

THE SEX AND AGE STRUCTURE OF THE CITIZEN POPULATION OF LIBYA, 1954 - 64

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1. Introduction

The study of the composition of population in general and that of sex and age in particular has several advantages (Hawley, 1959). To begin with, for example, it provides an inventory of human resources available and permits the description of the population in a community. In these contexts it also permits the comparison between or among population groups. The study, in addition, serves as a guide to future changes in the structure of population in a community because these changes are heavily affected by the present size and composition of the population in that community. Further, the study provides the factors which are most important in analysing the components of population change, namely, fertility, mortality and migration. The study of sex and age composition in any population has an added advantage of providing indirect estimates of population change.

The purpose of the present paper is confined to the discussion of the sex and age composition of the citizen population of Libya in 1954 and 1964. The reasons for selecting these characteristics stem mainly from their effect on demographic variables. It may be added that these characteristics directly affect the incidence of births, deaths and marriages and indirectly appear as differentials in migration, educational, occupational and other distributions obtaining in a community. A study of the sex and age composition with reference to a specified

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time reveals the past demographic history of the population of any community. Thompson and Lewis (1965) have termed this history as the biological one. This is because the past trends in fertility, mortality and migration experienced by the community over several decades occasion the sex and age composition of the population in the community at the specified time. The additional advantage of the study is that it provides an idea of the future course of fertility, mortality, marriage and to some extent of migration in the community.

Data provided by the Libyan Censuses of 1954 and 1964 will be used in the present study. As these were the only two censuses conducted in post-independent Libya, the scope of our study may be considered to cover that period. It may also be noted that censuses in 1954 and 1964 were taken respectively before and after the discovery of oil in Libya. A comparison of the sex and age structure of the citizens in these two census years may reflect the effects of new economic asset on the structure of population.

A critical analysis of data pertaining to the two characteristics under study will be given here. The reliability of data and adjustments, if attempted, will be given at appropriate places.

2. Sex Structure of the Citizen Population of Libya

To study the sex structure of the citizen population of Libya, we will use the conventional measure - the sex ratio. For our purpose, it will be defined as the number of females per thousand males in a specified category of people. This ratio is suitable for our purpose because it is simple in nature and can be used to compare the sex structure of well defined population groups regardless of their size. The interpretation of its magnitude has, however, to be done after careful examination of several factors. In this connection one has to remember that in general more male than female births occur in a population. On the average, it can be taken that for every 100 female births in a population there occur 105 male births. The latter number may, however, vary from 102 to 107 (United Nations, 1955). A

substantial deviation from this range except in small populations may indicate the presence of error in data. One has to remember further that mortality of females is lower than that of males (the reverse is not ruled out) and as the age advances the decrement caused by mortality in the number of males becomes greater than that in the number of females. This process counterbalances the excess of male births and in the absence of substantial migration gives a sex ratio for the total population, which deviates from unity only slightly. As noted by Hawley (1959) this deviation quite often gives the number of females slightly greater than that of males. Thus, we may either expect that the number of females will be approximately equal to that of males in a population or the former will slightly exceed the latter. The reverse may be obtained in population groups which have experienced abnormal maternal mortality sufficient to offset or exceed the relatively low mortality of females at ages outside the reproductive period. Error in data may also sometimes cause substantial departure in sex ratios from unity.

2.1 Sex Ratio for the Total Citizen Population of Libya

Libya, it appears, has suffered from the deficiency of females for quite some time in the past. While examining the reliability of 1936 Census of Libya (the Census with questionable coverage and reliability) Pan (1949) noted an excess of 75 males for every 1,000 females. In other words there were 930 females for every 1,000 males. He also noted an irregularity in the age-pattern of the sex ratio. Male exiles, some suspected underenumeration of women in certain age groups and mis-statement of ages of men and women were proposed as the main reasons for this irregularity. The Censuses of Libya taken in 1954 and 1964 again exhibit similar deficiency of females in the total citizen population of the country. In 1954, there were 928 females for every 1,000 males in the total citizen population of Libya. This deficiency of females was approximately the same as that in 1936. The sex ratio from its value of 928 in 1954 declined to a value of 922 in 1964. According to Dutta and Sharif (1968) the deficiency of

females in 1964 stemmed from biological reason, namely, excessive male births in Libya. The authors apparently did not take into account the differences between mortalities of males and females that might be obtaining in Libyan population. The contention was based on the low sex ratio for children aged less than one year in 1964. The reason although interesting suffers from lack of soundness. This can be seen as under. To maintain a total population with greater number of males than that of females stemming from greater male than female births alone, it would require a sustained high proportion (may be much more than the normally obtaining ratio of 105 male to 100 female births) of male births among total births over a long period of time. The statement implies that other conditions remain similar to those normally obtaining in most of the population groups. The sex ratio for children aged less than one year will be nearly the same as that at birth, provided the infant mortality rates for the two sexes are the same. The observed sex ratio of 942 in 1964 for children aged less than one year in Libya was precisely the same as that normally observed at birth. That is, there were 106 males for every 100 females among the children aged less than one year in 1964. A sex ratio of 975 for this group of children in 1954 also does not support the contention that the low femininity in Libya is occasioned by more male than female births in the population. The other possible causes for the deficiency of females in Libya are — mortality, migration and error in data. The effect of these factors on the sex ratio is discussed below.

Migration in a society such as Libya is mostly male dominated. This feature is observed by the present author (1969) in a study of internal migration in Libya. International migration prior to the discovery of oil in late fifties might have resulted in a net loss to Libya. The population in 1954 might have suffered from only slight net emigration, however, because of some return migration which followed the independence of the country. The discovery of oil increased the flow of return migration and it is hoped that almost all the net losses suffered earlier might have been counterbalanced. Irrespective of the volume

and direction of international migration, it may safely be assumed that this migration was male dominated. This suggests that the deficiency of females could not be explained in terms of migration. This is because the sex ratio in 1954 affected by male dominated net-emigration ought to have been higher than what it was. A slightly lower sex ratio in 1964 than that in 1954 is in line with the male dominated return migration.

