

EDUCATIONAL IMPLICATIONS OF POPULATION
TRENDS IN AFRICA

1. The objectives of this investigation are to ascertain the effect of population changes on primary level educational developments in Africa. ^{1/} Four variants of population projections were used for this exercise, namely "low", "medium", "high" and "constant" fertility prepared by the United Nations Population Division. These projections are available for the period 1965-1985. The enrolment data for the base year - 1965, are obtained from the UNESCO Statistical Year Book. For a very few countries enrolment figures for the year 1965 were not available in the year book. These have been estimated using past trends. The enrolment ratio in the base year for each country is obtained by dividing total primary level enrolment by the population in the age group corresponding to the official primary school system of the country. The total enrolment in different regions for the different years are obtained by adding the actual or estimated enrolment in the different countries constituting the region. In projecting the enrolment to 1985 it is assumed that the enrolment ratio will increase to 100 per cent by that year in all the countries.^{2/} However, in those countries where the 1964 enrolment ratio was 100 per cent or more it is assumed to remain constant up to 1985.

2. Three components of the overall increase in enrolment have been identified:-

- (a) The increase in enrolment because of the increase in the enrolment ratio to 100 by 1985 with constant population as in 1965 - enrolment component.
- (b) The increase in enrolment resulting from the population increase according to the four population variants with constant 1965 enrolment ratio - population component.
- (c) The increase in enrolment resulting from the growth in population and in the enrolment ratio - interaction component.

The UNESCO education simulation model can be used to establish the link between population growth and the educational expansion.

^{1/} See note on the countries included.

^{2/} The conference of African States on development of education in Africa recommend that "primary education shall be universal, compulsory and free by 1980". Outline of a plan for African educational development - conference of African States on the development of education in Africa, Addis Ababa 15-25 May 1961 - United Nations Economic Commission for Africa.

3. The link between population and the educational system constitutes the starting point of the UNESCO Educational Simulation Model. ^{1/} Since the entry into the educational system occurs only once and is, by definition, at the beginning grade of education, the order of magnitude of possible demand for entry is the population cohort of the school-entering age. The proportion of this cohort which enters the school system constitutes an important policy parameter. Thus, enrolment in the beginning grade is composed of those entering for the first time plus those repeating their grade from the previous year, plus those entering it from outside the system (migrants) and can be expressed:

$$E_y^c = e_y^c P_y^a + s_{y-1}^c r_{y-1}^c E_{y-1}^c + M_y^e$$

Where: E = enrolment
 P = population
 M = net migrants into the system (pupils)
 c = educational course
 y = year
 e = first-time, beginning grade enrolment ratio
 a = age
 s = survival rate, demographic
 r = repetition rate
 and where: c = 1 (beginning grade)

$$M \geq 0$$

if age-specific first-time, beginning grade enrolment ratios are

available and relevant, $e_y^c P_y^a$ can be replaced by $\sum_a e_y^{c,a} P_y^a$
 Educational course (c) means, in this Model, a year of study (grade) within a particular type of study.

4. Enrolment in any course other than the beginning grade is composed of those promoted to it from other courses plus those repeating it from the previous year plus migrants;

$$E_y^c = s_{y-1}^{c1} d_{y-1}^{c1,c} p_{y-1}^{c1} + \dots$$

$$+ s_{y-1}^{cn} d_{y-1}^{cn,c} p_{y-1}^{cn} E_{y-1}^{cn} + s_{y-1}^c r_{y-1}^c E_{y-1}^c + M_y^c$$

^{1/} See The UNESCO Educational Simulation Model (ESU), UNESCO, com/WS/149, May 1970; An Asian Model of Educational Development: Perspectives for 1965-80, ED. 66/D.33/A, UNESCO 1966 and Modelo Español de Desarrollo Educativo, Ministerio de Education y Ciencia, Madrid, 1970.

where: c^1 = a course other than c
 d = distribution proportion of enrolment
 n = identification of a course
 p = promotion rate

and where: $c = 2, 3 \dots n$. The notation relevant to the distribution proportion of enrolment ($d^{c^1, c}$, etc.) identifies that a proportion of pupils proceed from one course (c^1) to another course (c). Obviously, if from the course (c^1) pupils can proceed to only one other course (c), then $d^{c^1, c} = 1$. If, on the other hand pupils from a course (c^1) can proceed to several different courses, then different distribution proportions are applied to pupils from course (c^1) and their sum is equal to 1, thus $d^{c^1, c} = 1$.

