Does HIV/AIDS retard the pace of Age Structural Transition in Sub-Saharan Africa : The case of Botswana

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1. Introduction

At the time of independence in 1966, the population of Botswana stood around half million. It has grown to 1,680,863 in 2001 compared to 1,326,796 in 1991 (CSO, 2001). This implies an average annual population growth rate of 2.4 percent during 1991-2001. During 1981-1991 and 1971-1981, the growth rates were 3.5 and 4.5 respectively. In Sub-Saharan Africa, Botswana is well known on two counts; first as a fast growing economy due to the discovery of a vast reserve of diamonds in 1967 and second, as a country with the highest prevalence of HIV/AIDS. The national HIV prevalence rate is estimated at 17.1 percent in 2004 (CSO, 2005). In spite of the high death rates in the country, interestingly, there has been a notable decline in the total fertility rate (TFR) from 6.6 in 1981 to 3.3 in 2001. As we know, the fertility and mortality transitions in particular bring in, inevitably, the age structural transition – a process and consequence of shifting age structure from a young-aged population to old-aged population. This phenomenon, pioneered by the western industrialized nations since the dawn of the twentieth century, has been witnessed in developing countries as well including Sub-Saharan Africa since the last quarter of the last century. However, Sub-Saharan Africa is characterized by declining fertility and a stable or increasing mortality due to the high prevalence of HIV/AIDS and tuberculosis. Under these peculiar circumstances, the process of age structural transition in Sub-Saharan region is deemed to exhibit a strange pattern with no similarity with the West where development had a direct and positive bearing.

In this backdrop, an attempt is made in this paper to portray the age structural transition in Botswana since 1971 and examine the possible role of HIV/AIDS on it.

2. The demographic trends

Botswana's population in 1971 was 574 094, slightly above half a million.

The Crude Birth Rate was estimated at about 45.3 births per thousand and the total fertility rate was around 7. Comparatively, this was the typical figure for the continent, where the level of fertility is thought to be higher than anywhere else.

Table 1: Demographic Indicators of Botswana

Population Characteristic	**1971**	**1981**	**1991**	**2001**
Enumerated Population	574,094	941,027	1,326,796	1,680,863
Sex Ratio	84	89	92	94
Crude Birth Rate	45.3	47.7	39.3	28.9
Crude Death Rate	13.7	13.9	11.5	12.4
Natural Rate of Increase (%)	3.1	3.4	2.7	1.7
Mean age at Child Bearing	30.5	30.6	30.0	30.3
Total Fertility Rate	6.5	6.6	4.2	3.3
Infant Mortality Rate	97.0	71.0	48.0	56.0
Child Mortality Rate	56	35	16	19
Under 5 Mortality	152	105	63	74
Life expectancy at Birth	55.5	56.5	65.3	55.6
Males	52.5	52.3	63.3	52.0
Females	58.6	59.7	67.1	57.4

Source: Analytical Report 2001, CSO

The overall Sex Ratio of Botswana then stood at 84 males per 100 females. This deficit of males was largely attributable to the absence of male migrant workers in

South Africa and elsewhere. The crude death rate was 13.7, the infant mortality rate 97 and life expectancy 55.5 years.

The 1981 population was typified by a high growth that was due to the prevailing high fertility rate by then and declining mortality and emigration rates. The Natural Rate of Increase was recorded as 3.4 percent per annum, slightly higher than the 1971 estimate of 3.1 percent. Infant Mortality Rate was estimated at 71 per 1000 live births, a significant decrease from the 97 recorded in 1971. Child mortality decreased from 56 deaths to 35 whilst under-five mortality had fallen from 152 to 105. Life expectancy at birth was estimated at 52.3 years for males and 59.7 years for females. It was only the Crude Death Rate and Life Expectancies at birth that showed some small increases from 1971.

The estimated Crude Birth Rate in 1971 was 47.7 births per thousand, compared with 48.7 in 1981. Figure 2 gives the trends of Crude Death Rate and Crude Birth Rate since 1971. The figure shows an interesting pattern of births during the period 1971 and 1981. The Crude Birth Rate then came down from above forty to less than 30 in 2001. On the other hand, mortality peaks a bit before going down in 1991, and then rises again in 2001.

