



**UNITED NATIONS  
ECONOMIC AND SOCIAL COUNCIL**

---

52962  
**E**  
Distr.  
LIMITED

E/CN.14/POP/100  
6 July 1973

Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA

Seminar on Techniques of Evaluation  
of Basic Demographic Data

Accra, Ghana, 16-28 July 1973

COMPARATIVE ANALYSIS OF ACCURACY OF CENSUS AGE  
DISTRIBUTION FOR SELECTED AFRICAN COUNTRIES

Comparative analysis of accuracy of census age  
distribution for selected African countries

Introduction

1. The objective of the paper is to test the accuracy of the census age distribution of selected African countries <sup>1/</sup>. The selection of the countries was based mainly on the availability of two age distributions obtained preferably during the 1960 and 1970 rounds of censuses; however, a few countries with one census age distribution tabulated in single years have been included for the calculation of measures of digit preferences. Obviously all tests of age accuracy available <sup>2/</sup> were not applied for practical reasons; for the data tabulated in five year age groups the method was the same as used by the United Nations Secretariat, and for the data tabulated in single years, Myer's method was used.
2. In general it is agreed that errors which could affect the regularity of a census age distribution can be of three types : mistatement of age, incomplete enumeration at particular ages, and failures to report ages. In some African countries, however, a fourth type can be introduced by the underestimation or overestimation of age by the interviewer. Moreover, these types of errors may vary from census to census and from country to country. It will also be noted that the specific questions asked on age only, date of birth, age at last birthday or age at next birthday either singly or in combination will have a certain effect on the age distribution, particularly on single year age distribution.
3. Certain legal regulations may tend to distort the reported ages. Among these may be cited the minimum age for school entry, the age of compulsory military service, etc.
4. As a note of caution, it may be mentioned that for a given country data from two censuses may not be always readily comparable because of differences in geographical coverage, ethnic coverage, population coverage (de jure or de facto); in addition natural disasters and other unsettling conditions (including wars, declared or not) leading to upheavals of population may take place between the two censuses and affect the population size and structure.

Age structure of selected countries

5. Table 1 gives for the selected African countries, at two census dates, the population of the total population in three age groups : 0-15, 15-64 and 65 and over and also the median age and the dependency ratio.

---

<sup>1/</sup> For sake of comparison data from selected Asian and Latin American countries are included in the study; the list of countries covered by the paper are given in Annex I.

<sup>2/</sup> A list of selected references is given in Annex II.

Table 1. Percentage of the total population in broad age groups, median age and dependency ratio

Age (years)	Algeria		Botswana		Ghana		Kenya		Libya		Morocco		Tanzania		Tunisia		Uganda		Zambia	
	1954	1966	1964	1971	1960	1970	1962	1969	1954	1964	1960	1971	1957	1967	1956	1966	1959	1969	1963	1968
0-15	43	47	44	46	45	47	46	48	38	44	35	46	43	44	41	46	41	46	45	47
15-64	54	48	52	49	52	49	49 <sup>1/</sup>	46	56	51	61	49	54	50	55	50	57	50	51 <sup>3/</sup>	51
65 +	3	5	4	5	3	4	6 <sup>2/</sup>	6	6	5	4	5	3	6	4	4	2	4	4 <sup>4/</sup>	2
Median age (years)	19	17	18	17	25	17	17	16	22	19	19	17	19	18	20	17	20	17	18	17
Dependency ratio	84	107	93	106	91	102	105	116	79	95	94	103	80	89	83	99	77	100	95	95

Notes : <sup>1/</sup> 15-59 instead of 15-64  
<sup>2/</sup> 60 + instead of 65 +  
<sup>3/</sup> 15-54 instead of 15-64  
<sup>4/</sup> 55 + instead of 65 +

6. A common feature to all the countries, between their two censuses, is an increase of the proportion of the population under 15 years of age and a corresponding decrease in that of the population aged between 15 and 64 years; the share of the population aged 65 and over stays for most of the countries almost at the same level. This results in a decrease of the median age and an increase of the dependency ratio; it will be noted, however, that the sharp decline in the median age of Ghana, Libya, Tunisia, and Uganda cannot be solely explained by the level of fertility.

#### Sex ratio

7. Table 2 gives the sex ratio (number of males per 100 females) for successive quinquennial age groups, the total population and the sex ratio score <sup>1/</sup> obtained during the 1960 and the 1970 rounds of censuses for selected African countries; it also gives the same data for selected Asian and Latin American countries for a given year for the sake of comparison.

