



Economic Commission for Africa

Booklet on Population, Environment, Development and Agriculture (PEDA) Model

PEDA ADVOCACY BOOKLET:
*Projections on Aging for
Botswana*



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**BOOKLET ON POPULATION,
ENVIRONMENT, DEVELOPMENT
AN AGRICULTURE (PEDA)
MODEL**

**PEDA ADVOCACY BOOKLET: Projections on
Ageing for Botswana**

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INTRODUCTION

According to the World Population Prospects, the median age for the world population has been increasing (United Nations, 2001). It has increased from 23.6 years in 1950 to 26.5 years in 2000, and is expected to reach 36.2 years by 2050. This indicates that the population is shifting from younger ages to older ages. This process is known as “population ageing”

The ageing process is more advanced in developed countries where demographic transition occurred earlier, resulting in lower fertility and mortality rates in Europe and North America, than in developing countries in Latin America, Asia and Africa, where the transition took place in recent decades or has just started. Table 1 below clearly portrays this difference between developed and developing countries.

Table 1: Median Age by Major Area and Major Development Group, 1950, 2000 and 2050

Area/ Region	Median Age (years)		
	1950	2000	2050
World	23.6	26.5	36.2
More developed region	28.6	37.4	46.4
Less developed region	21.4	24.3	35.0
Africa	19.0	18.4	27.4
Asia	22.0	26.2	38.2
Europe	29.2	37.7	49.5
Latin America and the Caribbean	20.1	24.4	37.8
North America	29.8	35.6	41.0
Oceania	27.9	30.9	38.1

Source: United Nations, 2001

Being aware of the needs of the elderly in the world community, the United Nations General Assembly in 1982 endorsed the International Plan of Action on Ageing to guide the formulation of policies and programmes on ageing that would ensure the welfare of the elderly (United Nations, 1982). The Plan of Action aims to strengthen capacities of governments and civil society to deal effectively with the ageing of population and to address the development potential and dependency needs of older people. These elements comprise health and nutrition; protection of elderly consumers; housing and environment; family; social welfare; income security and employment; as well as education.

It is, therefore, timely that the Second World Assembly on ageing is planned for 2002 (20 years after the first one) and will be held in Madrid, Spain in April 2002 (United Nations, 2001). This means that there is recognition that population ageing generates important economic and social challenges for both individuals and the communities in which they live. Ageing will directly affect production, consumption, savings, investment and the labour market. In particular, it will

generate higher dependency ratios in the populations than ever before (Sembajwe and Kalasa, 1999).

Although Africa is indicated to be the area with the youngest population, the proportion of children on the continent is projected to decline from 43 per cent in 2000 to 28 per cent in 2050, while the proportion of the elderly is projected to double from 5 per cent to 10 per cent over the next 50 years.

This shift has serious implications for Africa where developing indicators clearly reflect that large proportions of the population live in poverty. It is usually the elderly who are most affected by poverty because they live in an environment of limited social security. The family environment that traditionally took care of the elderly is disintegrating as a result of increased migration, urbanization, social and political instability resulting in refugees and victims of conflict, as well as the effects of HIV/AIDS which reduced the active population and leave family support on the shoulders of the elderly, especially women (Sembajwe and Kalasa, 1999).

This advocacy booklet uses the Population, Environment, Development and Agriculture (PEDA) model to draw some lessons from the likely implications of ageing for a developing population in Africa. Botswana has been taken as a case for special reference.

I. BOTSWANA

Botswana is one of the small States of Africa, located in Southern Africa. Its land area is approximately 566,730 sq. kms with a population of 1.6 million in 2001 (Population Reference Bureau, 2001). The country is one of the few in Africa that have experienced demographic transition with a successful movement away from both high mortality and fertility rates to low mortality and fertility rates. Before the advent of HIV/AIDS, infant mortality had dropped to 60 per 1000 or less and the total fertility had dropped to less than 4 children per woman.

About two thirds of the country is part of the Kalahari Desert. Therefore most of the country is arid and semi-arid. Consequently, the agricultural sector in Botswana contributes only 4 per cent of the GDP and employs an estimated 22 per cent of the labour force.