The consistency of sex ratios for Libyan population over time as noted earlier in this paper indicates that males and females were enumerated with more or less similar accuracy in 1936, 1954 and 1964. As will be shown later regional variation in sex ratios also reveal a consistent pattern. This implies that the co-efficients of over - or underenumeration were almost the same for both the sexes in each of the censuses considered. Thus we can assume that the sex ratios for enumerated population were practically unaffected by error of enumeration and they can be regarded as those for the actual population.

Now we will consider the effect of differences between mortalities of males and females on the sex ratio. It may be noted that direct evidence in this connection is almost non-existent. The following discussion is based mainly on the indirect evidences derived from age distributions that are available for the two sexes separately in 1954 and 1964. It will be noted in section (3) that the average ages for males in 1954 and 1964 were slightly higher than those for females in respective years. This difference between the average ages of the two sexes could have stemmed from the differences between mortalities experienced by them. The contention is justified because there is no reason to believe that sex ratio at birth in Libya deviated substantially from the average obtaining in other populations and that migration affected the average age. Some calculations based on a set of Model Life Tables (United Nations, 1967) showed that if the expectation of life at birth for males was about 1.5 to 2.0 years higher than that for females, the sex ratio in such a stationary population would be approximately equal to that in Libya. The assumption that the mortality of

males in Libya was lower than that of females (an assumption contrary to observations in most of the populations) may not be very improbable and we may conclude that it was mortality that affected the deficiency of females to a great extent in Libyan population.

TABLE (1)
Sex ratios (number of females per 1,000 males) according
to administrative divisions (*Muqataat*) of Libya in
1954 and 1964

<i>Muqataat</i>	1964 for Population born in	Sex ratios in Population enumerated in	1954 for Population enumerated in
(1)	(2)	(3)	(4)
WESTERN MUQATAAT	911	919	927
Tripoli	946	909	
Misurata	880	925	
Khoms	885	920	
Zawia	922	926	
G. Gharbi	901	926	
EASTERN MUQATAAT	941	918	915
Benghazi	924	897	
Derna	949	941	
G. Akhdar	981	962	
SOUTHERN MUQATAAT	921	977	994
Sebha	864	938	
Ubari	1.011	1,037	
TOTAL (Libya)	919	922	928

Source of data : Censuses of Libya in 1954 and 1964

2.2 Regional Variation in Sex Ratio

The sex ratios according to the administrative divisions of the country are given in table (1). It may be noted in this table that the deficiency of females per thousand males in southern *muqataat* was less than that in eastern and western *muqataat* of the country. In 1954 the respective values of the sex ratios in southern, eastern and western *muqataat* were 994, 915 and 927. These changed respectively to 977, 918 and 919 in 1964. It is clear thus that southern and western *muqataat* suffered from a somewhat greater deficiency of females in 1964 than in 1954 whereas the eastern *muqataat* showed the reverse. The change in sex ratios in southern and western *muqataat* is in line with that in the total population of Libya. The change in this ratio for eastern *muqataat*, though negligible, is in opposite direction.

The sex ratios for citizen populations enumerated in different *muqataat* of the country in 1964 are given in column (3) of table (1). These ratios show that nine of the ten *muqataat* suffered from shortages of females. The *muqataa* of Ubari (an exception to the general pattern) showed a surplus of 37 females for every 1,000 males. A sex ratio of 897 for Benghazi was the lowest. This was followed by that for Tripoli (909). The low sex ratios for these two *muqataat* are understandable because populations of these are heavily concentrated in the cities of Benghazi and Tripoli which have experienced a substantial net in-migration in the recent past. It has been reported elsewhere (Srivastava, 1969) that males outnumber females in *inter-muqataa* migration in Libya and therefore the male populations in Benghazi and Tripoli must have been augmented by male in-migrants. The effect of *inter-muqataa* migration on the city of Benghazi was slightly more than that on the city of Tripoli because the former started attracting people much later than did latter. This recent migration to Benghazi might have caused a sex ratio for the *muqataa* as a whole slightly lower than that for the *muqataa* of Tripoli.

The comparison of sex ratios according to *muqataa* of birth with

those according to *muqataa* of enumeration reveals that in general (Derna is an exception) net out-migrating *muqataat* show a higher sex ratio for enumerated population than that for those born in that *muqataa*. The reverse may be noted for net in-migrating *muqataat*. Derna, although a net out-migrating *muqataa*, shows a feature similar to that of net in-migrating *muqataat*. This is because in this case net out-migration consisted of only females (Srivastava, 1969).

2.3 Variation in Sex Ratios According to Age

It will be noted in section (3) that Libyan censuses of 1954 and 1964 suffered from inaccurate age reporting. The error could be minimised provided the broad age groups were considered. Accordingly the study of the sex ratios in this case is confined only to broad age groups.

The sex ratios in 1954 and 1964, according to age groups considered are presented in table (2). One most striking feature of this table that one might note is the inconsistency of the sex ratios according to age in each of the two census years inspite of the fact that the sex ratios for the total citizen population in these years were almost the same. Also, it may be noted that there is no consistency between the ratios for 1954 and 1964 in each of the age groups considered. The reason for this inconsistency stems mainly from mis-statement of ages, the nature of which might be different for the two sexes. Columns (2) and (3) of table (2) show, however, that the ratios for 1964 were a bit more meaningful than those for 1954.