8. Of the eight African countries three showed an excess of males during the 1960 censuses and five during the 1970 censuses. Tunisia shows a deficit of males in 1956 and an excess in 1966, but it will be noted that the published number of females in 1956 was adjusted for an under-enumeration of 160,104 females; if this amount is excluded the ratio will become 107.2 males per 100 females. Ghana shows an excess of males in 1960 and a deficit in 1970; in the light of the decrease of most of the quinquennial sex ratios this indicates that the people who emigrated from Ghana between 1960 and 1970 were predominantly males. If we exclude Libya with a sex ratio of 107.9 in 1954 and 108.3 in 1964 and the sex ratios of Botswana which are heavily affected by emigration to South Africa, particularly of males, the sex ratios for the two rounds of censuses ranges from 92.6 to 104.3.

9. Considering the quinquennial sex ratios (see also figure I), one notes that for the eight selected African countries the sex ratio increases from age group 0-4 to 10-14 and this for the two rounds of censuses (the exception of Tanzania and Tunisia for their 1957 and 1956 census may be due to the fact that the published data were already graduated and smoothed); the same phenomenon is noted for India and Pakistan; this increase in sex ratio looks rather surprising particularly for the countries which show a deficit of males in the age group 0-4 and an excess in the age group 5-9 and 10-14. These age groups are not usually affected by migration and as a decrease of sex ratio would have been expected one can safely assume that the observed increase in sex ratio is due to under-enumeration or age mistatement, or both, of females.

10. If we compare the sex ratios at age 10-14 to those at ages 15-19 and 20-24 one is further tempted to assume that girls of age 10-14 overstated their age in most cases; anyway it is the depletion of females that very often explains the high sex ratios observed (for the 1960 censuses, 111 in Ghana, 114 in Algeria, 120 in Kenya and Libya, 132 in Morocco); for the same countries this sex ratio in the 1970 censuses is 105, 110, 107, 117 and 112 respectively, this is an improvement although the values are still high. If we consider the sex ratios at

<sup>1/</sup> See "Accuracy tests for census age distributions tabulated in five-year and ten-year groups", United Nations, Population Bulletin No. 2, October 1952, U.N. publication, sales No. 1952.XIII.4, pp. 59-79.

Table 2 : Sex ratios in five-year age groups during the 1960 and 1970 rounds of censuses for selected African countries and sex ratios for selected Asian and Latin American countries for a given year

Age (years)	1960 round of censuses								1970 round of censuses								Ceylon	India	Iran	Pakistan	Argentina	Colombia
	Algeria	Botswana	Ghana	Kenya	Libya	Morocco	Tanzania <sup>1/</sup>	Tunisia <sup>1/</sup>	Algeria	Botswana <sup>2/</sup>	Ghana	Kenya	Libya	Morocco	Tanzania	Tunisia	1963	1961	1966	1961	1960	1964
0-4	103.9	96.8	98.2	96.6	99.4	95.7	101.1	102.0	102.8	97.0	99.1	101.1	103.0	102.4	99.8	103.8	102.6	100.8	108.4	100.5	102.6	102.5
5-9	105.1	99.2	102.5	100.3	102.8	104.1	100.7	101.2	103.1	98.9	100.8	103.2	104.5	103.3	102.8	107.5	102.0	104.7	107.5	108.4	102.3	102.6
10-14	114.2	104.1	110.6	115.3	119.7	132.1	96.3	101.3	109.7	96.9	105.4	106.6	116.1	111.9	113.5	110.2	104.7	114.1	112.0	125.6	101.3	102.5
15-19	111.6	98.3	103.7	100.6	112.0	105.6	90.0	100.9	102.0	82.0	105.3	103.1	103.7	105.5	91.6	101.8	102.8	107.6	99.2	106.6	97.9	89.9
20-24	90.5	82.7	83.2	69.4	114.5	81.2	85.8	99.2	95.1	64.9	81.4	95.0	107.9	91.3	71.1	94.2	100.7	95.1	89.1	100.6	97.3	89.9
25-29	88.0	35.9	90.9	74.7	107.7	83.3	85.1	99.5	93.3	73.1	84.9	84.8	100.5	80.0	82.1	91.8	102.0	102.3	94.5	103.9	98.9	89.2
30-34	86.0	84.8	98.6	80.6	104.7	86.7	85.4	100.0	92.6	79.8	102.1	94.2	106.1	78.5	90.9	95.5	112.3	107.6	107.3	110.0	98.1	94.4
35-39	98.7	91.2	110.6	94.2	110.1	108.1	85.7	100.1	98.0	78.7	99.3	96.0	115.9	92.7	103.9	100.5	110.7	114.7	116.7	121.3	99.9	92.1
40-44	101.0	89.4	114.0	98.6	92.1	93.7	85.6	98.9	97.4	87.0	112.5	96.0	106.6	90.1	95.7	102.2	121.7	112.2	126.5	115.6	99.6	100.3
45-49	118.5	105.0	128.2	116.6	118.9	121.6	91.0	98.2	103.6	87.8	107.1	105.3	112.1	115.4	111.4	110.7	125.3	117.0	131.6	126.2	100.4	96.8
50-54	99.2	102.4	118.4	112.1	105.0	93.4	93.0	97.0	99.9	97.5	107.1	95.2	114.8	107.0	98.9	114.7	127.5	114.4	100.0	123.3	104.7	102.4
55-59	131.9	104.4	122.5	129.9	151.9	145.3	94.7	92.9	110.4	91.2	115.8	112.2	124.1	149.4	108.9	121.2	137.2	116.1	109.4	133.8	107.1	101.6
60-64	105.8	103.2	116.3	116.5	104.2	87.1	92.8	87.2	98.4	89.5	105.9	108.4	127.6	90.1	95.7	112.3	134.8	103.1	105.7	128.5	101.4	93.0
65-69	129.4	93.3	113.3	121.3	137.7	140.0	95.6	82.2	105.1	87.5	102.7	117.8	118.9	117.7		123.0	129.1	103.9	120.3	129.2	100.4	94.7
70+	112.0	72.3	112.4	138.0	99.8	113.3	90.7	70.9	83.8	77.8	104.0	105.4	123.3	107.3	79.2	110.9	116.2	94.0	110.3	127.2	84.9	79.4
All ages	102.9	94.8	102.2	96.8	107.9	99.8	92.6	98.5	100.8	87.7	98.5	100.4	108.3	100.2	97.5	104.3	108.2	106.2	107.3	111.1	100.0	97.1
Sex ratio score	13.3	5.6	8.5	11.7	17.9	26.7	2.3	1.7	5.3	6.2	7.2	7.7	7.0	17.1	12.3	5.7	4.2	5.9	10.0	8.2	1.8	3.8