5. Total primary school enrolment in a given year is the summation, over the number of years of duration of the school course, of the flows of those entering at different times and still found in the system in the given year. Obviously those found in the system are the result of the factors affecting the flows; entry, promotion, repetition and dropout. The direct relationship with population occurs at the time of entry only and once entered survival is due to educational parameters (the demographic survival through the primary cycle, of course, can also affect enrolment but at these ages the mortality is very low).

6. Strictly speaking, therefore, the population growth parameter should be used only with first grade enrolment, eliminating repeaters. A common education-population measure, however, is the enrolment ratio of the entire cycle, i.e., the primary school enrolment ratio. It represents the ratio of primary enrolment to the primary school age group. For descriptive and comparative purposes it has been quite useful but, of course, it hides many of the phenomena affecting the flow of school cohorts.

7. Especially concerning educational targets this overall descriptive statistics, in the interest of simplicity, has been often misused. The overall level enrolment ratio is a result rather than a norm, it is the result of the factors enumerated above. Still a common and practically universal quantitative objective for primary education is a 100 per cent enrolment ratio. It is virtually impossible to attain if the numerator and denominator of the ratio were strictly related for it would imply that every child not only entered primary school but remained throughout the course. In practise, of course, there are always some children who will not enter school for physical or mental

reasons and, some dropout during the cycle is bound to occur. At the same time, however, there is usually repetition as well so that the numerator will almost invariably include some children who are outside the normal age-range of the cycle. As a matter of fact the simple primary enrolment ratio, in countries with universal primary education is often well above 100 per cent for these reasons.

8. In countries where universal primary education has not been achieved the use of a ratio of 100 per cent (total primary enrolment of the normal primary school age group) as an objective is indicative of a desire for universal schooling at that level. In applying the 100 per cent to the age-group to determine the enrolment target an order of magnitude of enrolment needs can be ascertained. It is but an order of magnitude however but its use in macro-planning is evident. What such an enrolment really implies is that either there is no dropout or repetition during the course, or that drop-out equals repetition, thus cancelling out their effect upon overall enrolment. Thus, wastage is ignored in calculating the target enrolment in terms of a simple overall enrolment ratio.

9. The purpose of this paper is to demonstrate the relative importance of population growth (primary school age population) and primary enrolment ratio increases. A very simplified method is used to demonstrate the magnitudes and the relative contribution of population growth and enrolment ratio increases to enrolment increases necessary to achieve universal primary enrolment by a given date.

10. On a regional basis, the results are shown in Tables 1 and 2. The figures indicate that in East Africa the increase resulting from growth in enrolment ratio at the first level to 100 per cent by 1985, with 1965 constant population will result in a more than

Table 1

Actual or estimated enrolments in 1965 and 1985 by alternative population estimates (thousands)

Regions	1965	Enrolment 1985				
		No change	Low	Medium	High	Constant
East Africa	5,811	13,652	23,694	24,644	25,833	24,644
West Africa	5,790	13,818	24,428	25,720	27,156	25,694
Middle Africa	3,594	4,692	7,633	8,242	8,686	8,186
North Africa	7,275	11,453	21,434	22,754	23,784	22,907
South Africa	3,117	3,462	6,046	6,071	6,277	5,994
Africa	25,588	47,078	83,236	87,431	91,736	87,425

Table 2
Contribution to total percentage increase in enrolments 1965-1985 of

Regions	Population growth only fertility			Increase in enrolment ratio only			Interaction of population growth and increase in enrolment ratio only			Total enrolment increase in 1965-1985			
	Low	Medium	High Constant	Low	Medium	High Constant	Low	Medium	High Constant	Low	Medium	High Constant	
East Africa	80.1	86.5	95.3	86.9	134.9	92.7	102.7	114.3	102.3	307.7	324.1	322.5	324.1
West Africa	75.4	83.9	94.4	83.7	138.6	107.8	121.6	135.9	121.4	321.8	344.1	368.9	343.7
Middle Africa	63.3	74.3	83.6	73.1	30.5	18.6	24.5	27.6	24.1	112.4	129.3	141.7	127.7
North Africa	84.1	96.4	105.3	98.0	57.4	53.1	59.0	64.2	59.5	194.6	212.8	226.9	214.9
Southern Africa	71.9	75.2	81.1	73.0	11.1	11.0	8.5	9.2	8.2	94.0	94.8	101.4	92.3
Africa	76.8	85.6	94.5	85.7	84.0	64.5	72.1	80.0	72.0	225.3	241.7	258.5	241.7

doubling of the total enrolment. On a regional basis, roughly the same conditions exist in West Africa. The trends indicate that there will be a somewhat lower growth in total enrolment in the regions of Southern, North and Middle Africa. The differences are primarily attributable to the differences in the first level enrolment ratios obtaining in the countries in the different regions in 1965.