Botswana was one of the poorest countries in the world when she became independent in 1966 with a per capita income of \$US 49 million. By 1973/1974 the GDP had done up to \$US 263 and reach \$US 1,850 in 1983/1984. GDP growth continued steadily into the 1990s. With increasing resources, the Government channeled more resources towards the development programmes leading to increased investment, mitigation of national disasters (such as drought) improving the communication infrastructure (especially roads) and increasing the stock of health and school facilities.

The country is one of those which have experienced stable and responsible governance since independence. This stability is based on the upholding of

democratic principles, as well as efficient and responsible economic management. The Government provides critical services to its population, such as education and health care. It invests in infrastructure and strives to achieve macroeconomic balance by maintaining a budget surplus at all times.

In 1996, the Government passed a social security legislation aimed at protecting the elderly (US Social Security Administration, Office of Policy, 1999). It provides a universal pension programme covering all citizens aged 65 and older (with a special system for public employees). The Government bears the whole cost and provides the elderly with a flat pension of Pula 100 per month. But is this realistic given the rising cost of living in Botswana? Even if it is realistic, what are the further implications of a rapidly increasing group of elderly people? This advocacy booklet tries to answer the last question based on a number of assumptions about elderly people in Botswana (persons aged 60 and above).

II. AGEING IN BOTSWANA

Botswana is one of the few African countries to have undergone substantial demographic transition. Between 1950 and 1990, the country infant mortality rate was reduced from 130 per thousand to 53 per thousand live births. Life expectancy reached 63 years for females and 59 years for males in 1990 and fertility declined from a total fertility rate of 6.6 child per woman in 1971 to 4.9 children per woman in 1988. Currently, Botswana has an estimated total fertility rate of 3.9 children per woman (Population Reference Bureau, 2001).

In the case of mortality, however, the recent upsurge of the prevalence of HIV/AIDS in the country seems to have taken its toll on life expectancy. It is estimated that life expectancy in 2001 reached a low of 42 years for females and 45 years for males. The implications of this reversal in life expectancy on the population structure of the country is not clearly known. But since fertility (among all factors of population dynamics) has the most noticeable influence on a country's age structure, it can be surmized that if sustained fertility decline continues to prevail in Botswana, the country is set on acquiring a rapidly increasing proportion of its population for the elderly. This has serious socio-economic implications for the welfare of the population, especially for the elderly, if the Government does not institute appropriate measures to cater for their needs.

This paper utilizes the Population, Environment, Development and Agriculture (PEDA) model to generate the population projections that are utilized for the discussion on ageing. The model was developed by UNECA using experts from the International Institute for Applied Systems Analysis (IIASA) working in collaboration with professional members of staff of the Food Security and Sustainable Development Division (FSSDD) of UNECA. The model is an advocacy tool aimed at demonstrating the likely impact of alternative policy options on food security as a factor of development in the areas of population, environment, agriculture and socio-economic development. It demonstrates the relationships among these fields and uses multi-state demographic techniques to generate eight different sub-groups in the population, in all the projections. The

population sub-groups are based on three dichotomous individual characteristics: urban/ rural place of residence; literacy status, and food security status. Through the setting of scenario variables, the model enables the user to project the population that will be food secure and food insecure at a chosen point in time. This will form one of the basic points of discussion on ageing in Botswana.

A. The baseline data and the baseline scenario for Botswana

1. The demographic baseline data

The demographic data used in this publication were taken from the 1991 census of Botswana (Botswana Central Office of Statistics, 1995). Population by single years of age and sex, and age-specific fertility and mortality schedules were prepared for the following sub-groups using procedures given in the PEDDA Technical Manual (FSSDD, 2001).

- St1: Urban, literate, food secure
- St2: Urban, literate, food insecure
- St3: Urban, illiterate, food secure
- St4: Urban, illiterate, food insecure
- St5: Rural, literate, food secure
- St6: Rural, literate, food insecure
- St7: Rural, illiterate, food secure
- St8: Rural, illiterate, food insecure

2. The food distribution curve

Income data were not readily available for Botswana. Hence, the income distribution curve for Tanzania was assumed to apply to Botswana and was taken from the African Development Indicators Published by the World Bank in 1997 but referring to the 1993 Human Resource Development Survey (World Bank, 1997).