In 1991, all the mortality indicators have gone down and the Life expectancy has significantly increased from around 56 years to 65 years. The level of fertility was also going down, with a Total Fertility Rate of 4.2 children per woman, down from 6.6 children in 1981. During that period, the country was experiencing impressive gains in the economic front. There was an improvement in the health conditions, which led to declining death rates. A comprehensive family planning program also contributed to low family sizes and subsequently low fertility.

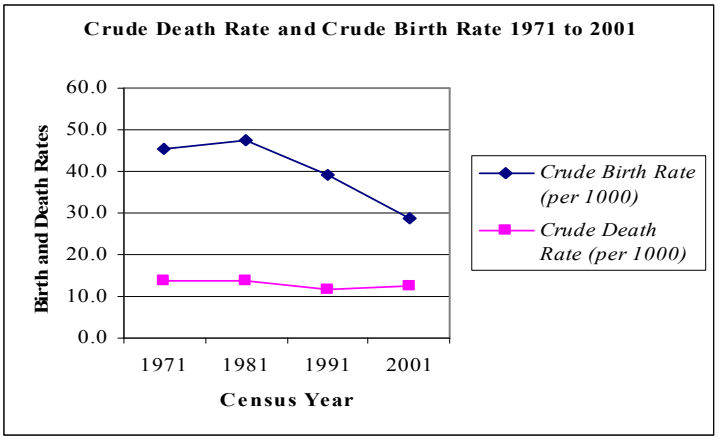
In 2001, Infant mortality had risen to 56 and the Total Fertility Rate has fallen from 4.2 in 1991 to 3.3 . Child mortality increased from 16 deaths per 1000 to 19, Under-five mortality rose from 63 per thousand to 74, Life expectancy at birth

declined from 65.3 years to 55.6 years. Crude Death Rate rose from 11.5 to 12.4. Another noteworthy aspect of the 2001 population is the high levels of age specific mortality in the middle ages. Starting from age group 20-24, the level of mortality picked so viciously when compared to the level of mortality for the same age groups ten years ago. Figure 3 shows high levels of ASDR from age 24 to age 49.

Table 2 : Fertility and Mortality Indicators for Botswana; 1971-2001.

Indicator	1971	1981	Decadal Change (%) (1971-81)	1991	Decadal Change (%) (!981-91)	2001	Decadal Change(%) (1991-01)
TFR	6.5	6.6	+1.54	4.2	- 36.36	3.3	-21.43
CBR	45.3	47.7	+5.30	39.3	- 17.61	28.9	-26.46
CDR	13.7	13.9	+1.46	11.5	-17.27	12.4	+ 7.83
Life Exp.	55.5	56.5	+1.80	65.3	+ 15.86	55.6	-14.85
IMR	97.1	N.A	--	48.0	--	56.0	+16.67

Figure 1: CDR and CBR - 1971 to 2001



3. HIV Prevalence

Table 4 provides the latest HIV prevalence rates by age according to the Botswana AIDS Impact Survey II – a nationally representative survey conducted in 2004 (CSO, 2005). The overall prevalence rate measured 17.1 percent. For the very young, ages 18 months to 4 years old, 6.3 percent were HIV positive. For those between the ages of 30 and 34, 40.2 percent were HIV positive. In general, the highest prevalence rates are for those between 25 to 44 years old; roughly between 30 and 40 percent. Among the young aged 19 and under and among the old, aged 65 and above, prevalence rates are typically below 10 percent. The exception is the 70-74 year old cohort where the prevalence rate was 13.1 percent.

The overall prevalence rate for males is 13.9 percent and for females 19.8 percent. Hence, prevalence for males is less than the national average. The prevalence rates are highest for men between the ages of 30 and 49, while for females, the prevalence rates are high between the ages 25-39. The cohort with the highest prevalence rate among males is the 30-34 years old group for which the prevalence rate is 36.2 percent. Prevalence rates in urban areas exceeded those for rural areas. Females 25-29 years have a prevalence rate of 41 percent and for females 30-34 years; the prevalence rate is 43.7 percent. After the age of 34, rates begin to slowly decline, although the cohort of females 50-54 years old still reports a prevalence rate of 19.3 percent.