The sex ratios for children aged 0-14 years in 1954 and 1964 were almost the same and were very near to the average sex ratio at birth. For other age groups, the ratios increase as the age groups advance until they attain a highest value. The reverse may be noted for the ratios in age groups following that with the highest value of the ratio. The ratios for 1954 rise from a level of 881 in the age group 15-24 years to that of 1,009 in the age group 35-44 years whereafter these decline to a level of 816 in the age group 55-64 years. The rate of rise in the

ratios is smaller than that of fall. The pattern of rise and fall in the ratios for 1964 is slightly different. In this year the sex ratio increased from its value of 937 in the age group 15-24 years to a value of 966 in the following ten-year age group. The ratios in the age groups 35-44 and 45-54 years were almost equal and were about 70 points lower than the ratio in the age group 25-34 years. The deficiency of females in the age group 55-64 years was greatest and was about 100 points more than that in the preceding two ten-year age groups.

2.4 Educational Status and Sex Ratio

The educational status is reported for all citizens (males and females) aged 5 years and above in 1954 and for all those aged 6 years

TABLE (2)

Sex ratios (number of females per 1,000 males) according to age groups for the citizen population of Libya in 1954 and 1964

Age Groups (in years) (1)	Sex ratios in	
	1964 (2)	1954 (3)
0—14	939	945
15—24	937	881
25—34	966	945
35—44	896	1,009
45—54	890	905
55—64	797	816
65+	814	921
All Ages	922	928

Source of data : Censuses of Libya in 1954 and 1964

and above in 1964. Also, the classification of educational status in these censuses is not uniform. The population in 1954 is classified into illiterate and literate categories whereas in 1964 it is classified according to level of education. The sex ratios according to educational status of Libyan citizens are given in table (3).

The sex ratios for citizens whose educational status were reported showed respectively a deficit of about 86 and 92 females per 1,000 males in 1954 and 1964. The sex ratios given in table (3) exhibit a large surplus of males among literate persons. The reverse may be noted only among illiterate persons. This feature is common to many developing countries of the world. The data for 1964 reveal that there are 1455 illiterate females for every 1,000 illiterate males. By contrast, there were only 1141 illiterate females for every 1,000 illiterate males in 1954. To interpret the difference between the sex ratios the following points have to be considered : (i) the change in the definition of population for which the educational status was reported, (ii) size of the population which did not specify the educational status, and (iii) the difference between the patterns of development of education for the two sexes during 1954 to 1964.

The effect of the change in the definition of population for which the educational status was reported, on the sex ratio of illiterate persons may be assumed to be negligible because children aged less than 5 or 6 years are equally illiterate (or literate). The difference between the numbers of boys and girls at these ages will certainly effect the sex ratio but it is suspected that the effect will be of any substantial magnitude.

The size of the female population which did not state the educational status might have depleted the sex ratio in 1954. If we suppose that all those (males and females) who did not specify their educational status were illiterate, the sex ratio in 1954 for this population group would have been 1,174 instead of 1,141. A similar assumption will not change the value of the sex ratio of 1,455 for illiterate persons in 1964.

TABLE (3)

Sex ratios (number of females per 1,000 males) according to educational status of Libyan Citizens aged 5 years and above in 1954 and that of those aged 6 years and above in 1964

Educational Status (1)	Sex ratios in	
	1964 (2)	1954 (3)
Illiterate	1,455	1,141
Literate and Educated	190	92
Read only	272	
Read and write	206	
Primary certificate	127	
Preparatory certificate	102	
G. Secondary certificate	66	
Graduate and above	67	
Not stated	727	1,642
TOTAL	908	914

Source of data : Censuses of Libya in 1954 and 1964

The sex ratio for the literate population increased from 92 females per 1,000 males in 1954 to 190 females per thousand males in 1964. This change indicates that the literacy among females in relation to that among males improved by about 100 per cent during the intercensal period. In spite of this improvement, the sex ratio for illiterate persons in 1954 showed a marked increase by 1964. The main reason for such a sex structure of the population according to literacy stems from the difference between rates of progress in education of the two sexes. It is quite possible, particularly in a male dominated society,

that the education of males received more attention than that of females. The available statistics (Census and Statistical Department, Tripoli, various years) for the inter-censal period show that the rates of growth in numbers of male students in various grades and institutions were greater than those in numbers of female students in similar grades and institutions. Thus, the improvement in female education, although perceptible, did not match that in male education and the result was a greater imbalance in 1964 than in 1954 between the sexes among illiterate group of population.

The sex ratios for citizens according to level of attendance in various schools and institutions showed that there were 314 girls per 1,000 boys in Primary schools in 1964. The ratios for Preparatory and Secondary schools and the University were, respectively, 132, 96 and 86. These ratios are quite low and imply that even in 1964 most of the females in Libya remained uneducated.

2.5 Marital Status and Sex Ratio

The available data on the distribution of population according to sex and marital status in 1954 and 1964 suffer from lack of uniformity. In 1954, the marital status was recorded for all persons (citizens and foreigners) who were aged 14 years and above. By contrast, in 1964, there was no age limit for non-single persons whereas for single males and females the lower limits of ages were 18 and 16 years, respectively. Thus it may be noted that the sex ratios for citizens who were single in 1954 and 1964 were not comparable. Since the total population of the country in 1954 largely consisted of citizens, the comparison made between the ratios for each of the other categories of marital status of population in these two years will be of some interest.

The ratios for "currently" married population group showed a negligible change from 1954 to 1964. The respective values were 1,010 and 1,014. The slight excess of females among the "currently" married group is caused by polygamous marriages in Libya. In this connection it was obtained that in 1954, 3.21 per cent of all the

"currently" married males in Libya had more than one wife. The corresponding percentage in 1964 was 2.89. It may be noted here that a higher sex ratio for "currently" married persons is associated with a lower percentage of males married to more than one wife in relation to total married males. This is because there was a difference between the proportions of males married to two, three and four wives among all those married to more than one wife in 1954 and 1964. On the average, it was obtained that every married male of this category in 1954 and 1964 had respectively 2.045 and 2.060 wives.