3. General settings and model parameters

The general settings and model parameters are given in table 2.

Table 2: General settings and model parameters

Parameter	Value	Comments
Initial year	1991	
End of projection period	2050	The fertility, and mortality assumptions are assumed to remain constant after 2030
Production of Kcal per capita in the initial year	2079	This figure represents the net daily per capita production in the initial year (taken form FAO state of food security 2000)
Net food import and export in Kcal per person in initial year	231	Given the nature if the environment in Botswana and the stress of livestock keeping as the major farming activity, net food imports were assumed to be 231 kcal per capita, per day in the initial year and to increase by 10% thereafter
Assumed minimum consumption of daily Kcal per capita in order to be food secure	1840	This is the nationally recommended minimum according to the FAO State of Food Security
Hard degradation impact factors	0.01	
Proportion of cohort moving to cities	0.2	

4. Sub- population parameters

Tables 3 and 4 give the fertility, mortality and literacy conditions in the country in 1991, as well as the assumed values for the projections by the year 2030.

Table 3: Fertility, mortality and literacy conditions in 1991.

Population Group	Fertility (TFR)	Mortality (Life Expectancy in Years)	Literacy (% literate)		
	Females	Males	Females	Males	
Urban, literate, food secure	3076	74.33	69.90	NA	NA
Urban, literate, food insecure	3.92	72.00	67.88	NA	NA
Urban, illiterate, food secure	3.92	72.00	67.88	53	48
Urban, illiterate, food insecure	4.08	69.87	65.92	53	48
Rural, literate, food secure	4.54	66.88	63.18	NA	NA
Rural, literate, food insecure	4.72	64.89	61.34	NA	NA
Rural, illiterate, food secure	4.72	64.89	61.34	53	48
Rural, illiterate, food insecure	4.91	62.94	59.54	53	48

Table 4: Fertility, mortality and literacy assumptions under the baseline scenario (by 2030)

Population Group	Fertility (TFR)	Mortality (Life Expectancy in Years)	Literacy (%literate)		
	Females	Males	Females	Males	
Urban, literate, food secure	1.86	75.43	71.00	NA	NA
Urban, literate, food insecure	2.02	73.10	68.94	NA	NA
Urban, illiterate, food secure	2.02	73.10	68.94	53	48
Urban, illiterate, food insecure	2.18	70.97	67.02	53	48
Rural, literate, food secure	2.64	67.98	64.28	NA	NA
Rural, literate, food insecure	2.82	65.89	62.44	NA	NA
Rural, illiterate, food secure	2.82	65.89	62.44	53	48
Rural, illiterate, food insecure	3.01	64.04	60.64	53	48

5. Other variables in the model

i. HIV/AIDS

Botswana is one of the countries in sub-Saharan African most affected by HIV/AIDS. Estimates of the rate of infection with the HIV/AIDS virus in the country vary from 25 to 36 per cent of the population. This has most likely been affected by the social and physical mobility of the population as well as cultural attitudes and lack of empowerment for women.

On a positive side, however, is the fact that information on the cause and prevention of AIDS is openly and widely communicated. This may help to reduce, to a certain extent, the impact of the pandemic on labour supply, social services, health services and the expected large number of child orphans. In the model, therefore, the scenarios for discussion will incorporate a morbidity rate of 25 per cent for HIV/AIDS.

ii. Net food imports

Because of its limited agricultural base dictated by forces of nature, 10 per cent of the food requirements of Botswana were assumed to be net food imports. This will increase from year to year by 1 per cent.

iii. Post-harvest losses

The rural road infrastructure is usually poor in African countries. In addition to this, storage facilities are limited. It was therefore assumed that, overall, the country may experience food losses of 15 per cent of the food produced.