Notes : 1/ Published data were graduated and smoothed.

2/ African population only.

age 10-14 for the selected Asian countries, we note that in relation to those of age groups 15-19 and 20-24, the pattern of distortions seems to be same as the one prevailing in African countries.

11. Over age 20, an explanation of difference between sex ratio from one age group to another becomes more complex as beside mortality differentials which normally lower the sex ratio one is confronted with effects of migration and still with those of age mistatements, under-enumeration, etc. The rapid drop in sex ratio between age 15-19 and age 20-24 of about 20 per cent in many cases indicates that many women really aged 15-19 have been enumerated as aged 20-24 (a rapid drop is also observed for India and Pakistan during their 1961 census, 107.6 to 95.1 and 106.6 to 100.6 respectively); several factors can be advanced for this, among others, attainment of the legal age of marriage, enumerators overestimating the age of those having borne children etc.

12. Between ages 30 and 50, upwards and downwards variations are noted from age group to age group for all the countries (see figure 1) but in most cases no abnormal ratios are observed particularly in view of the fact that in certain cases migration, beside certain events, has affected or still affects seriously the age distribution.

13. From age 55 the situation becomes more obscure and one finds it difficult to explain the fact that in many cases (for the two rounds of censuses) the sex ratios at age 55-59 are higher than those of age 50-54 and that those of age 65-69 are higher than those of age 60-64. For Ceylon, India, Iran, Pakistan and Argentina sex ratios of age 55-59 higher than the ratios of age 50-54 are observed. Age 65-59 sex ratios higher than those of age 60-64 are observed for India, Iran, Pakistan and Colombia. In some instances the sex ratios are so high that they can hardly be acceptable; they were for the 1960 round of censuses, at age 55-59, 131.9 for Algeria, 122.5 for Ghana, 130.9, for Kenya, 151.9 for Libya, 145.3 for Morocco, 137.2 for Ceylon, 133.8 for Pakistan; for the same countries for age 65-69 they were 129.4, 113.3, 128.1 <sup>1/</sup>, 137.7, 140.6, 129.1 and 129.2 respectively.

14. For the 1970 round of censuses, at age 55-59 the sex ratio is 110.4 for Algeria, 115.8 for Ghana, 124.1 for Libya, 149.4 for Morocco and 121.2 for Tunisia; for the same countries for age 65-69 they were 98.4, 105.9, 127.6, 90.1 and 112.3 respectively. Except for Morocco at age 55-59 the sex ratios are lower in the 1970 censuses than in the 1960 censuses, those for Tunisia are higher but this may be due to the fact that the published data of the 1956 census were already adjusted and smoothed.

15. At age 70 and over, the high sex ratios observed for some of the countries are somewhat suspicious; indeed where it is expected to have an excess of females one is surprised to find sex ratio as high as 123.3 (Libya) and 127.2 (Pakistan).

16. Considering the sex ratio scores, their levels indicate the presence of widespread errors; however from one census to another all countries seem to have shown some improvement. One has, however, to keep in mind the fact

<sup>1/</sup> For age 60 and over.

that errors in age distribution may, in some cases, be similar for both sexes; hence the need to discuss later on the joint score which although heavily affected by the sex ratio score takes into consideration the age ratio scores for both sexes.