11. The impact of population growth on enrolment is shown in Table 2, as two components, first its impact on increase in enrolment due to population increase alone with constant 1965 enrolment ratio under the four population variants and second the interaction component resulting from the simultaneous increase in population and enrolment ratio, the latter reaching 100 per cent by 1985. The figures clearly indicate that in East Africa and West Africa the population component will be manifested in a near doubling in the total enrolment by 1985. Obviously there are some minor differences among the regions in the estimates of the population growth. In areas of Middle, Southern and Northern Africa the situation is somewhat different due to the lower population growth estimates. However, even in these regions the figures indicate that the educational facilities by 1985 will be seriously over-taxed by population growth even to maintain the 1965 enrolment ratio.

12. Similar differences exist in regard to the interactions between population growth and enrolment ratios between the regions of East and West Africa and the other three regions. For the former the data indicate that the interaction alone will produce a doubling of total enrolment in these three regions. By contrast, in regions of Middle, North and Southern Africa the situation will be also serious, but potentially not as deleterious as in the other two regions. In North Africa the increase due to interaction will result in about 60 per cent increase, whilst in Middle and Southern Africa the rate will be about 25 per cent and 9 per cent, respectively, in enrolment as compared with the existing 1965 position.

13. This analysis indicates that there is a conspicuous relationship between population growth and enrolment increase. In matter of fact, the underlying reason for the effect on enrolment increase of the population component and the interaction component, is the population growth. This is shown in Table 3 for the medium estimates of population.

Table 3

Contributions to total percentage increase in enrolments 1965-85

	Per cent increase in enrolment due to:	
	Enrolment ratio increase	population growth
East Africa	134.9	189.2
West Africa	138.6	205.5
Middle Africa	30.5	98.8
North Africa	57.4	155.4
Southern Africa	11.1	83.7
Africa	84.0	157.7

14. Another way of demonstrating the impact of population growth on enrolment is through a graphical presentation as depicted in Graph I (A - F). Six graphs are shown here, one for each region and another one for Africa. Each graph consists of three curves. Curve 'A' shows the increase in enrolment from 1965-1985 due to the increase in enrolment ratio to 100 per cent by 1985 with constant 1965 population; curve 'B' gives the increase in enrolment due to accumulative effect of enrolment ratio increase alone and population growth with constant enrolment ratio; and curve 'C' gives the overall increase in enrolment due to all factors. The areas between curves 'A' and 'C' give the effect of population growth on enrolment expansion.

15. The individual countries in the different regions show some internal variations from the corresponding regional position, according to the present stage of educational development of the country and the rate of population growth. The data for individual countries are presented in Tables 4 and 5.

16. It is obvious that if the estimated population growth continues, irrespective of the population alternative which manifests itself, educational facilities will be seriously strained by 1985, which, in turn, may result in blocked educational opportunities to a substantial segment of children.

17. Since population growth will be a major factor in educational development in Africa, it would be profitable to undertake further detailed studies along these lines, taking into account educational alternatives. In this endeavour the educational simulation model discussed in the paper will prove advantageous.

Table 4

Actual or estimated enrolments in 1965 and 1985 by alternative population estimates (thousands)