The sex ratios for divorced persons in 1954 and 1964 were 1,460 and 1,426 respectively. The decline in the sex ratio for divorced persons over a period of ten years indicates that marriages in 1964 were more stable than those in 1954. Among the divorced persons in both the years females exceed the males by a substantial margin. The reason mainly stems from prevailing social and religious sanctions relating to divorce. For example, the conditions of obtaining divorce for men are easier than those for women (Bear, 1964).

The study of the widowed population showed that for every widower there were 5 widows. The reasons for such an abnormally high sex ratio may be found in social customs and differences between mortalities of the two sexes. As a rule men tend to marry women younger to them. The differences between the ages of brides and grooms are much larger in developing than those in developed countries. These differences increase further in instances of remarriages. Widowers remarry girls much younger to them while older widows find it difficult to get a suitable partner. As a result most of the widows continue to live in widowed state while widowers leave this state much easily. The age distribution, although inaccurate, does reflect that most of the widows in the population were aged past reproductive period. It is believed, however, that the incidence of remarriage of widowers alone will not be sufficient to explain the entire imbalance of the sexes of this category. A part of this imbalance might have

been occasioned by differences between the mortalities of males and females in older age groups.

2.6 Economic Activity and Sex Ratio

The economic activity was reported for all citizens aged 6 years and above in 1964. Among such citizens, there were 908 females for every 1,000 males. The total number of citizens was divided into economically active and inactive groups. As expected for a society obtaining in Libya the number of economically active females (54) for every 1,000 males in that category was extremely low. The economically inactive group was heavily loaded with females who numbered 2,158 per 1,000 economically inactive males.

2.7 Infirmary and Sex Ratio

The distribution of citizen population in Libya according to sex and infirmity is available for the census in 1964. This shows that the number of females who suffered from any of the infirmities noted was slightly more than seven tenths of that of males. The infirmities and the corresponding sex ratios are given below :

<u>Infirmity</u>	<u>Sex Ratio</u>
Blind	1,428
One eye-blind	544
dumb	596
Deaf	401
Deaf and dumb	617
Loss of arms	157
Loss of legs	288
Paralytic	621
Feeble minded	676

It may be noted that except for blinds, none of the other categories of infirmity recorded more females than males. It is understandable that the infirmities which might have resulted from violence, namely,

loss of arms and/or loss of legs, showed, respectively, low sex ratios of 157 and 288. This is in agreement with a sex ratio of 289 for those infirmities which were occasioned by accidents. The sex ratios for infirmities caused by congenital defects and diseases were, respectively, 638 and 855.

3. The Age Structure of Citizen Population of Libya

To analyse the age structure of the citizen population of Libya, certain assumptions will be made. These will be necessary because of the unavailability of direct information on the past level of and trend in fertility, mortality and migration which the population experienced. It will be assumed, on the basis of the knowledge of the past social and economic conditions in the country, that the population must have experienced a high birth rate (certainly above 40 per thousand persons per year) and relatively high death rate. The net-migration of citizens across the boundary of the country will be assumed to be of negligible importance and therefore its effect on the age distribution will be ignored. In view of these assumptions we can expect that the age distribution of Libyan citizens will exhibit a shape similar to those obtained in populations which have experienced high fertility and mortality rates. That is, the distribution of citizens in quinquennial age groups should show a broad base and gradually decreasing proportions in the following higher age groups.

3.1 Reported Distribution of Citizens According to Age

The age distribution for the citizen population (male and female) of Libya in 1954 and 1964 are presented in table (4) and figures 1a, 1b, 1c and 1d. It may be noted in this table that the reported distributions of males and females in the age groups 0-4, 5-9, 10-14 and 15-19 years in 1954 form an almost uniformly decreasing sequence. The distributions of both the sexes in age groups beyond 20 years in 1954 present a problem obtaining in most of the developing countries. The declines in the numbers of males from the age group 15-19 to 20-24

years and again from the age group 20-24 to 25-29 years are very slight. Successive declines in numbers of males in quinquennial age groups from 25-29 years to 45-49 years are quite sharp. However, a noticeable dip in the age group 35-39 years may be noted. The distribution of males in age groups 45-49, 50-54,, 65-69 years clearly indicates the possibility of concentration of population at certain preferred ages. It appears that age groups containing the end digit 0 attracted more people than those containing the end digit 5. This resulted in peaks for age groups 50-54, 60-64 years and troughs for age groups 55-59, 65-69 years.

The transfer of numbers from age groups beginning with end digit 5 to those beginning with end digit 0, affected the distribution of females more than that of males. The transfer in case of females starts at an earlier age than that of males. The data indicate that the transfer of females from one quinquennial age group to the other started from the age group 35-39 years. The distribution of females over the age groups 20-24, 25-29 and 30-34 years presents a feature which is just the reverse of that noted for age groups 35-39 years and above. A peak for the distribution of females in the age group 25-29 years is indicative of some undue concentration. The excess number of females, it is suspected, must have largely come from that in the preceding and following age groups. This indicates that the pattern of error in age reporting for females is not the same throughout.

The peaks and troughs in the distributions of males and females according to quinquennial age groups as noted above might have stemmed from low literacy, ignorance of actual age etc. This is a feature which has been observed in several populations of developing countries. But the heavy concentration of females in the age group 25-29 years requires some investigation of the prevailing conditions which have prompted such reporting of ages in Libyan censuses.