Table 4. HIV Prevalence by Age group, Botswana, 2004.

Age	Rate	Age	Rate
1.5- 4	6.3	45-49	29.4
5-9	6.0	50-54	20.9
10-14	3.9	55-59	14.0
15-19	6.6	60-64	12.0
20-24	19.0	65-69	9.0
25-29	33.0	70-74	13.1

30-34	40.2	75-79	3.9
35-39	35.9	80-84	6.0
40-44	30.3	85-89	2.2
Total			**17.1**

3. Age Structural Transition

As observed in Table 3, we see a systematic decline in the proportion of 0-14 years, the young dependents over the years. The pace of decline was marginal, only less than 1 percent, during 1971-1981. During that period, changes in fertility and mortality was also not significant. However, the proportional decline was substantial during the next two decades, 8.7 percent and 15 percent respectively. As seen in Table 3, fertility declined considerably since then despite an increased mortality level especially during the last decade, 1991-2001 mainly due to the increase in infant and child mortality. The gains in the chances of survival of infants experienced in the Nineties have apparently been lost due to HIV/AIDS. The probability that a child will die between exact age one and exact age five stood at 0.024 in 1987, declined to a low level of 0.018 in 1992 and increased to a high level of 0.029 in 2001. The trend shows that the probability is increasing (R.J. Majelantle, 2003). This is attributed to mother to child transmission of HIV/AIDS. Also, the gains in life expectancy did not sustain mostly due to the rapid increase in the HIV/AIDS epidemic. Life expectancy has declined to 55.6 years in 2001 (CSO, 2001). If we eliminated this hike in death rates due to HIV/AIDS, the proportional change in mortality during 1991-2001 would have been less.

There was no appreciable increase in the proportion of 0-14 during the 10- year period of 1971-1981 due to a stagnant high fertility. The same trend was observed in the young and adult age groups as well. Since 1991, there has been dramatic changes in the proportions of 0-14 and 15-64 age groups. The proportion of 0-14 age group now stands at 37 percent while that of the economically age group 15-64 at 58 percent.

In 1981, the age composition also revealed a very young population, with 47.3 percent aged less than 15 years and only 47.6 percent within the working age group (15-64), 5.1 percent were aged 65+. The mean age of the population in 1981 was 22.7 years (22.0 years for males and 23.4 for females). This was a slight decline of 0.7 years from the 1971 estimate.

The 2001 age structure portrays a very different picture from the rest of the previous censuses. It has a narrowing base, of the age group 0-4 and its proportion stood at 11.7 percent, quite a pronounced decline from the 1981 and 1991 proportions of 18.5 percent and 14.6 percent respectively. There could be several factors that can be associated with this fall of the proportion of the young age group. Infant mortality had risen from 48.0 in 1991 to 56 in 2001, as well as a declining Total Fertility Rate that has fallen from an average of 4.2 in 1991 to 3.3 in 2001. The age group that has experienced a significant growth is the broad age group of 15-49 years. It has experienced a growth of about 6.5 percentage points (from 45.5 percent in 1991 to 52 percent in 2001). The median age has increased to 17.4 in 1991 and 20.1 in 2001.

It is encouraging to note that during 1971- 2001, the proportion 15-64 years has increased substantially, from 48 to 58 percent. This, in a way, implies that HIV/ AIDS does not impact significantly the proportion of labour force. The levels of mortality between males and females are almost identical with males experiencing slightly higher mortality before 15 years . Between 15 and 30 years , females experienced higher mortality which may be explained by higher maternal mortality associated with HIV/AIDS. From age 30 onwards, men experience relatively higher mortality than women. These gender differences at ages above 30 can be explained by unusually high incidence of tuberculosis among men and high rates of road accidents. The high incidence of tuberculosis among men in Botswana or in Sub-Saharan Africa is not a new phenomenon.; the HIV/AIDS epidemic has made the situation worse.