Countries	1965	1985				
		No change	Low	Medium	High	Constant
<u>East Africa</u>	5,811	13,652	23,694	24,644	25,833	24,644
Ethiopia	379	3,304	5,212	5,484	5,749	5,484
Tanzania	710	2,102	3,527	3,734	3,936	3,734
Kenya	1,011	1,829	3,536	3,580	3,741	3,580
Uganda	527	1,187	2,155	2,153	2,252	2,153
Madagascar	672	983	1,739	1,849	1,956	1,849
Mozambique	423	852	1,404	1,477	1,550	1,426
Southern Rhodesia	628	628	1,348	1,346	1,387	1,346
Malawi	331	864	1,438	1,517	1,590	1,517
Zambia	407	758	1,405	1,461	1,527	1,461
Rwanda	330	492	912	957	1,000	957
Burundi	147	287	475	500	525	500
Somalia	29	150	230	243	256	243
Mauritius	135	135	172	185	205	220
Reunion	83	83	140	159	159	174
<u>West Africa</u>	5,790	13,818	24,428	25,720	27,156	25,694
Upper Volta	90	37	579	623	665	623
Togo	156	265	452	483	513	483
Dahomey	131	379	655	699	743	699
Sierra Leone	126	437	706	742	780	742
Niger	62	268	493	523	552	523
Guinea	164	522	844	899	951	899
Senegal	219	521	899	955	1,011	955
Ivory Coast	354	585	985	1,047	1,108	1,047
Mali	162	586	959	1,025	1,088	1,025
Ghana	1,294	1,703	3,198	3,247	3,462	3,244
Nigeria	2,912	8,165	14,114	14,901	15,681	14,901
Portuguese Guinea	17	69	97	104	110	98
Mauritania	20	81	133	141	149	135
Gambia	13	49	76	81	84	81
Liberia	73	151	238	250	260	139
<u>Middle Africa</u>	3,594	4,692	7,633	8,242	8,686	8,186
Cameroon	714	799	1,309	1,394	1,477	1,394
Angola	219	538	843	899	952	899
Congo dem. Rep.	2,067	2,388	3,975	4,177	4,379	4,179
Equatorial Guinea	37	43	64	67	70	65
Chad	164	441	689	898	953	898
Central Afr. Rep.	128	217	354	379	402	352
Gabon	79	79	94	102	107	94
Congo People's Rep.	187	187	305	326	346	305

Table 4 (Cont'd)

Countries	1965	1 9 8 5				
		No change	Low	Medium	High	Constant
<u>North Africa</u>	7,275	11,453	21,434	22,754	23,784	22,907
United Arab Rep.	3,450	4,632	7,946	8,617	9,021	8,737
Morocco	1,116	1,795	3,517	3,788	4,045	3,829
Sudan	427	1,473	2,890	2,997	3,164	2,990
Algeria	1,358	2,565	5,228	5,372	5,504	5,377
Tunisia	734	734	1,345	1,457	1,514	1,457
Libya	190	254	508	523	536	523
<u>Southern Africa</u>	3,117	3,462	6,046	6,071	6,277	5,995
Lesotho *	166	166	258	267	279	260
South Africa *	2,750	3,034	5,266	5,350	5,523	5,281
Namibia *	85	92	146	154	161	154
Swaziland	50	72	130	136	142	136
Botswana	66	98	157	164	172	164
Africa	25,588	47,078	83,236	87,431	91,736	87,425

* 1965 enrolment estimated.