#### Age ratio

17. Table 3 gives the age ratio<sup>1/</sup> for five year age groups and the age ratio scores 1/ by sex during the 1960 and 1970 rounds of censuses for eight selected African countries; it also gives the same data for selected Asian and Latin American countries for a given year.

18. Most of the countries show for age 5-9 an age ratio, for each sex, in excess of 100; this indicates that the share of this age group is too high as age ratios of less than 100 would have been expected because of the patterns of child mortality.

19. From age 10 the fluctuations vary from country to country and from census to census but in most cases where for an age group the age ratio is in excess of 100 for males, it is also in excess of 100 for females; however the deviations over 100 for females tend to be larger than those for males. Except for Libya, Tanzania and Tunisia for their last census and Ceylon for its 1963 census all other countries show lower age ratio scores for males than for females.

---

<sup>1/</sup> See "Accuracy tests for census age distributions tabulated in five-year and ten-year groups", op. cit.

Table 3.

Age ratio for five-year age groups under 70 during the 1960 rounds of censuses for selected African countries and age ratio for selected Asian and Latin American countries for a given year

1960 round of censuses																
	ALGERIA		BOTSWANA		GHANA		KENYA		LIBYA		MOROCCO		TANZANIA <sup>1/</sup>		TUNISIA <sup>1/</sup>	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
5-9	92.8	92.8	121.4	122.3	103.1	102.9	100.9	104.7	101.8	106.4	113.1	115.5	93.7	92.3	99.6	100.1
10-14	102.4	96.7	96.1	91.3	90.5	84.2	107.6	93.7	102.0	90.6	92.9	73.5	97.2	96.8	94.4	94.2
15-19	98.9	91.4	98.7	95.8	88.0	82.2	95.4	90.0	89.5	93.8	72.5	72.6	98.1	99.8	97.4	96.8
20-24	102.8	115.2	84.3	94.6	96.8	112.8	80.5	102.1	99.5	95.4	100.9	114.7	99.1	101.3	98.3	99.3
25-29	88.6	89.2	112.7	109.7	109.1	107.8	111.5	110.7	112.4	114.9	109.1	109.8	100.0	100.7	100.4	100.5
30-34	101.6	109.1	83.1	86.4	101.7	101.3	94.3	95.7	96.5	100.1	101.7	108.5	100.2	100.2	100.2	99.8
35-39	90.3	82.9	122.1	116.1	97.1	91.5	103.1	95.6	91.1	82.1	97.9	81.1	99.6	99.3	98.7	98.1
40-44	116.6	129.0	80.4	87.0	103.4	106.0	94.5	98.3	103.8	64.1	110.7	133.1	98.4	100.9	100.2	100.6
45-49	84.7	69.7	119.2	107.5	93.5	84.1	106.8	95.0	83.1	68.5	77.2	59.4	98.4	95.4	99.5	99.4
50-54	126.7	157.6	93.3	95.5	106.3	113.5	100.6	108.4	139.9	173.9	137.1	189.7	98.3	97.1	99.3	98.3
55-59	80.0	61.6	96.4	94.8	74.0	71.0	79.7	69.8	67.3	46.4	57.4	35.7	98.4	96.4	99.4	99.5
60-64	117.1	144.9	107.3	104.0	138.4	141.8	131.4	142.9	151.6	212.3	191.8	315.2	95.5	97.9	97.6	99.3
65-69	79.3	65.7	99.0	81.3	69.4	70.3	71.4	70.3	62.1	47.8	54.4	34.6	97.8	93.9	89.9	89.6
Age ratio score	11.7	23.5	10.9	11.6	11.7	15.6	11.2	12.3	17.1	32.2	24.0	48.4	2.0	2.6	2.0	2.1

Note : 1/ Published data were graduated and smoothed



Table 3. (Cont'd)

Age ratio for five-year age groups under 70 during the 1960 rounds of censuses for selected African countries and age ratio for selected Asian and Latin American countries for a given year