Most of the recent loss in life expectancy was experienced from birth to age 40. This can be explained by relatively high infant mortality and adult mortality in child bearing ages. From ages 45 and above, older people are expected to live longer in 2001 compared to 1991 because they are not affected by the increase in adult mortality as a result of HIV/AIDS.

The reduction in the proportion of 0-14 years and gain in the economically active age group bring in the so-called "demographic bonus" or "window of opportunity". During the period of window of opportunity, social sector expenditures are reduced due to lesser demand for health care services by the very young and old aged population as well as reduced demand for educational services due to declines in the growth of school aged population. Therefore, the demographic bonus is likely to contribute partly to the growth of the national economy if favourable and adequate policies are pursued.

The clear impact of HIV/ AIDS prevalence is seen in the transition of age 65+ years. In Table 3, we find that the proportion has increased slightly during 1971-1981 , the pre- HIV/AIDS period. Afterwards, it has stagnated emphatically. This implies a lowered magnitude of cohort flows from the adult age groups to older age groups due, most likely, to the HIV/AIDS related deaths in the economically active age group. If one considers the positive socio-economic changes Botswana has registered during the last 20 years, one would obviously expect a higher proportion of 65+ in the country. But, it has not happened. To that extent, HIV/AIDS has retarded the pace of aging at the upper end of the age structure. Nonetheless, it is encouraging to note that HIV/ AIDS does not impact the proportion of labour force significantly

However, the median age has increased, although slightly, mainly due to the proportional reduction in 0-14 years invoked by the HIV related increase in child mortality. It may be recalled that an increase in infant and child mortality has the same effect of a decreased level of fertility. In Botswana, as seen earlier, fertility

has declined considerably since 1981 concomitantly with an increase in mortality. It may look strange and its replication in other countries in the region is, perhaps, doubtful. So, it may be concluded that HIV/AIDS prevalence has not impacted the median age, an indicator of population aging.

Table 3. Age Structure of Botswana, 1971,1981,1991 and 2001.

Age	**1971**	**1981**	**1991**	**2001**
0-4	19.8	18.5	14.6	11.7
5-9	15.2	16.0	14.8	12.4
10-14	12.6	12.8	13.8	12.5
0-14	**47.6**	**47.3**	**43.2**	**36.7**
15-19	9.8	9.9	11.5	12.2
20-24	7.0	8.4	8.8	10.2
25-29	5.9	6.7	7.5	8.8
30-34	5.2	5.0	6.1	6.8
35-39	4.6	4.0	5.0	5.7
40-44	4.1	3.6	3.6	4.6
45-49	3.6	3.1	2.9	3.8
50-54	3.1	2.6	2.5	2.7
55-59	2.6	2.4	2.1	2.0
60-64	2.1	1.8	1.7	1.7
15-64	**48.1**	**47.6**	**51.8**	**58.4**
65-69	1.6	1.6	1.5	1.5
70-74	1.2	1.3	1.1	1.3
75+	1.5	2.2	2.3	2.2
65+	**4.3**	**5.1**	**4.9**	**5.0**
Total	**100.0**	**100.0**	**100.0**	**100.0**
Median Age	**15.75**	**15.86**	**17.44**	**20.09**

