in the schedules of mortality and fertility relative to their levels in 1960. It has been shown that a single decline in mortality levels has a minor

effect on age composition of the Egyptian population. A small amount of decrease in the proportion of young people and a small amount of increase in the proportion of those at older ages were noticed. On the other hand, the case of declining fertility showed larger changes in the age composition than those recorded in the case of declining mortality and in an opposite direction. The manipulation of a simultaneous decline in both fertility and mortality was an indicative example of not only the combined effect of the two schedules on the age composition, but also the effect of each of them separately. Generally, a reduction in fertility has caused the population of Egypt to become older, while reduced mortality, with its opposite effect has prevented it from becoming much older. When mortality and fertility conditions were fixed at their levels of 1960, we did not observe any significant changes in the relative age distribution. The differences between the levels at successive time points were negligible At last, the more notable change in the Egyption age composition occurred in the case of producing NRR = 1. The proportion of individuals at young ages was at its lowest level, while that of people at other ages was at its highest level. This was mainly due to the larger amout of reduction in fertility levels maintained in this case rather in other cases.

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