iv. Water

Botswana is known to suffer droughts from time to time. Moreover, given the arid and semi-arid conditions of the country as whole, it was presumed pertinent to utilize a less than optimal water conditions assumption for the country. The water scenario variable was therefore put at 0.70 (less than the value of 1 for optimal conditions).

v. Irrigation

Only a limited percentage of agriculture in the country is based on irrigation. In the baseline scenario, the level of irrigation is assumed to be constant. Moreover, Prommer (2001) states that on average, 14,000 cubic metres of water per hectare are used for irrigation every year. This means that irrigation technology is inefficient.

vi. Fertilizer use

In the baseline scenario, we assume a constant rate of fertilizer use.

vii. Machinery use

In the baseline scenario we assume a constant rate of use of machinery.

viii. Technical education of the labour force

In the agricultural production function, it is assumed that in addition to the literacy of the labour force, technical education would give the labour force a variety of skills that would contribute to agricultural production. In this scenario, the variable is assumed to be constant.

ix. Urban bias factor

Given the general concern of the Botswana Government for the welfare of its entire population, it is assumed that there is no urban or rural bias in the distribution of food.

B. Simulation results

In the baseline scenario, a great deal of optimism about the welfare of the population of Botswana has been invoked, to the extent that it is assumed that the economic trends of the past will continue to prevail, despite the effect of HIV/AIDS. HIV/AIDS has been included in the scenario by assuming a morbidity rate of 25 per cent for the country, and by reducing the rate over time by 2 per cent per year. The aging process in this type of scenario is reflected in table 5 and figure 1A, in which the proportions under 15 years of age and 60 years of age and over will change from 43 and 7 per cent respectively in 1991 to 24 and 16 per cent respectively in 2050. This clearly suggests that the aging process in Botswana is already underway.

Figure 1B depicts the sex ratios of two segments of the population, the very young (under 15 years of age) and the elderly (60 years and over). While the young population will experience sex ratios just above 100, the elderly will experience sex ratios largely below 80. This suggests that within the elderly population there will be a predominance of females.

Taking note of the food insecurity status by population subgroups, it is revealed that among the food-insecure populations by urban and rural residence, the elderly constitutes 18 and 16 per cent respectively in 2050. This is clearly demonstrated by figures 2A and 3A. On the other hand, figures 2B and 3B show that the elderly population subgroups will be dominated by females.

Table 5: Baseline scenario estimated and projected population for Botswana by age (Both sexes)

Age	1991	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
00	191189.00	208470.05	221796.04	225553.11	224747.04	234238.68	239852.15	241451.53	239128.21	240553.88	247325.30	252402.78	255725.28
05	199334.00	191516.44	206931.63	220096.28	223306.16	222473.17	231926.70	237528.47	239145.14	236865.32	238245.88	244940.49	249961.70
10	175272.00	197302.63	191360.96	206720.05	219772.29	222970.57	222136.20	231578.52	237175.43	238792.69	236514.66	237890.28	244571.65
15	149037.00	169900.04	196906.17	190894.77	206160.31	219177.96	222356.34	221527.94	230947.30	236534.35	238145.37	235871.00	237243.02
20	121514.00	141974.57	167828.87	194310.53	188275.20	203482.64	216363.21	219485.75	218701.20	228015.57	233533.83	235119.11	232867.33
25	98121.00	113697.28	138214.27	163370.28	188918.64	183152.57	198207.52	210807.58	213840.28	213102.23	222164.24	227545.03	229082.26
30	81515.00	91284.49	108852.16	132552.90	156882.39	181257.59	175884.18	190638.70	202853.45	205730.35	204969.94	213675.24	218859.80
35	64338.00	74580.07	86559.08	103772.22	126903.16	150148.84	173331.10	168341.97	182742.29	194513.30	197165.81	196369.33	204704.13
40	50630.00	58511.01	70565.96	82450.98	99626.14	121777.41	144032.99	166103.07	161449.75	175482.24	186773.77	189219.46	188391.00
45	39950.00	46066.74	55328.69	67194.17	79222.52	95826.99	117071.83	138389.20	159413.72	155036.00	168667.56	179507.28	181757.63
50	33184.00	36550.92	43551.91	52650.00	64503.07	76154.88	92216.66	112571.63	132966.26	152947.65	148778.88	162025.02	172420.90
55	27755.00	30704.84	34740.02	41516.64	50511.50	61981.97	73285.36	88826.71	108317.21	127802.72	146729.44	142759.43	155633.31
60	23178.00	25720.94	29275.32	33090.81	39574.82	48256.22	59325.56	70251.76	85244.97	103786.35	122239.71	139995.53	136226.37
65	18916.00	21113.08	24039.99	27276.78	30723.94	36867.14	45098.66	55581.31	65957.88	80149.63	97324.54	114331.91	130451.33