Figure 2. The 1981 Population Pyramid

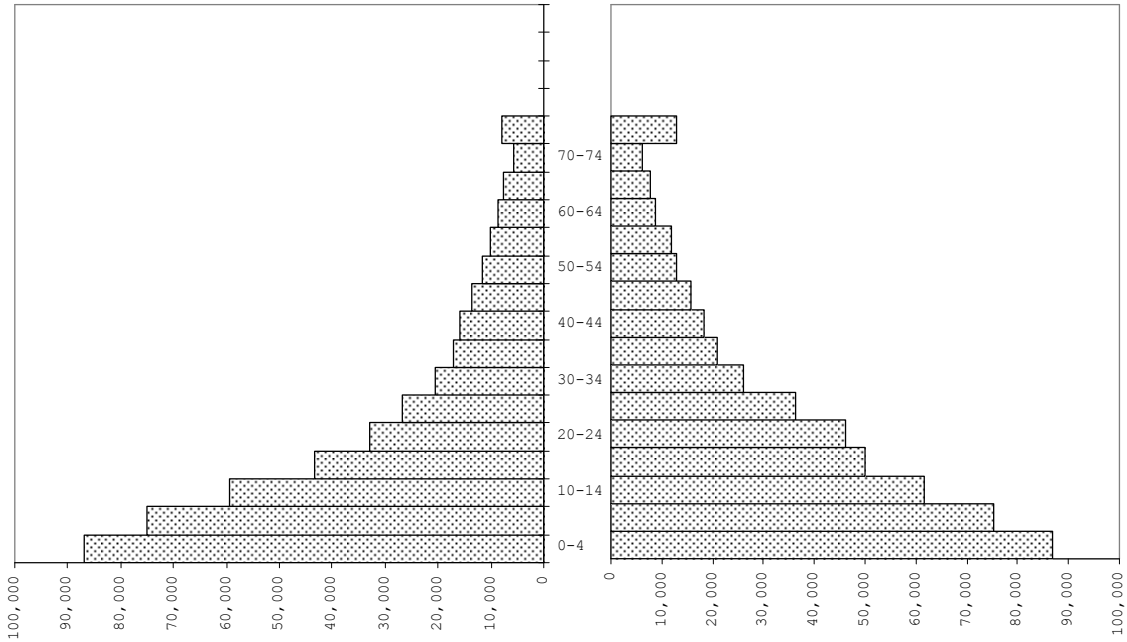
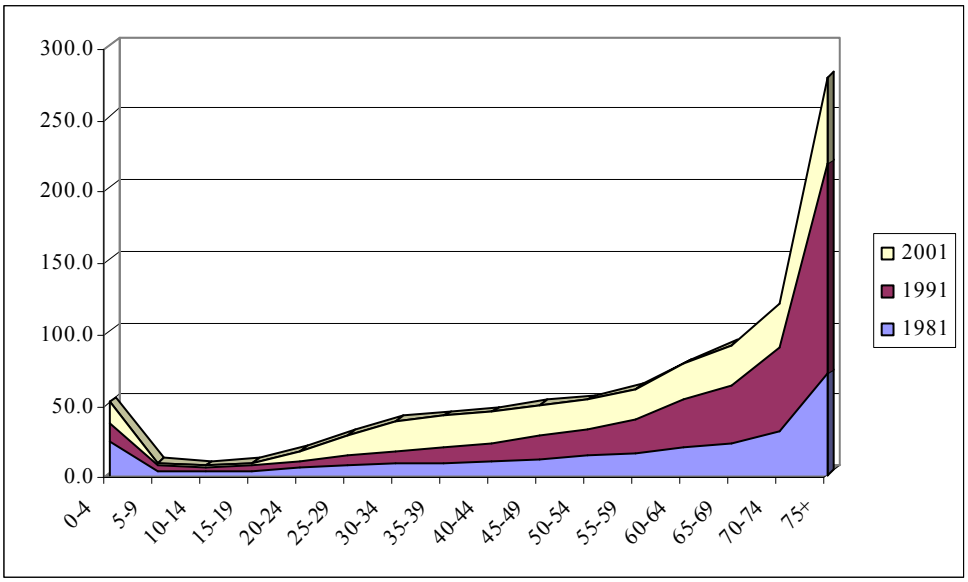
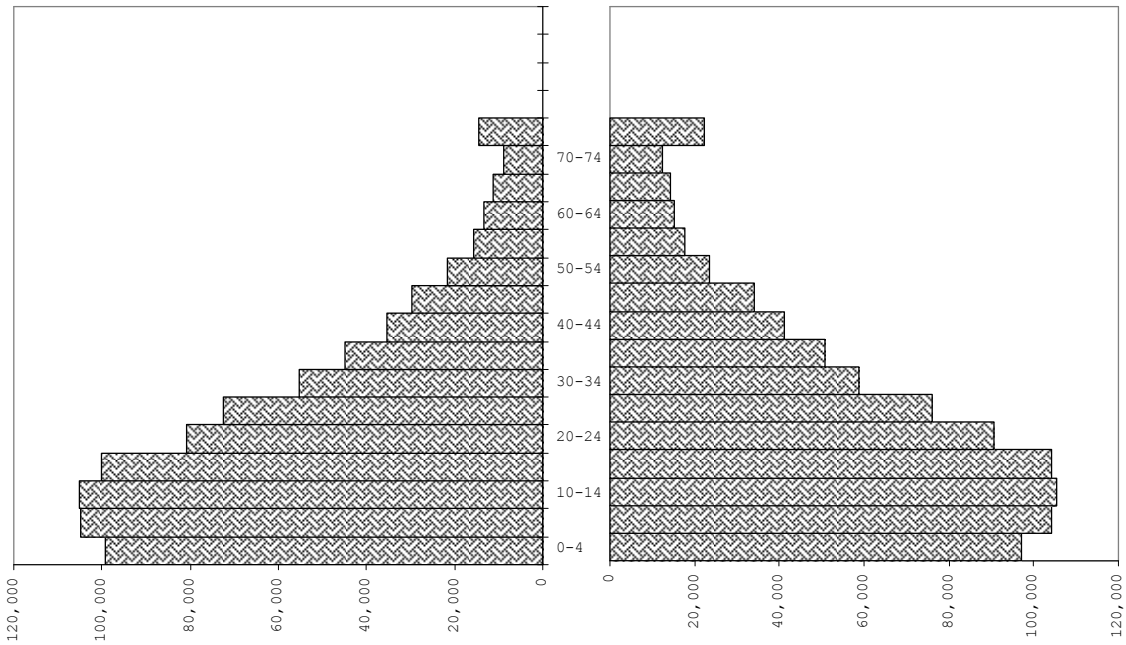


