African Sociological Review 11, 2, 2007, pp.16-28

Martin E. Palamuleni

Population Projections for Malawi and its Regions, 1998-2023

Abstract

The main objective of this paper is to critically evaluate the most recent projections prepared by the National Statistical Office (NSO) and provide alternative projections for Malawi. The Epidemic Projection Package (EPP) developed by UNAIDS and the SPECTRUM programme developed by the Futures Group were used to model the Malawian HIV epidemic, to project future trends in HIV/AIDS and population and to estimate the demographic impact of AIDS. The national HIV prevalence surveys among pregnant women from 1985 to 2000 served as the data sets used to calibrate the input HIV prevalence values for the model, while demographic data obtained from the 1998 Malawi Population and Housing Census acted as a base for population projections. The results indicate that the population of Malawi will continue to grow despite the negative impact of HIV/AIDS epidemic. The population of Malawi is expected to increase from 9.92 million in 1998 to 13.52 in 2010 and to 16.84 million in 2020. The population projections presented in this study are not about predicting the future so much as they are about exploring the consequences of today's trends. These are intended to show what the future will look like if today's trends continue for the next decade or two. As in the case of Malawi, the predicted future is sufficiently undesirable that it should serve to focus our attention on implementing programmes today that will protect people from HIV infection and promise a brighter future.

Introduction

Population projection is a scientific attempt to peep into the future population scenario, conditioned by making certain assumptions, using data relating to the past available at that point of time. Predicting the future course of human fertility, mortality and migration is not easy, especially when looking beyond much further in time. Medical and health intervention strategies, food production and its equitable availability, climatic variability, socio-cultural setting, political economic conditions and a host of other factors influence population dynamics, making it a somewhat unpredictable exercise. Therefore, caution must be exercised when either making or using the population projections, and the context of various conditions imposed should not be lost sight of on the basis of past behaviour and the likely future scenario assumed.

Different population projections at the country level are made by the Government and National and International agencies from time to time. In addition, individual demographers make projections for the country as a whole and sometimes at the sub-national level. The international agencies that make projections for the world as a whole and for individual countries are the United Nations Population Division, the

World Bank and United Nations Population Fund (UNFPA) etc., (see for example, United Nations, 2003). One major problem with population projections by international organisations is the need to come up with comparable statistics. A recent report from the US Bureau of Census notes: 'Not only must the assumptions be appropriate for the particular country in question, but consistent assumptions must be made when projections are carried out for more than one country'.

For Malawi, with an apparent high population growth rate, continued high but slowly declining fertility, worsening mortality due to HIV/AIDS epidemic, young age structure, recurrent drought and associated famine, rampant poverty and its ongoing social, economic and political changes, the need of population projections cannot be overemphasised. With decentralisation process there is a need to come up with population data at regional, district and sub district levels.

The paper intends to achieve two objectives. First, to review the existing population projections especially those prepared by the National Statistical Office (NSO).[1] Second, to prepare fresh population projections for Malawi using 1998 as a base.

This paper commences with an overview of population projections in Malawi including a brief discussion of the weaknesses of existing population projections. This is followed by a review of existing population projections of the population of Malawi and a discussion of the method used for the projections in this publication.

Population Projections in Malawi

Population projection methodologies vary widely in terms of degree of sophistication, data requirements and detail of results. There is not any methodology that can be considered to yield absolute error-free results. It should be noted that the accuracy of the projections does not only depend on the calculations involved, but also on the assumptions underlying future levels of fertility, mortality and migration as well as on the accuracy of the base year population data.

Since the mid-1980s, NSO has prepared four sets of population projections (Malawi Government, 1984, 1994, 2002, 2003). The first detailed sets of official national population projections were prepared by the NSO in 1984 based on the 1977 census (Malawi Government, 1984). These were based on three differing fertility assumptions and two mortality assumptions. In particular, fertility was assumed to remain constant; to decline at a slow pace and to decline at a fast pace. Mortality was assumed to remain constant and to continue to decline at a slow pace. In either case, international migration was assumed to be negligible. Surprisingly, even at a time when this assumption was being made, some Mozambican refugees were trekking into Malawi! The NSO recommended that constant fertility and slow decline in mortality scenario should be used for planning as it was deemed to be realistic.

The second set was prepared in 1994 using the 1987 census as a base (Malawi Government, 1994). In this case three sets of projections were introduced to cover the period 1987 to 2012.

The projections were based on one mortality assumption (slow decline) and three fertility assumptions (constant, slow decline and fast decline). The variant based on slow decline in fertility and slow decline in mortality was recommended for planning

purposes. The only problem with this set of projections is the fact they did not implicitly take AIDS assumption into account.