Age	1991	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
70	14745.00	16150.48	18811.72	21330.10	24048.06	27191.93	32794.80	40300.09	49853.58	59327.92	72212.31	87346.52	102212.01
75	15012.00	12293.46	13219.95	15321.40	17220.83	19496.45	22168.57	26925.82	33311.08	41412.77	49441.15	60338.99	72584.58
80	11366.00	10910.65	8677.54	9298.27	10659.40	12058.20	13724.89	15712.75	19272.97	24051.33	30066.28	36053.16	44182.61
85	6952.00	6381.26	6113.87	4814.64	5115.02	5914.91	6738.29	7708.08	8893.74	11036.62	13898.03	17487.77	21080.93
90	3275.00	2870.07	2572.77	2457.67	1902.70	2049.02	2388.38	2734.38	3139.88	3648.75	4574.91	5810.82	7355.40
95	507.00	904.09	784.76	706.10	669.31	518.18	565.11	659.50	757.10	871.01	1014.96	1278.89	1631.42
100	0.00	61.67	105.99	88.79	81.75	76.11	58.65	68.64	79.06	91.04	104.50	122.55	155.93
Total	1325790.00	1456964.77	1626237.66	1795466.48	1958824.24	2125071.42	2289527.14	2447193.39	2593190.52	2729751.72	2859891.04	2980090.59	3087098.60
Pop <15	0.43	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.28	0.26	0.25	0.25	0.24
Pop 60+	0.07	0.07	0.06	0.06	0.07	0.07	0.08	0.09	0.10	0.12	0.14	0.16	0.17

Table 6 demonstrates further that the proportions food insecure by population subgroup for the population under 15 years and the population 60 years and over will increase over time. The elderly will contribute a significant proportion which will be largely composed of females, especially in the rural areas where the sex ratios will be 63 in the year 2030.

Table 6. Proportions and sex ratios under 15 and 60+ years of food-insecure population sub-groups for the baseline scenario, 2000 and 2030

Sub-group	Proportions				Sex ratios			
	2000		2030		2000		2030	
	< 15	60+	<15	60+	<15	60+	<15	60+
Urban	.38	.05	.26	.13	102	82	104	83
Rural	.39	.08	.32	.08	103	78	103	63

C. Mixed policies scenario and simulation results

In the mixed policies scenario, we have stretched further the idea that Botswana's socio-economic success of the past will continue. We have assumed further that this success combined with the country's openness on HIV/AIDS will lead to the following mix of policies:

- Reduction in HIV/AIDS mortality of 25 per cent by 4 per cent per year;
- Increase in literacy to 0.7 for females and 0.6 for males;
- An increase in technical education by 1 per cent per year;
- An increase in net food imports by 2 per cent per year;
- An increase in irrigation by 1 per cent per year; and
- An increase in fertilizer use of 1 per cent per year.

This scenario leads to lower proportions of the food insecure by about 41 per cent by the year 2050. It clearly reflects the importance of a multidisciplinary and multisectoral approach to planning and policy making.

III. POLICY IMPLICATIONS

These results imply that the aged population is going to increase over time in Botswana and that the aged will constitute significant segments of the food insecure in the country. This implies that as the Government continues with its range of policies on infrastructural and human development, strong financial management, implementation of incentives to attract private enterprise, as well as growing sectoral diversification, policies geared towards strengthening social policies that take into account the needs of the elderly, should increasingly come on board. These may, for example, include:

- Initiating efforts directed at enabling the elderly to lead independent lives in their own families and communities for as long as possible.