The age distributions of male and female citizens in 1954 and 1964 are not presented in comparable form after the age group 40-44 years. The reported distributions according to age in 1964 are available in

quinquennial age groups until 40-44 years and thereafter in ten-year intervals. This latter grouping was effected mainly to avoid the peaks and troughs that were observed in the age distribution of citizens in 1954. The age distributions of males and females over the age range 0-44 years in 1964 can, however, be compared directly with those for the respective sexes in 1954. This is done in table (4) and figures 1a and 1b. A close look at these figures reveals that the nature of age reporting was almost the same in both the censuses. The numbers of males and females aged 0-4, 5-9, 10-14 and 15-19 years formed a successively declining series. The comparison of reported distributions of males over the age groups 15-19, 20-24,, 35-39 years in 1964 and 1954 showed that in 1964 the reported numbers of males in age groups 25-29 and 35-39 years were somewhat larger than what these should have been. This is understandable if the investigators in 1964 received particular instructions to guard against the errors that were noted in the age distributions of citizens in 1954. The extra precaution might have caused this feature in the age distribution of population in 1964. The proposition appears genuine because the reported age distribution of females in 1964 (figure 1b) also shows feature similar to that exhibited by the age distribution of males in that year.

If we disregard the small variations that may be noted in the age distributions of males and females in 1954 and 1964, we can conclude that the patterns of age distributions for the two sexes remained somewhat similar except for the very young age groups 0-4 and 5-9 years. The percentages of population in the age groups 0-4 and 5-9 years in relation to total population in 1964 were substantially larger than those in 1954. This possibly could stem from two reasons, namely, the degree of underenumeration for children in 1964 was less than that in 1954 and/or there occurred a heavy decline in child mortality during the intercensal period. The identification of the real cause, however, needs further investigation. It may be added at this stage that the latter cause may not be far from the truth. Libyan population experienced a very high infant and child mortality rates in

the past. The expansion of medical care that followed the independence and economic developments must have been utilised to save more lives of children in recent years than in the past. ,

The assertion that the accuracy of age reporting for both the males

TABLE (4)

Reported percentage distribution of Libyan male and female citizens according to age in 1954 and 1964

Age group in years	Percentage distribution in			
	1954		1964	
	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)
0—4	14.168	15.394	17.897	18.860
5—9	12.894	13.534	15.000	15.592
10—14	11.100	9.948	10.780	10.046
15—19	8.807	8.449	7.666	8.000
20—24	8.557	8.039	7.918	7.847
25—29	8.447	8.438	7.906	8.464
30—34	6.375	6.660	6.242	6.367
35—39	5.016	4.951	5.703	5.316
40—44	4.446	5.343	4.315	4.426
45—49	3.667	3.349		
50—54	4.472	4.594	6.406	6.189
55—59	2.576	1.759		
60—64	3.324	3.431	4.740	4.099
65—69	1.753	1.349		
70—74			3.166	2.878
75+	4.398	4.762	2.261	1.916
All ages	100.000	100.000	100.000	100.000

Source of data : Censuses of Libya in 1954 and 1964

and females in 1954 and 1964 was almost of the same order is better illustrated when the age distributions are presented in ten-year groups, namely, 5-14, 15-24, 25-34,, 65-74. The percentage distributions of males and females over these age groups as obtained from columns (2) to (5) of table (4) are presented respectively in figures 1c and 1d. These figures bring out a marked similarity between the age distributions of the two sexes in 1954 and 1964. It may also be noted that the age distributions of males and females in 1954 are respectively similar to those in 1964. This indicates that the patterns of age distributions of Libyan citizens have not been influenced either by sex or by time except for very young ages. The probable reasons for the difference between the age distributions of children in 1954 and 1964 have already been mentioned earlier. The age segment which was affected by error most extended from 15 to 34 years. The emergence of unusual patterns of age distributions of males in 1954 and 1964 and of those of females in same years in young adult age groups from 15 to 34 years cannot be explained in terms of the variation in fertility, mortality and migration. The knowledge of the local conditions does not permit any plausible assumption regarding past fluctuations in fertility and mortality in the population that could explain such a pattern. On the contrary, it can safely be assumed that Libyan population experienced a constant and high level of fertility in the past. Mortality must have shown a downward trend during the recent past mainly because of medical facilities now available to citizens but it could not be assumed to be confined to a particular age segment to such an extent as to reflect in the age distribution in a manipulative form. The volume of migration could not be assumed to produce this peculiar age distribution. The pattern, it seems, is largely affected by error in age reporting, the intensity of which is reduced greatly when the distribution is presented in ten-year age groups, namely, 5-14, 15-24 etc., years. Thus, it may be suggested at this stage that the distributions of Libyan citizens according to ten-year age groups are more meaningful and nearer the truth than those in the available form.

3.2 Evaluation of the Accuracy of Age Reporting

The age distributions of males and females in 1954 are given in quinquennial age groups 0-4, 5-9,, 65-69 years. The last group included males and females aged 70 years and above. The most appropriate method of evaluating the accuracy of age reporting in this situation is that of Age-Sex score developed by the Population Division of the United Nations (1955). To calculate the score we require the age distribution in five-year age groups extending from 0-4 to 70-74 years. Thus, to apply the method in our case the distribution of population in one additional age group was required. But, it was decided to leave the distribution in this additional age group. It may, however, be added that the inclusion of the age group 70-74 years would increase or decrease the score that we have calculated according as its contribution is more or less than the components of calculated score. For the reported age distribution of citizens over the age groups 0-4 to 65-69 years in 1954, the respective age scores for males and females were 16.01 and 31.5 and the sex score was 17.9. The joint age-sex score was obtained as the total of the two age scores and three times the sex score and the same was equal to 101.2. An age-sex score of about 10 is indicative of the fact that the age distributions of both the sexes are almost free from error of age reporting. By comparison, a score of more than 100 reveals that the age data are of poor quality.