The third set was prepared in 2002 based on the 1998 census and was later revised in 2003 to incorporate region and district level projections (Malawi Government, 2003). This set of population projections covered the period 1998-2023. The projections were produced using RUPMENU and RUPAGG programmes developed by the US Bureau of the Census (Arriaga, E.E. et al.,1994). However, based on the belief that the results of the 1998 census were affected by HIV/AIDS, this set of projections was prepared using the 1977 as population estimates.

The 2003 set of projections contain a number of problems. First, it is usually advisable that whenever one is preparing population projections one should formulate several scenarios. This was done in projections based on the 1977 and 1987 censuses (Malawi Government, 1984, 1994). In this case only one scenario was produced. Why was this case?

Second, the 1987-1998 inter-censal population growth rate was two percent per annum. This was believed to be an underestimate by many researchers (see for example, Palamuleni, 2002). To date, NSO has not yet explained why this was the case. Surprisingly, the 2003 NSO projections estimated that the population growth rate in Malawi was 3.32 percent. Surely there is a need to explain why this is the case.

Third, if you calculate percentage distribution by Region and districts for the projected population once notices that the percentage distribution for the population in Northern Region declines from 10 percent in 1999 to 9 percent in 2023. This is not consistent with the trend observed since independence in 1964 and not in line with expectations. On the one hand the preparation of projections at districts and regional levels is commendable. On the other hand are the projection results realistic? One wonders.

Fourth, the set provides projections for the four major cities. This is commendable. However, there is no discussion on how were the cities were projected.

Fifth, both international migration and internal migration were assumed to be zero. For international migration probably this is acceptable. But for internal migration this is not realistic. Internal migration should not be assumed to be zero. It is true to say that migration assumptions are the most difficult to include in any population projection. As such most available sets of projections at national level assume that the net international migration in zero. At district and regional levels it is not safe to make this assumption as evidence suggests that there is a lot of movement taking place at these levels. The fact that the 1998 census did not collect information on migration is not sufficient reason to ignore migration in the estimating future population sizes of the country and its subdivisions. There are some indirect estimation procedures that could be used to gauge the nature and patterns of internal migration in the country.

Sixth, the projected estimates of fertility and mortality are not consistent with other available and accepted estimates. The analytical report indicates that the Total Fertility Rate for Malawi in 1998 was 6.5 children per woman. On the other hand, the results of the projections suggest that in 1999 the TFR was 6.7. Does this mean that fertility is increasing in Malawi? What was the TFR estimate for 1998 used in the projections? The same can be said of mortality estimates. The analytical report suggests a reported

CDR of 20.9 whereas the projected CDR for 1999 is 23.1. Does this indicate worsening of mortality conditions in Malawi?

Furthermore, another problem with the NSO projections is associated with the fact that no explanation is made regarding how the initial estimates of fertility and mortality were calculated. It is mentioned that 'life tables for the districts were used', but no mention is made on how these life tables were calculated. Closer examination of the expectation of life by districts suggests that reported life tables were used. If this is the case has Malawi reached that stage when we can completely trust the reported mortality statistics? Furthermore it is mentioned in the report that in some districts 'expectation of life at birth was so low that national estimates were used'. What does this tell us about the quality of mortality data?

Why did the NSO use the 'P/F Trussell Variate' to estimate fertility when the analytical report of the 1998 census used the Gompertz Relational model? This also leads to another related problem which any student of the demography of Malawi should take note.

Lastly, the population projections did not take HIV/AIDS into account. In the section that described the methodology followed in projecting the population the only reference to HIV/AIDS was made as follows: 'As the Malawi population is greatly impacted with the HIV/AIDS, there is no doubt that the mortality measures calculated for 1998 are affected by this impact. Malawi has experienced declining life expectancy at birth from around 49 years observed in 1987 to around 42 in 1998. The present projection assumes that this trend will be reversed due to reduced incidence of new cases as the various awareness campaigns leads to changes in behaviour and those affected die off'.

From the inconsistencies presented above one thing is clear: 'little is known about the demography of Malawi'. In particular there is a need for more studies on the population of Malawi in order to establish the levels, trends and differentials in fertility, mortality and migration. This calls for more demographers interested in the population of Malawi to critically evaluate the existing demographic data and establish the nature and patterns of demographic variables. It is for this reason that another set of population projections in Malawi was prepared. The exercise was carried out not to duplicate the work of NSO but to present a more plausible scenario since the projections were found to deficient in a number of ways. In order to come up with plausible assumptions it was felt necessary to re-examine the existing knowledge of the components of population growth in Malawi.