- Providing adequate, appropriate and sufficient nutrition to the elderly to ensure their well-being.
- Planning and introducing housing for the aged of various types to suit the status and degree of self-sufficiency of the aged themselves, in accordance with local tradition and customs.
- Enabling the family as a whole, including its male members, to take over and share the burden of help in the family to take care of the elderly.
- Encouraging appropriate support from the wider community to families to sustain their willingness and ability to continue to care for elderly relatives.
- Promoting social welfare services as instruments of national policy in a community-based environment, to provide a broad range of preventive, remedial and developmental services for the ageing, to enable them to lead as independent a life as possible in their own homes and in their communities, remaining active and useful citizens.
- Creating or developing social security schemes based on the principle of universal coverage for older people.
- Ensuring that the minimum benefits will be enough to meet the essential needs of the elderly and guarantee their independence.
- Making it possible for women as well as men to acquire their own rights in the social security system.
- Taking appropriate measures, in collaboration with employers' and workers' organizations, to ensure that older workers can continue to work under satisfactory conditions and enjoy security of employment.
- Taking measures to assist older persons to find or return to independent employment by creating new employment possibilities and facilitating training or retraining.
- Developing educational programmes featuring the elderly as the teachers and transmitters of knowledge, culture and spiritual values.
- Promoting educational policies which reflect the principle of the right to education of the ageing through appropriate allocation of resources and in suitable education programmes.
- Urging the mass media to highlight the positive aspects of the ageing process and the elderly themselves and cover relevant socio-economic issues such as the effect of migration (both internal and international) on the relative ageing of populations of rural areas, and its effects on agricultural production and living conditions in these areas.

- Supporting programmes aimed at providing the elderly with easier physical access to cultural institutions (such as museums, theatres, opera houses, concert halls and cinemas) in order to encourage their greater participation in leisure activities and the creative use of their time.
- Supporting the collection and analysis of genderized data on the elderly, which will give member States information on such matters as sex, age, income levels, living arrangements and health status.
- Promoting and supporting research and data analysis in support of integrating the problems of ageing in planning and policy formulation and management.

IV. CONCLUSION

This study has shown that although Botswana, like other African countries, has a population which is relatively young, compared to populations of the developed countries, it will experience fast paces of growth in the elderly segment of its population over the next 50 years. This suggests that the country should continue to expand and strengthen its policies and plans related to the elderly, so that the elderly can be assured of appropriate institutional mechanisms for improving their welfare in the future.

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FIGURE 1A: BASELINE SCENARIO TRENDS IN PROPORTIONS <15 & 60+ YEARS IN BOTSWANA