A similar evaluation of the quality of age reporting in 1964 was attempted. The method, however, could be applied only after certain preliminary adjustment and interpolation of the available data. This was because the distribution in quinquennial age groups was available for 0-4 to 40-44 years. The distribution thereafter was available in ten-year age groups, namely, 45-54, 55-64 and 65-74 years. The numbers of males and females in five-year age groups 45-49, 50-54,, 70-74 years were obtained from those in ten-year age groups with the help of the following formula (United Nations, 1956).

$$f_{na} = \frac{1}{2} f_a + \frac{1}{16} (f_{-n} - f_{+n}) \dots\dots\dots(1)$$

where f_{na} = total population in the first half of ten-year age group
 f_a = total population in the entire ten-year age group
 f_{-n} = total population in the preceding ten-year age group
 f_{+n} = total population in the following ten-year age group.

The population in the second half of the ten-year age group was obtained as $f_a - f_{na}$. Thus the total in each ten-year age groups remained unaltered. To split the total numbers in the age group 65-74 years, the totals in the age group 75-84 years were required. As the latter were not available, these were estimated by using the percentages of persons at advanced ages in stationary populations given by United Nations (1956). These percentages, based on the model stationary populations, provide the percentage of population in the age groups 70-74, 75-79, 80-84 and 85+ years corresponding to a percentage of population aged 70+ or 75+ years in relation to total population in any community. Linear interpolation is used in situations where percentages are not directly available from the table. Thus, corresponding to 2.26 per cent of males aged 75+ years in relation to total males in 1964, it was obtained that there were 1.38, 0.64 and 0.24 per cents of total males respectively in the age groups 75-79, 80-84 and 85+ years. The percentages of female population in these age groups to total female population were 1.20, 0.54 and 0.18, respectively. This corresponded to an observed percentage of females aged 75+ years (1.92) to total females in 1964. The estimated percentages for males and females in the age group 75-84 years were used to split the observed total numbers of males and females in the age group 65-74 years. The reported and estimated distributions of persons in five-year age groups in the ranges of 0-44 and 45-74 years were used to calculate the age-sex score for the age distribution of Libyan Citizen in 1964. The respective values of the age scores for males and females and the sex score were 5.98, 6.38 and 7.44. The joint age-sex score

was as $5.98 + 6.38 + 3 (7.44) = 34.68$. This level of score indicates the presence of some error in the age data, which may be minimised if the age distributions are smoothed by a suitable formula.

The age-sex score for the age and sex distributions of Libyan Citizens in 1954 and 1964 as obtained earlier indicate that the quality of age-sex data in 1964 is better than that in 1954. Unfortunately this is not true. To compare the quality of age reporting in these two censuses, we obtained, for the age distribution in 1954, a joint age-sex score which was comparable to that in 1964. The method was as follows : The available age distributions in age groups 0-4, 5-9,, 40-44 years for both the sexes in 1954 were retained as such. The distributions in age groups 45-49, 50-54, 55-59 and 60-64 years were grouped in ten-year intervals as 45-54 and 55-64 years. The populations in the following two ten-year age intervals were obtained as under. The numbers of males and females aged 64-69 years were directly available from the published tables. The percentages of population in the age groups 70-74, 75-79 and 80-84 years in relation to total population of respective sexes were obtained with the help of the table of percentages at advanced ages in stationary populations referred to earlier (United Nations, 1956). In 1954 the percentages of males and females aged 70 years and above to total male and female citizens were 4.40 and 4.76, respectively. These were found to correspond to the following percentages for male and female citizens in age groups 70-74, 75-79, 80-84 and 85+ years :

Males : 2.24, 1.33, 0.61 and 0.22

Females : 2.38, 1.44, 0.68 and 0.26

The reported distributions in the age group 65-69 years and estimated percentages in age groups 70-74, 75-79 and 80-84 years for males and females were used to obtain the distribution of population in ten-year groups 65-74 and 75-84 years. The percentages in ten-year groups 45-54 to 75-84 years were reduced to five-year age groups 45-49, 50-54,, 70-74 years. The reduction was done by formula (1).

The above procedure converted the reported age distributions of male and female citizens in 1954 to age distributions of these citizens, which were comparable to those in 1964. The age scores for males and females and the sex score for the distribution of citizens according to sex and age in 1954 as obtained above were 4.31, 7.28 and 8.37 respectively. This yielded a joint age-sex score of 36.7, which was very near to that (34.68) obtained in respect of the age distributions of citizens in 1964. Thus, it may be concluded that the quality of age reporting in Libyan Censuses of 1954 and 1964 was almost the same.

3.3 Reduction of Error in Reported Age Distribution

It has been noted above that the reported distributions of male and female citizens in Libya in 1954 and 1964 suffered from inaccurate age reporting. In this section an attempt will be made to adjust the age distributions such that the error occasioned by wrong reporting of ages is minimised. In this connection it may be mentioned that no attempt will be made to adjust the reported numbers of male and female children in age groups 0-4 and 5-9 years. This is because there is no information available regarding the births in years preceding the census dates, which could be used to adjust the reported numbers of children in the age group 0-4 years in both the censuses. The reported numbers in the age group 5-9 years can be taken to represent a somewhat true picture of the population. (United Nations, 1956). The adjustment, thus, is carried out for numbers of males and females aged 10-14, 15-19,, 70-74 years. The smoothing formula employed here uses two preceding and two following group totals to adjust the number reported in any age group. The formula implies that a particular five-year age group can gain (or lose) persons from (to) two preceding and following five-year groups. The formula is given as (United Nations, 1956) :

$$W = \frac{-S_{-2} + 4S_{-1} + 10S_0 + 4S_1 - S_2}{16} \dots\dots\dots(2)$$

where W = the adjusted number of persons in a five-year age group,

S_0 = the reported number of persons in that five-year age group for which the adjusted number is W ,

S_{-2}, S_{-1} = the reported numbers of persons in the two preceding five-year age groups,

S_1, S_2 = the reported numbers of persons in the two following five-year age groups.