Table 5

Contribution to total percentage increase in enrolments, 1965-1985 of

Countries	Population growth only fertility				Increase in enrolment ratio only	Interaction of population growth and increase in enrolment ratio only			
	Low	Medium	High	Constant		Low	Medium	High	Constant
<u>East Africa</u>	80.1	86.5	95.3	86.9	134.9	92.7	102.7	114.3	102.3
Ethiopia	49.8	57.6	65.2	57.6	728.6	428.6	489.1	548.0	409.1
Tanzania	67.7	77.6	87.2	77.6	195.9	133.0	152.3	171.1	152.3
Kenya	93.4	95.8	104.6	95.8	80.9	75.5	77.4	84.6	77.4
Uganda	84.1	83.9	92.4	83.9	125.3	99.6	99.5	109.8	99.5
Madagascar	77.3	88.2	99.1	88.2	46.3	35.4	40.6	45.6	40.6
Mozambique	64.8	73.4	81.9	67.4	101.5	65.7	74.4	83.2	68.4
Southern Rhodesia	114.7	114.4	120.9	114.4	0.0	0.0	0.0	0.0	0.0
Malawi	66.4	75.6	84.0	75.6	160.8	106.9	121.5	135.2	121.5
Zambia	85.4	92.8	101.5	92.8	86.2	73.6	80.0	87.5	80.0
Rwanda	85.4	94.5	103.3	94.5	49.0	41.9	46.4	50.7	46.4
Burundi	65.5	74.1	83.0	74.1	95.0	62.8	70.9	79.3	70.9
Somalia	52.8	61.5	70.1	61.5	419.2	224.1	260.4	296.8	260.4
Mauritius	28.1	37.2	52.4	63.8	0.0	0.0	0.0	0.0	0.0
Reunion	68.6	90.8	90.8	109.3	0.0	0.0	0.0	0.0	0.0
<u>West Africa</u>	75.4	83.9	94.4	83.7	138.6	107.8	121.6	135.9	121.4
Upper Volta	54.0	65.7	76.7	65.7	314.5	173.2	210.3	245.3	210.3
Togo	71.1	82.9	94.3	82.9	70.0	49.0	47.1	65.0	47.1
Dahomey	75.3	87.1	98.9	87.1	189.8	135.8	157.6	179.5	157.6
Sierra Leone	62.5	70.8	79.6	70.8	246.9	151.1	171.4	192.7	171.4
Niger	90.8	102.6	113.7	102.6	332.6	271.6	309.1	344.0	309.1
Guinea	59.4	69.8	79.6	69.8	218.1	136.8	159.9	181.8	159.9
Senegal	72.6	83.3	94.1	83.3	138.1	100.2	115.1	129.9	115.1
Ivory Coast	67.1	77.6	87.9	77.6	65.4	45.9	53.0	59.9	53.0
Mali	66.2	77.6	88.5	77.6	262.6	164.6	194.1	222.1	194.1
Ghana	87.9	90.7	103.4	90.7	31.6	27.7	28.7	32.6	28.4
Nigeria	74.5	84.2	93.9	84.2	180.4	129.8	147.2	164.2	147.2
Portuguese Guinea	41.3	51.4	60.2	42.7	301.9	121.8	152.5	278.6	126.2
Mauritania	59.4	69.0	78.0	61.9	302.1	202.8	233.2	261.7	210.3
Gambia	56.5	66.8	73.0	66.8	288.2	157.3	186.6	204.2	186.6
Liberia	57.3	65.2	71.9	58.0	107.9	62.5	71.2	78.2	63.2

Table 5 (Continued)

Countries	Population growth only fertility				Increase in enrolment ratio only	Interaction of population growth and increase in enrolment ratio only			
	Low	Medium	High	Constant		Low	Medium	High	Constant
<u>Middle Africa</u>	63.3	74.3	83.6	73.1	30.5	18.6	24.5	27.6	24.1
Cameroon	63.8	74.4	84.8	74.4	12.0	7.6	9.0	10.2	9.0
Angola	56.6	67.0	76.8	67.0	146.1	82.9	98.1	112.6	98.1
Congo Democratic Rep.	66.4	74.8	83.0	74.9	15.5	10.4	11.7	13.3	11.8
Equatorial Guinea	49.0	56.0	63.0	51.3	15.1	7.1	8.1	9.2	7.5
Chad	55.5	102.6	115.1	102.6	169.0	95.7	176.1	197.1	176.1
Central Afr. Rep.	62.6	74.1	84.7	61.7	69.0	44.0	52.0	59.3	43.4
Gabon	18.5	28.8	35.7	18.5	0.0	0.0	0.0	0.0	0.0
Congo People's Rep.	83.0	95.2	107.5	83.0	0.0	0.0	0.0	0.0	0.0
<u>North Africa</u>	84.1	96.4	105.3	98.0	57.4	53.1	59.0	64.2	59.5
United Arab Rep.	70.4	84.8	93.5	87.3	34.2	25.7	30.7	33.7	31.5
Morocco	95.4	110.5	124.8	112.8	60.9	58.9	68.1	76.8	69.5
Sudan	96.2	103.5	114.8	103.0	244.8	235.5	253.3	281.1	252.2
Algeria	104.1	109.7	114.9	109.7	88.9	92.1	97.4	101.6	97.4
Tunisia	83.3	98.4	106.2	98.4	0.0	0.0	0.0	0.0	0.0
Libya	100.8	106.7	111.8	106.7	33.8	33.1	35.1	36.8	35.1
<u>Southern Africa</u>	71.9	75.2	81.1	73.0	11.1	11.0	8.5	9.2	8.2
Lesotho	55.1	60.7	68.2	56.4	0.0	0.0	0.0	0.0	0.0
South Africa	73.5	76.3	82.0	74.0	10.3	7.7	7.9	8.5	7.7
Namibia	58.7	67.4	75.0	67.4	8.2	4.9	5.6	6.2	5.6
Swaziland	81.2	89.5	97.9	89.5	45.4	36.0	39.8	43.5	39.8
Botswana	59.2	66.3	74.4	66.3	48.3	30.2	33.6	37.7	33.6