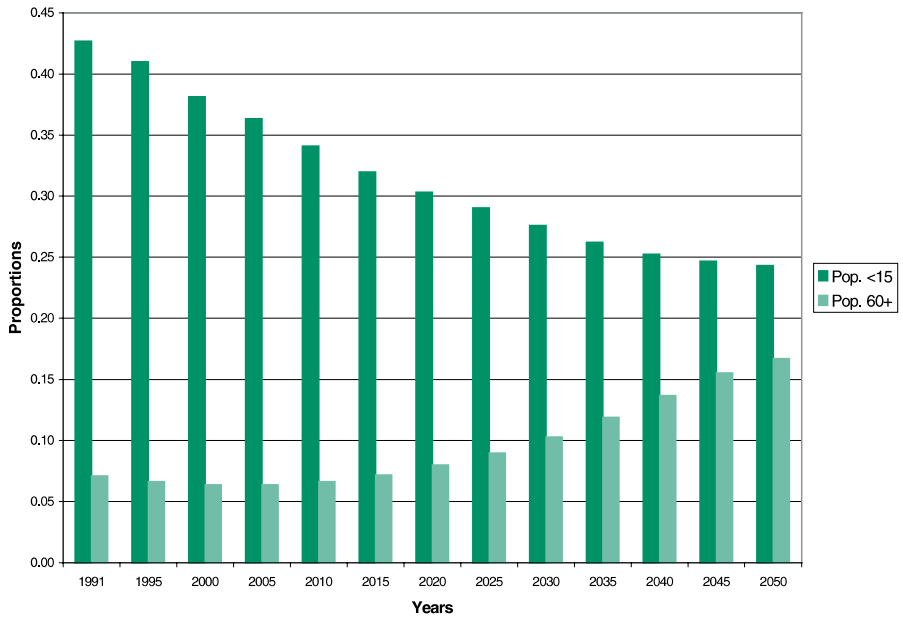


FIGURE 1B: BASELINE SCENARIO TRENDS IN SEX RATIOS FOR <15 & 60+ YEARS IN BOTSWANA

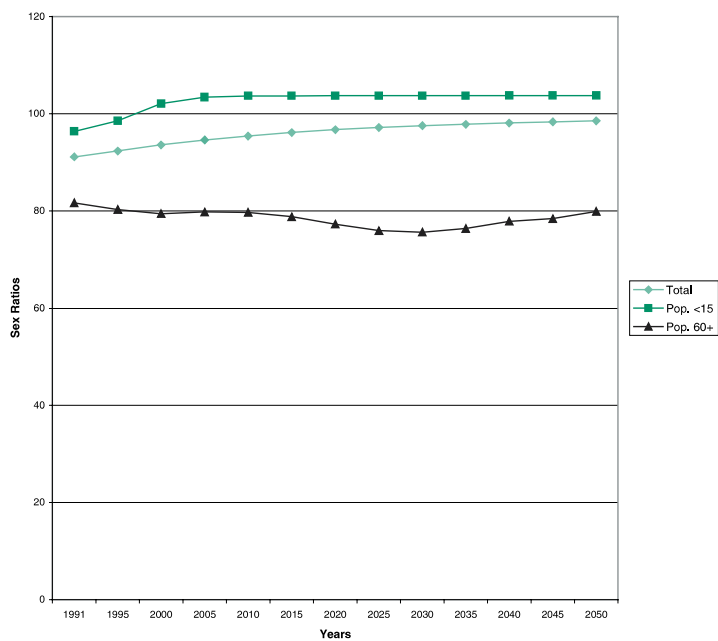


FIGURE 2A: BASELINE SCENARIO TRENDS IN PROPORTIONS <15 & 60+ YEARS URBAN & FOOD INSECURE IN BOTSWANA

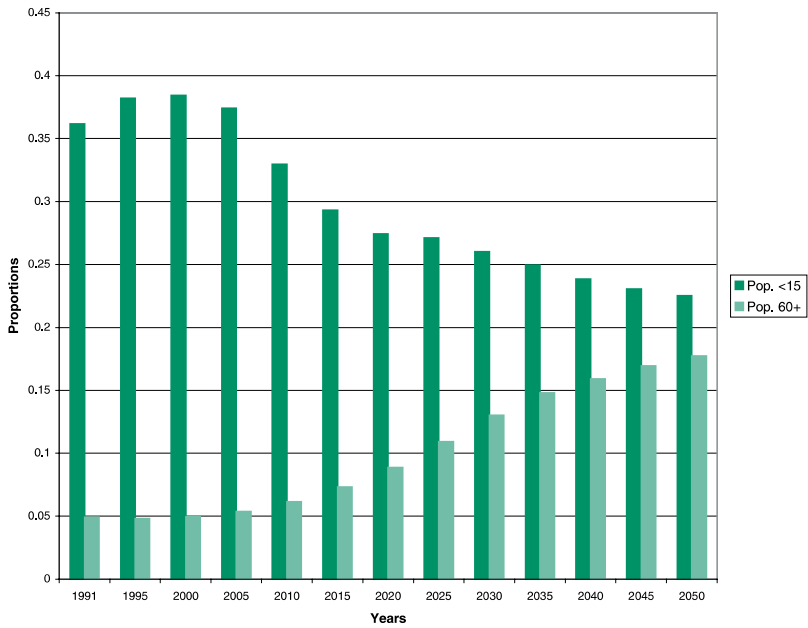