This formula is appropriate in situations where data are markedly inaccurate. It smooths the reported distribution for inaccuracies but retains the genuine fluctuations. To adjust the reported distributions until the age group 70-74 years, the number of persons in the age group 75-79 and 80-84 years were required. For this purpose, the estimated distributions for males and females in 1954 in the age groups 70-74, 75-79 and 80-84 years and those in 1964 in the age groups 75-79 and 80-84 years as obtained earlier in section (3.2) were used. Once the age distributions over the age groups 10-14, 15-19,, 70-74 years were smoothed, the percentages of males and females aged 0-74 years in relation to total populations of respective sexes were obtained. A difference between 100 and the above percentages provided the percentages of population aged 75+ years to total population of each of the two sexes. These percentages were again distributed over the age groups 75-79, 80-84 and 85+ years, in a manner similar to that explained in section (3.2). The adjusted percentage distributions are presented in table (5) and figures 2_a, 2_b, 2_c and 2_d. The adjusted numbers of males and females in different five-year age groups are presented in table (6). Figures 2_a and 2_b give respectively the adjusted percentage distributions of male and females in 1954 and 1964 according to age in five-year age groups. Figures 2_c and 2_d give the same distributions in ten-year age groups 5-14, 15-24,, 65-74 years.

The comparison of figures 1_a , 2_a and 1_b , 2_b shows that most of the irregularity that are present in the age distribution of males and females in 1954 and 1964 have been smoothed by the formula that has been adopted. It may also be noted that the basic nature of the distributions remains practically unaltered after smoothing. The age and sex scores for the smoothed distributions are as under :

For 1954	Age Score (males)	3.46
	Age Score (females)	4.55
	Sex Score	5.38
	Joint Age-Sex Score	24.15
For 1964	Age Score (males)	3.60
	Age Score (females)	4.50
	Sex Score	4.03
	Joint Age-Sex Score	20.19

The comparison of age-sex scores for adjusted and reported distributions indicate a definite reduction in the magnitude of error that might be present in the reported age distributions of citizens. The smoothing in case of age distributions in 1954 is remarkably good where the age-sex score declined from slightly more than 100 for the reported age distributions to about 24 for the smoothed age distributions. The age-sex score for the adjusted age distributions in 1954 was slightly greater than that in 1964. This does not conclusively indicate that the smoothing of the age distribution in 1954 is inferior to that in 1964.

The smoothing formula works on the principle that the reported number of population in any five-year age group is affected by that in the preceding and following two five-year age groups. Also, only ignorance of true age is the cause of error and no deliberate misstatement of ages is involved. If these conditions are satisfied, the smoothing formula will undoubtedly eliminate the irregularities and will produce an age distribution which will almost be free from error in

TABLE (5)

Adjusted percentage distributions of Libyan male and female citizens according to five-year age groups in 1954 and 1964

Age group in years	Percentage distribution in			
	1954		1964	
	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)
0—4	14.17*	15.39*	17.90*	18.86*
5—9	12.89*	13.53*	15.00*	15.59*
10—14	11.02	10.33	10.93	10.58
15—19	9.15	8.47	8.14	8.03
20—24	8.63	8.27	7.88	8.05
25—29	8.21	8.17	7.74	8.07
30—34	6.59	6.73	6.62	6.71
35—39	5.12	5.40	5.56	5.32
40—44	4.30	4.75	4.49	4.42
45—49	4.08	4.19	3.53	3.50
50—54	3.90	3.63	2.95	2.77
55—59	3.24	2.83	2.57	2.26
60—64	2.76	2.50	2.19	1.88
65—69	2.26	2.11	1.76	1.57
70—74	1.94	1.94	1.52	1.36
75—79	1.10	1.11	0.80	0.70
80—84	0.47	0.48	0.33	0.27
85+	0.15	0.15	0.08	0.07
All ages	99.98	99.98	99.99	100.01

(*) unadjusted

TABLE (6)

Adjusted distributions of Libyan Citizens according to sex and
five-year age group in 1954 and 1964

Age group in years	Adjusted distribution of total population in			
	1954		1964	
	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)
0—4	76.558*	77.159*	141.149*	137.088*
5—9	69.676*	67.835*	118.297*	113.328*
10—14	59.574	51.770	86.198	76.930
15—19	49.460	42.453	64.180	58.350
20—24	46.655	41.464	62.133	58.531
25—29	44.364	40.972	61.077	58.652
30—34	35.591	33.709	52.236	48.740
35—39	27.674	27.066	43.846	38.632
40—44	23.258	23.797	35.439	32.126
45—49	22.034	21.003	27.862	25.429
50—54	21.071	18.184	23.299	20.116
55—59	17.531	14.205	20.280	16.408
60—64	14.919	12.555	17.271	13.640
65—69	12.210	10.586	13.871	11.439
70—74	10.480	9.738	11.969	9.895
75—79	5.934	5.557	6.332	5.080
80—84	2.558	2.425	2.566	1.983
85+	817	757	652	477
All ages	540.364	501.235	788.657	726.844

(*) Prorated values to account for the *age not stated* category.