Components of Population Growth

The population of any given area can change as a result of people being born into that population (fertility); people dying (mortality), people moving out of a given area (emigration/out-migration) and people moving into a given area (immigration/in-migration). Before one prepares population projections one has to have a good understanding of the levels and trends in fertility, mortality and migration. In this section, we will examine each of these factors in some detail.

Fertility

It is generally accepted that, like in most countries in sub-Saharan Africa, fertility in Malawi is declining (Malawi Government, 1994; Palamuleni 2002). However, the

nature, pattern, causes and consequences of this trend are not yet fully determined. To an inquisitive researcher several questions come to mind. What has been the role of the family planning programme or the population policy in influencing fertility decline in Malawi? Is the rate of decline the same throughout the country? At what pace is fertility declining? Has fertility decline reached the ten percent cut-off usually associated with incipient decline? It is important that these questions are answered now before any meaningful assumptions regarding future trends in fertility can be made.

Any demography student conversant with the theory of demographic transition would certainly believe that the modest gains in social and economic development Malawi achieved during the thirty years of political independence would translate into fertility decline. In an attempt to establish future trends of fertility we explored several possibilities. First we examined the trend of fertility between the 1997 and 1987 censuses. During this period, the available statistics indicate that fertility declined from 7.6 to 7.4 children per woman, implying that TFR declined by three percent in ten years. Assuming that this trend will continue in future (1987 onwards) TFR would be 7.2 in 1998 and reach 6.7 in 2020. In addition, with this rate of fertility decline, fertility will reach replacement level in 2250. However studies suggest that fertility decline in Malawi was much faster than this since TFR was found to be 6.7 in 1992 and 6.5 in 1998 (Malawi Government, 1994, 2002). Second, the trend of fertility between 1987 and 1998 was examined. During this period fertility declined from 7.4 to 6.5 children per woman, implying that TFR declined by twelve percent in eleven years. Third, the trend of fertility between 1992 and 2000 was examined. During this period fertility declined from 6.7 to 6.4 children per woman implying that TFR declined by twelve percent in eight years and replacement level fertility would be reached in 2115.

The question that remains is which of these scenarios is plausible for Malawi. This question is not that simple. The answer depends on a number of factors all of which are beyond the control of an ordinary demographer and relate to the nature and pattern of social and economic development the country will follow: political situation, good governance, developmental programmes include poverty alleviation, family planning, HIV/AIDS and other reproductive health initiatives, climatic changes, drought and associate food shortages, just to mention a few.

Mortality

Like fertility, mortality can either lead to an increase or decrease in the population of any given area. Other things being equal, if mortality conditions are worsening the population of any given area will decline and vice versa. In this case, it is important to find out the levels and trends of mortality in Malawi.

A number of mortality studies conducted in the country indicate that mortality rates declined during the period after independence to the late-1980s (Malawi Government, 1984, 1994; Ndawala, 1989, 1994; Palamuleni, 1987, 1993, 1994). Thereafter, differing opinions emerge. On the one hand, there are those that suggest a continuation of mortality decline but at a reduced pace (Malawi Government, 1994). On the other hand, some commentators have suggested an increase in mortality. This has largely been attributed to the AIDS epidemic.

The effect of AIDS on the projected population of Malawi remains a debatable subject. First, there are studies that indicate that the population of Malawi will not be

greatly affected by AIDS (House and Zimalirana 1992). Second, there are those that argue that the population of Malawi will greatly be affected by the AIDS epidemic, to such an extent that life expectancy will decline to 39 years (World Bank, n.d.; UNDP, n.d.; USAID, n.d.).There is no doubt that AIDS will affect the population of Malawi.

Migration

Another factor worth examining is migration. Two forms of migration are important, namely internal and international migration. When examining this factor it is always important to remember that from early last century Malawians have tended to move to more remunerative places such as South Africa, Zimbabwe, Zambia, and Botswana. At the same time, the country has played host to people from Mozambique (Palamuleni 1992). There is no doubt that the magnitude of international emigration has decreased drastically from the mid-1970s. However as a result of the forces of globalisation, some other patterns have emerged. One notable feature of the new emigration patterns is that of skilled professionals (also known as the brain drain): doctors, nurses, university lecturers, etc., and this trend is likely to increase. However, the numbers involved are relatively small.

In terms of immigration Malawi has played host to thousands of Mozambican fleeing from an oppressive colonial government, a war of liberation and armed conflicts within the country. This led to an influx of refuges in the mid-1980s. However, these refugees were repatriated in the early-1990s. The impact of these immigrants on the social, economic and demographic situation in Malawi are well documented and need not be repeated here. But it suffices to note that the refugees were included in population projections. As a result of this a somewhat large population estimate is expected. The impact of refugees on the Malawian population varies from one area to another as the available evidence indicates that some districts recorded more refugees than others. At regional level it could be demonstrated that the Southern Region was the most affected followed by the Central Region with Northern Region being least affected (Palamuleni, 2002, 2005).