1970 round of censuses

	ALGERIA		BOTSWANA <sup>2/</sup>		GHANA		KENYA		LIBYA		MOROCCO		TANZANIA		TUNISIA	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
5-9	90.5	92.6	106.0	106.9	112.7	113.3	103.0	103.0	107.7	107.8	105.9	109.3	111.7	113.7	98.2	97.1
10-14	112.3	105.1	105.0	99.8	91.3	88.7	97.1	94.0	95.1	85.4	110.9	103.2	88.2	76.7	108.9	104.2
15-19	90.5	92.7	95.5	98.2	97.3	87.7	98.1	96.9	82.1	89.1	93.0	92.2	99.0	100.7	87.0	89.3
20-24	85.4	88.3	80.3	97.1	88.7	104.2	94.6	94.9	101.2	95.7	87.0	90.4	77.7	95.0	85.2	88.0
25-29	102.5	103.2	100.5	97.5	101.9	101.6	97.5	108.8	111.6	118.8	90.7	96.7	125.1	121.2	100.0	103.3
30-34	102.6	105.6	99.0	93.6	103.1	106.3	94.3	89.3	92.3	92.7	97.9	106.9	89.6	88.8	103.5	103.9
35-39	102.5	98.7	100.3	105.6	101.1	91.8	105.4	104.3	107.7	98.8	105.7	95.3	117.5	105.1	107.7	105.1
40-44	92.6	95.3	94.9	90.2	95.5	101.8	91.6	95.0	94.2	101.0	106.8	119.4	74.8	83.5	91.1	93.2
45-49	98.5	93.6	110.6	115.1	97.9	89.1	105.7	96.1	49.1	96.0	86.6	72.5	168.2	110.1	100.1	97.2
50-54	99.5	106.1	97.1	88.7	108.5	115.1	92.2	104.5	94.3	96.0	126.2	148.3	98.3	110.4	101.1	101.4
55-59	100.7	90.5	96.7	99.8	78.4	72.2	97.6	87.5	101.9	98.5	69.0	46.0	75.9	68.2	108.0	101.4
60-64	102.8	113.2	95.5	95.7	121.3	126.3	108.3	114.1	100.5	96.1	139.4	208.6	119.3	134.9	91.0	98.7
65-69	103.0	91.1	105.3	107.8	81.4	83.4	98.9	90.1	96.5	100.2	67.5	52.8	60.1	59.5	103.6	93.1
Age ratio score	5.3	6.9	6.1	6.4	9.1	12.0	4.6	7.0	9.5	6.1	15.6	26.9	21.4	17.3	6.2	4.8

Note : <sup>2/</sup> African population only

Table 3. (cont'd)

Age ratio for five-year age groups under 70 during the 1960 rounds of censuses for selected African countries and age ratio for selected Asian and Latin American countries for a given year

	CEYLON 1962		INDIA 1961		IRAN 1966		PAKISTAN 1961		ARGENTINA 1960		COLOMBIA 1964	
	M	F	M	F	M	F	M	F	M	F	M	F
5-9	97.6	99.1	111.2	113.0	109.1	111.4	132.2	132.5	102.2	101.9	104.7	104.6
10-14	109.0	106.6	101.7	94.2	99.9	93.4	77.4	66.5	103.6	102.5	101.8	96.9
15-19	92.0	92.3	83.6	82.0	88.8	92.4	94.0	100.2	96.4	98.0	91.9	99.6
20-24	99.4	101.2	98.0	108.3	85.2	92.8	93.2	97.4	94.4	95.5	96.8	96.5
25-29	94.2	97.4	108.4	106.2	96.8	100.1	110.7	111.7	100.2	99.0	93.8	96.6
30-34	98.3	92.7	99.5	99.3	110.3	107.1	96.4	96.9	104.0	105.3	100.7	96.6
35-39	112.2	117.6	96.9	92.5	95.4	94.3	100.9	93.5	104.5	103.4	103.0	108.3
40-44	87.6	83.8	103.6	106.7	118.7	114.5	101.0	107.7	92.5	93.0	98.0	91.7
45-49	109.1	108.0	91.8	88.8	86.5	76.4	91.3	86.0	104.8	106.3	93.6	97.9
50-54	96.5	98.1	121.6	124.0	105.4	130.2	121.7	127.1	100.8	99.4	114.5	110.0
55-59	93.2	88.7	71.2	67.3	62.5	58.7	75.8	70.9	104.0	100.3	78.5	76.1
60-64	115.8	115.3	147.1	159.7	166.9	180.2	111.8	114.7	97.2	100.4	126.3	134.6
65-69	86.6	87.4	62.9	61.1	72.4	64.3	89.3	87.7	96.6	94.7	79.4	75.8
Age ratio score	7.7	7.7	14.6	17.9	17.5	20.9	12.4	21.9	3.6	3.1	9.1	10.0

20. Table 4 indicates for each selected country the age groups, by sex, where the age ratio is high compared to those of the adjacent age groups and this for a given census data. For the 1960 African censuses there is clear indication that ratios are mostly high at ages 25-29, 40-44, 50-54 and 60-64. For the 1970 African censuses the high ratios are less concentrated on the above age groups and one finds high ratios at ages 15-19 and 35-39.
21. Considering the data for the selected Asian and Latin American countries, India, Iran and Pakistan show high ratios at ages 40-44, 50-54 and 60-64 a pattern similar to that observed for the selected African countries during their 1960 censuses. Ceylon, however, shows high age ratios at ages 10-14, 20-24, 35-39, 45-49 and 60-64; Argentina shows high age ratios at ages 10-14, 45-49 and 60-64 for both sexes and Colombia shows high ratios at ages 35-39, 50-54 and 60-64 for both sexes.
22. If we consider the joint score (see table 5) all selected African countries show an improvement from one census to another as was suggested by the sex ratio score.
23. The level of the joint score for the African countries compares favourably with that of the selected Asian countries and Colombia but is much higher than that of Argentina.
24. The selected Asian and Latin American countries may not be representative of their respective region and it will be hazardous to draw conclusions, based on their data, on the similarity or difference of pattern of age misreporting in comparison to those observed in most African countries.
25. It is, however, interesting to note that other studies <sup>1/</sup> show that "certain populations (including many in tropical Africa, some in Northern Africa and the Near East, plus India and Pakistan) have census age distributions by five-year intervals that are quite substantially distorted by age misreporting, in a pattern that has many common features. In contrast, censuses in the Philippines and Latin America have five-year age distributions that are much less distorted, and censuses in parts of Asia, including China (Taiwan), the Republic of Korea and Thailand have five-year age distributions that appear distorted only to a minor extent by age misreporting".