age reporting. But, in the present situation, the smoothed age distributions do not appear to be completely free from error. The indication of some deliberate mis-statement of ages is brought out by the comparison of figures 1 and 2. It appears that the young adult age groups 15-19, 20-24 and 25-29 years suffered from some deliberate mis-statement of ages which might have produced exactly similar dip or flatness in the age distribution over the age groups. If this feature for the age distributions of both the sexes in 1954 was the consequence of genuine impact of past fluctuations in fertility and mortality, it ought to have moved forward by 10 years in 1964. Instead age distributions of each of the two sexes in 1964 produced similar patterns as those in 1954. It is difficult to believe that the components of population growth during the period 1954-64 inter-acted in such a manipulative manner that the flatness in age distributions for male and female citizens in 1954 and 1964 remained confined to same set of age groups. In respect of migration, the inter-censal period experienced the return migration of citizens who had left the country earlier. Most of these were family migrations and it may be assumed that the age distributions of migrants alone could not be responsible for the emergence of an age distribution as that for Libyan citizens in 1964. In such a situation it may be logical to conclude that the flatness observed in the age distributions over the age groups 15-19, 20-24 and 25-29 years in 1954 and 1964 for both the sexes is not genuine. On the contrary, it has been produced by some sort of deliberate mis-statement of ages the mechanism of which in Libyan population needs further investigation. A tendency to report an age higher than the actual among persons aged 15-29 years and that to report an age slightly lower than the actual among those aged more than 30 years may be one of several possible reasons responsible for the flatness that has been noted in the age distributions of Libyan Citizens in 1954 and 1964.

3.4 Selected Characteristics of the Age Distributions of Libyan Citizens

Selected partition values and inter-quartile ranges of the reported

and adjusted age distributions of Libyan Citizens in 1954 and 1964 are presented in table (7). It may be noted in this table that the values of the first quartile of the reported and the corresponding adjusted age distribution are the same. This is because the numbers of males and females in age groups 0-4 and 5-9 years were not adjusted and these together amounted to slightly less than (in one case) or more than one quarter of the total distributions of respective sexes. The values of the second and third quartiles of the adjusted distributions are invariably lower than the respective values of the corresponding reported age distributions. Inter-quartile ranges which are affected by changes only in the values of third quartile show a similar feature. This implies that, on the average, reported ages of males and females in both the censuses might have been slightly higher than the actual ones. The differences between values of third quartile of reported and the corresponding adjusted age distributions are greater than the differences between values of second quartile of the distributions concerned. This might be taken to reveal that the tendency of reporting an age higher than the actual one increases as the age advances.

Since the adjustment of the reported age distributions does not radically alter the pattern of the distributions, the following discussion is based only on the adjusted age distributions.

It may be noted further in table (7) that the values of all the three quartiles of age distributions of females in 1954 and 1964 were smaller than those of males in respective years. If the differences are genuine and are not affected by migration, these must have stemmed from differences between mortalities of males and females. Fertility could not produce these differences because, as we have noted in section (2.1), the proportions of male and female births in total births in Libya were very near to the averages observed in several populations. It may be inferred, therefore, that the mortality of females was slightly

TABLE (7)

Selected partition values and inter-quartile ranges of the reported and adjusted distributions of Libyan Citizens according to age in 1954 and 1964

Sex	Characteristic	Nature of age distribution in			
		1954		1964	
		Reported	Adjusted	Reported	Adjusted
(1)	(2)	(3)	(4)	(5)	(6)
MALE	First Quartile	9.20	9.20	7.37	7.37
	Second Quartile				
	(Median)	21.77	21.60	19.12	18.79
	Third Quartile	39.64	39.23	36.39	35.71
	Inter-Quartile				
	Range	30.44	30.03	29.02	28.34
FEMALE	First Quartile	8.55	8.55	6.97	6.97
	Second Quartile				
	(Median)	21.66	21.38	18.44	18.09
	Third Quartile	39.58	38.80	34.86	34.33
	Inter-Quartile				
	Range	31.03	30.25	27.89	27.36

higher than that of males. The average ages of males and females in 1954 and 1964 given as under provide the same picture :

<i>Year</i>	<i>Sex</i>	<i>Average Age</i>
1954	Male	26.27
	Female	25.82
1964	Male	23.74
	Female	22.91

The median and the average ages of each of the two sexes in 1964 were substantially lower than those of respective sexes in 1954. The median ages of males declined from 21.6 years in 1954 to 18.8 years in 1964 and that of females declined from 21.4 years in 1954 to 18.1 years in 1964. Under stable conditions, a decline in the median age is associated with a rise in the crude birth and death rates in a population. Could the decline in median ages of males and females in Libya be associated with a corresponding rise in the crude birth and death rates? It is difficult to provide a definite answer to this question mainly because the necessary data are not available. It may be added, however, that the crude death rate might not have increased during 1954-64. Instead, it must have declined. A decline in crude death rate is associated with a decline in median age in a population provided that the decline in the crude death rate is brought about by heavy decline in infant and child mortalities and the fertility does not experience any decline. This might be quite true in Libya where people availed of the medical facilities that were extended considerably during the period. Since the infant and child mortalities in Libya were quite high, these must have experienced a huge reduction during the period 1954-64. It is, therefore, quite plausible to assume that in populations where the infant and child mortalities are quite high, a decline in the crude death rate will be associated with a decline in the median age. This effect will be quite temporary. Any further decline in the crude death rate consequent upon declines in mortalities at higher ages, will produce a relatively higher median age in a population. The next Libyan Census may provide some answer to it.

4. SUMMARY

Libyan population has suffered from the deficiency of females for quite some time in the past. The available evidences show that the deficiency might have stemmed from slightly higher mortality of females than that of males.

The participation of females in various socio-economic activities appears to be considerably lower than that of males.

Available age distributions of Libyan Citizens in recent censuses suffer from inaccurate reporting, which could be minimised by considering the distribution in broad age groups.

The adjusted age distributions of Libyan Citizens in 1954 and 1964 are presented.

The age structure suggests that the population must have experienced high birth and death rates in the past. It also indicates the possibility of substantial declines in infant and child mortalities during recent past. The average age of females is slightly lower than that of males in each of the two census years. This implies that the mortality of females is slightly higher than that of males.

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