Figure 3. Age Specific Deaths Rates – 1981, 1991and 2001 Censuses



Source: 2001 Census, CSO

Figure 4. The 2001 Population Pyramid.



5. Summary and Conclusions

An attempt is made in this paper to examine the possible role of HIV/AIDS on the age structure of Botswana despite the demographic and socio-economic achievements in the country. The population of Botswana as on 2001 was 1,680,683, compared to 1,326,796 in 1991 (CSO, 2001). This implies an average annual population growth rate of 2.4 percent during 1991-2001. During 1981-1991 and 1971-1981, the growth rates were 3.5 and 4.5 respectively. Although there has been a notable decline in the total fertility rate (TFR) from 6.6 in 1981 to 3.3 in 2001, there is evidence of increasing mortality rates in the recent times. Botswana ranks among the hardest hit with an HIV prevalence of 17.1 percent. The population of Botswana has a young age structure with 37 percent of the total population below 15 years while the 65+ population is only 5 percent .

The median age has increased form 15.7 years to 20.1 years during 1971 and 2001. The proportion of 0-14 age group now stands at 37 percent while that of the economically active age group at 58 percent which is likely to increase to 59.6 percent in 2011 and 62.1 percent in 2021.

During 1991-2001, fertility declined considerably although mortality level has picked up substantially during the same period mainly due to the HIV related increase in infant and child mortality. The gains in the chances of survival of infants experienced in the Nineties have apparently been lost mainly due to HIV/AIDS. This is attributed to mother to child transmission of HIV/AIDS. Unfortunately, the gains in life expectancy did not sustain mostly due to the rapid increase in the HIV/AIDS epidemic. Life expectancy has declined to 55.6 years in 2001. If we eliminated this hike in death rates, the proportional change during 1991-2001 would have been less.

It is encouraging to note that HIV/ AIDS does not impact the proportion of labour force significantly. From ages 45 and above, older people are expected to live longer in 2001 compared to 1991 because they are not affected by the increase in adult mortality as a result of HIV/AIDS. The major impact of HIV/ AIDS prevalence is seen in the transition of age 65+ years. HIV/AIDS has retarded the pace of aging at the upper end of the age structure. However, the median age has increased slightly. So, it may be concluded that HIV/AIDS prevalence has not impacted the median age, an indicator of population aging.

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