---

<sup>1/</sup> United Nations. Manual IV. Methods of estimating basic demographic measures from incomplete data. United Nations publication No. 67.XIII.2)



Table 5. Sex ratio score, age ratio score and joint score for selected countries at given census dates

	Algeria		Botswana		Ghana		Kenya		Libya		Morocco		Tanzania		Tunisia		Ceylon	India	Iran	Pakistan	Argentina	Colombia
	1954	1966	1964	1971	1960	1970	1962	1969	1954	1964	1960	1971	1957 <sup>1/</sup>	1967	1956 <sup>1/</sup>	1966	1963	1961	1965	1961	1960	1964
Sex ratio score	13.3	5.3	5.6	6.2	8.5	7.2	11.7	7.7	17.9	7.0	26.7	17.1	2.3	12.3	1.7	5.7	4.2	5.9	10.0	8.2	1.8	3.8
Age ratio score																						
Males	11.7	5.3	10.9	6.1	11.7	9.1	11.2	4.6	17.1	9.5	24.0	15.6	2.0	21.4	2.0	6.2	7.7	14.6	17.5	12.4	3.6	9.1
Females	23.5	6.9	11.6	6.4	15.6	12.0	12.3	7.0	32.2	6.1	48.4	26.9	2.6	17.3	2.1	4.8	7.6	17.9	20.9	21.9	3.1	10.0
Joint ratio score	74.1	28.1	39.3	31.3	52.8	42.7	58.6	33.7	103.0	36.6	152.5	93.8	11.5	75.6	9.2	26.8	27.9	50.2	66.4	58.9	12.1	30.5

Note: The published data for 1957 and 1956 are not the reported ones. The original distribution was already before publication.

### Digit preferences

26. Table 6 gives the measures of digit preferences and Myer's index for eleven selected African countries, for which single years age-distributions are available, and for Ceylon, Iran and Colombia. Except for Swaziland and Ceylon the index of digit preference is greater for females than for males.

27. As far similarity or difference in the preference or aversion for a given digit is concerned one can note that for males the preferred digit is "0" in seven African countries; In Iran and Colombia, "5" in two African countries and in Ceylon, "6" in Swaziland and "9" in Zambia. All the countries (except Botswana for which the second preferred digit is "6") showing "0" as preferred digit have "5" as second preferred digit or vice-versa. For Swaziland the second preferred digit is "8", while it is "7" for Zambia.

28. For males the least preferred digit is "1" or "9" or both in all the countries except in Morocco and Zambia where they are "4" and "6" respectively.

29. For females the preferred digit is "0" in all the countries but the second preferred digit is "9" in Botswana and Zambia, "8" in Swaziland and Ceylon and "5" in the other countries.

30. The least preferred digit for females is "1" or "9" in all countries except Botswana and Nigeria where it is "3" and Zambia where it is "6".

31. With the data of the selected countries it is established that there is definite preference for digit "0" particularly among females; "5" being the second preferred digit, in most cases, where it is not the first. For most countries the least preferred digit is "1" or "9" or both.

32. It will be noted however that unusual preferences or aversions are observed; this is the case of Zambia with "9" as the preferred digit for males and the second preferred digit for females and "6" as the least preferred for both sexes. In Swaziland the preferred digit for males is "6" and "8" is the second preferred digit for both sexes. In Morocco the least preferred digit for males is "4".

### Conclusion

33. The tests applied to the selected countries show that the reported age distributions show irregularities which vary from country to country and from census to census although some of the irregularities in certain cases are common to most of the countries and are present in two consecutive censuses for the same country.

34. Some of the irregularities can reflect the true situation inasmuch as they can be consequences of factors such as fertility, mortality and migration or other events. Thus, the demographic history of a country, can always be helpful in determining if the irregularities of age distribution are true or due to errors: The use of model for correcting the reported irregularities should be viewed in this setting.