FIGURE 2B: BASELINE SCENARIO TRENDS IN SEX RATIOS FOR <15 & 60+ YEARS URBAN & FOOD INSECURE IN BOTSWANA

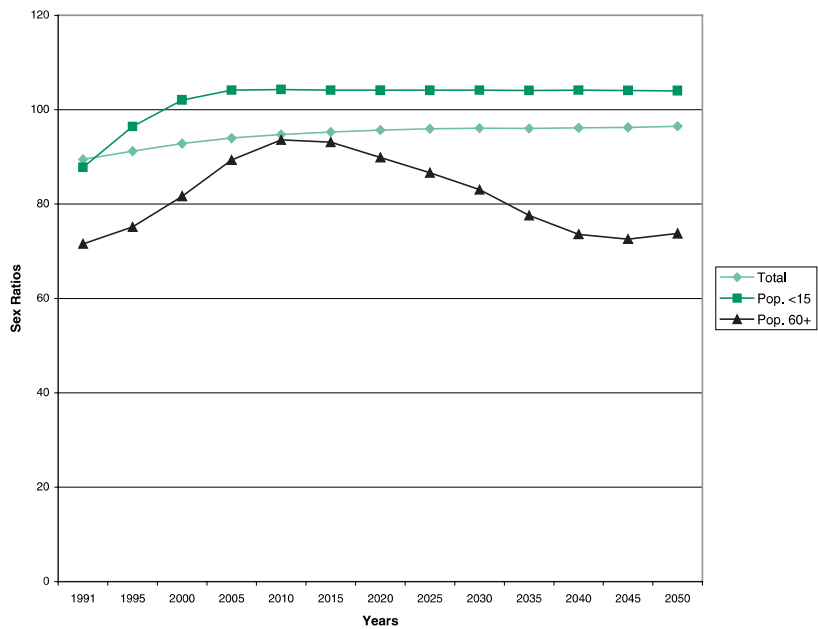


FIGURE 3A: BASELINE SCENARIO TRENDS IN PROPORTIONS <15 & 60+ YEARS RURAL & FOOD INSECURE IN BOTSWANA

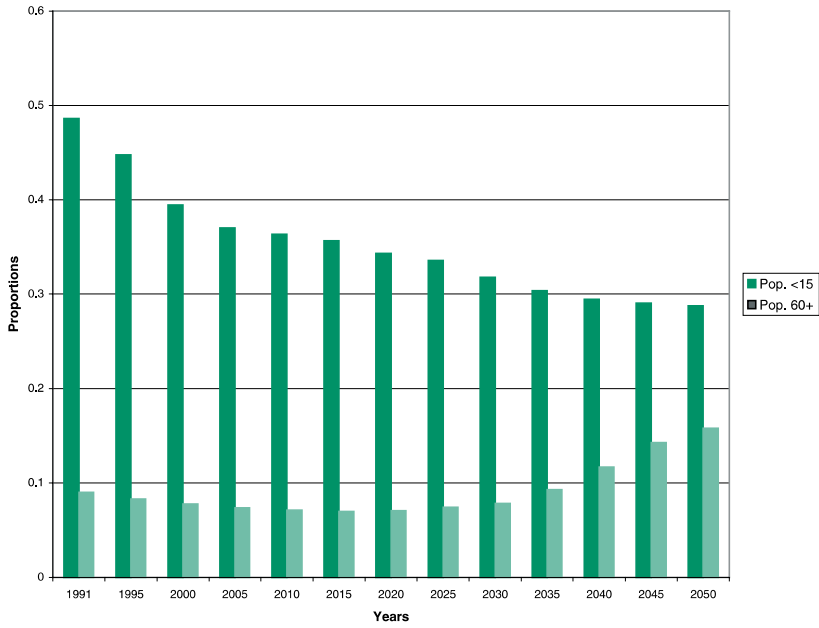


FIGURE 3B: BASELINE SCENARIO TRENDS IN SEX RATIOS FOR <15 & 60+ YEARS RURAL & FOOD INSECURE IN BOTSWANA