Table 6 : Measures of digit preferences and Myer's index for selected countries

Digit	M A L E S													
	Algeria	Botswana	Ghana	Kenya	Morocco	Nigeria	Swaziland	Tanzania	Tunisia	Uganda	Zambia	Ceylon	Iran	Colombia
	1966	1971	1970	1969	1960	1963	1966	1967	1966	1969	1969	1963	1966	1964
0	+1.6	+2.6	+7.8	+5.3	+20.6	+18.8	-0.2	+11.5	+1.7	+7.8	+1.3	+4.9	+11.5	+2.9
1	-1.6	-1.6	-3.2	-2.7	-6.0	-3.2	-4.8	-4.8	-1.3	-3.1	-0.2	-3.1	-3.4	-3.0
2	-0.2	0.0	+0.1	0.0	-1.7	-1.6	-2.0	-1.0	+0.1	0.0	-1.1	+0.4	-0.6	+0.5
3	-0.7	-1.3	-2.8	-2.3	-4.9	-4.1	-3.4	-3.0	+0.6	-2.6	-1.5	-0.4	-2.7	-0.3
4	-0.1	-1.4	-1.9	-1.5	-4.6	-4.7	-2.3	-3.5	-0.6	-2.0	-1.5	-2.2	-2.7	+0.8
5	+2.2	+0.4	+4.3	+2.9	+12.5	+7.6	+0.3	+4.9	+2.1	+3.0	+1.5	+5.5	+8.5	+1.8
6	+1.1	+0.7	-0.4	-0.9	-2.7	-3.2	+8.7	+2.1	+1.1	-1.3	-2.2	-1.4	-2.8	-1.0
7	-0.9	-0.3	-2.6	-1.6	-5.5	-3.2	-2.9	+2.1	-0.3	-1.5	+1.7	-2.1	-2.5	-1.1
8	+0.1	+0.4	+1.3	+1.1	-0.8	-2.4	+7.2	+2.0	-0.2	+0.9	-0.7	+1.3	-1.3	+1.1
9	-1.6	+0.5	-2.6	-1.0	-7.0	-3.9	-0.6	-2.0	-2.0	-1.4	+2.7	-2.9	-4.0	-1.7
Index	10.1	9.2	27.0	19.3	66.3	52.7	32.4	36.9	10.0	23.6	14.4	24.2	40.0	14.2

Digit	F E M A L E S													
	Algeria	Botswana	Ghana	Kenya	Morocco	Nigeria	Swaziland	Tanzania	Tunisia	Uganda	Zambia	Ceylon	Iran	Colombia
	1966	1971	1970	1969	1960	1963	1966	1967	1966	1969	1969	1963	1966	1964
0	+5.4	+2.7	+9.9	+6.4	+29.5	+20.5	+3.6	+10.2	+4.4	+10.9	+3.4	+8.6	+15.3	+4.5
1	-2.3	-1.3	-3.6	-3.1	-7.1	-3.4	-3.0	-5.0	-1.4	-3.8	+0.6	-3.3	-4.5	-3.7
2	-0.8	-0.2	+0.1	-1.2	-3.4	-2.3	-0.4	-1.9	-0.4	-0.6	-0.8	+0.5	-1.3	+0.2
3	-1.6	-1.4	-3.0	-2.6	-6.4	-4.6	-1.8	-3.6	-1.6	-3.5	-0.9	-0.3	-3.6	-0.9
4	-0.9	-1.3	-1.8	-1.7	-6.0	-5.0	-1.1	-3.5	-1.5	-2.4	-1.7	-2.0	-3.3	+0.2
5	+3.0	+0.2	+3.8	+2.4	+13.8	+7.3	+2.1	+7.2	+2.9	+3.8	+0.7	-0.5	+9.9	+2.4
6	+1.0	+0.6	-0.5	-0.6	-4.4	-3.4	-0.3	-2.5	-1.4	-1.8	-2.4	-1.0	-3.3	-0.9
7	-1.9	-1.1	-3.5	-2.0	-6.6	-3.4	-1.9	-2.1	-0.5	-2.7	-0.2	-1.9	-3.2	-1.2
8	+0.5	+1.0	+1.8	+2.1	-1.8	-1.9	+2.4	+3.4	+0.6	+1.9	-1.9	+2.6	-1.3	+1.3
9	-2.4	+0.8	-3.2	-0.9	-7.7	-4.0	+0.4	-2.1	-2.6	-1.9	+3.2	-2.7	-4.7	-1.9
Index	19.8	10.6	31.2	23.0	86.7	55.8	17.0	41.5	17.3	33.3	15.8	23.4	50.4	17.2

Note : Indices are based on single year data from 10 to 69 years.

ANNEX I

List of countries covered by the paper with information on their censuses coverage

<u>Algeria</u>	31/X/1952	De jure population. Excluding persons in institutions and personnel in military establishments, merchant seamen, armed forces and diplomatic personnel stationed outside the country.
	4/IV/1966	Age classification based on year of birth rather than completed years of age. De jure population. In the departments of Oasis and Saoura, enumeration took place between 22 December 1965 and 20 January 1966.
<u>Botswana</u>	15/I-VI 1964	De jure population, excluding nomads estimated at 14,150 (7,075 males; 7,075 females).
	VIII/1971	574,094 persons were enumerated as the de facto population; in addition, 45,735 persons were reported as absent and an estimate of 10,550 persons was made for nomads who were not enumerated. Age was recorded as age at the last birthday.
<u>Ghana</u>	20/III/1960	_____
	1/III/1970	_____
<u>Kenya</u>	15/VIII/1962	Data are based on a complete enumeration of non-African population and of urban African population and on a 10 per cent sample of rural African population. The population of Northern Province is excluded.
	24-25/VIII/1969	_____
<u>Libya</u>	30/VII/1954	Excluding alien armed forces stationed in the area.
	31/VII/1964	De jure population.
<u>Morocco</u>	18/VI/1960	De jure population.
	20/VIII/1971	Results published based on the processing of a sample of 10 per cent of the census schedules.
<u>Nigeria</u>	5-8/XI/1963	Census believed to be over-enumerated.



<u>Swaziland</u>	24/V/1966	Excluding persons in transit.
<u>Tanzania</u>	20-11 & 19/VIII/1957	Census of Tanganyika, excluding armed forces. Published data are adjusted and smoothed.
	26/VIII/1967	Excludes population of small agglomerations in the frontier districts, numbering 101,225 persons for both sexes.
<u>Tunisia</u>	1/II/1956	Excluding Algerian refugees temporarily in the country, estimated at about 170,000 for both sexes in 1960. Data have been adjusted for under-enumeration of females and smoothed.
	3/V/1966	Excludes adjustment for under-enumeration estimated at 4.0 per cent.
<u>Uganda</u>	18/VIII/1969	
<u>Ceylon</u>	8/VII/1963	Census results exclude adjustment for under-enumeration.
<u>India</u>	1/III/1961	Including data for the Indian-held part of Jammu and Kashmir (population 3,356,976, of which 1,896,633 males 1,664,343 females), the final status of which has not yet been determined, and an estimate (626,667 of which 302,534 males and 324,133 females) for population of Goa, Daman and Diu. Excluding part of North East Frontier Agency (population 297,853, of which 147,100 males and 150,753 females).
<u>Iran</u>	1-20/XI/1966	For settled population only; unsettled population (numbering 244,141 for both sexes) and nomadic tribes (numbering 462,146 for both sexes) were excluded.
<u>Pakistan</u>	1/II/1961	Excluding data for Jammu and Kashmir, the final status of which has not yet been determined, Junagadh, Manavadar, Gilgit and Baltistan. Excluding also data for Frontier Regions of West Pakistan (population 3,437,939 of which 1,791,755 males and 1,646,184 females), 111,369 foreigners (64,824 males, 46,545 females) and probably also a considerable number of nomads. Also excluding adjustment for under-enumeration.

Argentina

30/IX/1960

Census results exclude adjustment for  
under-enumeration.

Colombia

15/VII/1964

\_\_\_\_\_

---

Sources : United Nations. Demographic Yearbook. For Botswana and Morocco  
(1971 census) National publications.

ANNEX II

Selected references

1. United Nations. Population Bulletin No.2, October 1952. Sales No. 1952.XIII.4 pp. 59-79.
2. United Nations. Methods of Appraisal of Quality of Basic Data for Population Estimates. Sales No. 1956.XIII.2.
3. U.S. Department of Commerce. Bureau of the Census. The Methods and Materials of Demography. October 1971.
4. United Nations Economic Commission for Africa, Age data in African Censuses and surveys, E/CN.14/CPH/13, 14 May 1968.
5. Robert J. Myers, Errors and Bias in the Reporting of Ages in Census Data, Transactions of the Actuarial Society of America, Vol. XLI, 1940.
6. Ajit Das Gupta, A Technical Note on Age Grouping, Indian Statistical Institute, National Sample Survey, No. 12, 1958.
7. Roberto Bachi, The Tendency to Round off Age Returns : Measurement and Corrections, Bulletin of the International Statistical Institute, Vol. XXXIII, Part IV.
8. K.V. Ramachandran, An Index to Measure Digit Preference Error in Age Data, Proceeding of the World Population Conference, 1965, Vol. III.
9. INSEE, Afrique Noire, Madagascar, Comores : Demographie Comparée. Structures par age actuelle et future, by F. Gendreau and R. Nadot, Paris 1967.
10. Etienne van de Walle, Some Characteristics features of Census Age Distribution in Illiterate Populations, The American Journal of Sociology, Vol. LXXI, No. 5 (March 1956).
11. United Nations. Methods of Estimating Basic Demographic Measures from Incomplete Data, Sales No. 67.XIII.2/