Population projection methodology used in this study

The cohort component method was used for projecting the population of Malawi. In each scenario two steps were followed. First, population projections were prepared for the whole country. Second, projections were made for the each of the three regions separately and the sum of the three yielded projections for the Republic of Malawi.

As the name itself implies, the methodology first requires projections of the components of population growth, namely fertility, mortality and migration. Once the future levels and patterns of fertility, mortality and migration are obtained, these are used in conjunction with a base population to obtain the projected population.

SPECTRUM software that was developed by the Futures Group was used to project the population of Malawi (Stover, 1999; Stover, Kirmeyer 1999). Two modules of SPECTRUM have been used, DemProj and AIM (AIDS Impact Model). DemProj projects the population by age and sex and displays a full range of demographic indicators while AIM calculates the number of people infected with HIV, AIDS cases, AIDS deaths, AIDS orphans and other consequences of AIDS. The AIM model includes a calculation of infected children. The model calculates the number of

infected children from the age-specific infection rates among women, the age-specific fertility rates, the perinatal transmission rate, the non-AIDS age-specific death rates and the distribution of the time from birth to AIDS death for infected new-borns.

Base data

Every population projection has a starting point that is usually the date for which the requisite data on the total population by age and sex are available. In the case of the population projections presented in this publication, the most recent census, the 1998 Malawi Population and Housing census, was used as the base data. This means that the year 1998 was used as a starting point of the projections. The reported age-sex distributions were adjusted using a PAS spreadsheet AGESMTH (Arriaga, E. E. et al., 1994). The smoothed age-sex distributions based on the Arriaga Method were adopted (Arriaga, E. E. et al., 1994).

Projection Assumptions

Fertility Assumption

SPECTRUM requires TFR assumptions for each year over the projection period as well as the distribution of the fertility by age group of the women. The UN sub-Saharan fertility pattern was used.

Mortality Assumptions

SPECTRUM requires assumptions about male and female life expectancy at birth for each year over the projection period. The North family of the Coale-Demeny model life table was used. Assumptions with regard to life expectancy at birth were made by using the UN working mortality model for mortality improvement according to the initial level of mortality. For countries with life expectancy at birth below 55, eo is expected to increase by 2.5 years every five years.

Migration Assumptions

The available studies on migration in Malawi indicate that Southern Region has been experiencing net out-migration whereas the Central Region has been experiencing net in-migration, and the Northern Region has moved from being a net sender to a net receiver (Palamuleni, 2005). In view of the above it was assumed that Southern Region would be losing 5000 people a year, of whom 2000 would go to the Northern Region and the reminder to Central Region.

HIV/AIDS Assumptions

The Estimation and Projection Package (EPP) is used to estimate and project adult HIV prevalence from surveillance data. The input to EPP is surveillance data from various sites and years showing HIV prevalence among pregnant women. EPP is used to fit a simple epidemic model to data from urban and rural sites. The prevalence projection produced by EPP can be transferred to Spectrum to calculate the number of people infected, AIDS cases, AIDS-related deaths, etc. EPP was developed by the UNAIDS Reference Group on estimates, models and projections and programmed at the East West Center.

Data for the EPP that were used to prepare inputs for the regions AIMs were taken from various ANC sero-prevalence surveys conducted in Malawi starting in 1990. In the case of the 2001 data, we took the reported prevalence rates that were used in preparing state-level estimates of the HIV positive urban and rural populations and calculated the weighted averages for prevalence in each state. The resulting curve for the trend in prevalence that was fitted to the EPP was checked to make it fall as close as possible between 1999 and 2001 figures.

The prediction is that the prevalence of HIV rose rapidly from the late 1980s to a peak of 11 percent in 2000, declining thereafter only slightly with prevalence of around ten percent by 2024. The predicted levelling off of the epidemic is a result of saturation of the most susceptible group in the population. This is explained by the fact that entry of new uninfected group members and exit of infected members due to death and migration could cause equilibrium to be reached. This, however, does not mean that the incidence of HIV is zero; this simply implies that new cases are balanced by death and migration.

Results

Population growth and population size

Table 1 presents the results of projecting the population of Malawi based on the medium scenario as described above. The population of Malawi is expected to increase from 9.92 million in 1998 to 13.52 in 2010 and to 16.84 million in 2020. It is projected that the population of the Northern Region increase from 1.23 million in 1998 to 1.73 million in 2010 and will reach 2.37 million in 2023. In addition, the population of the Central Region is projected to increase from 4.06 million in 1998 to 5.93 million in 2010 and will reach 8.5 million in 2023, while the population of the Southern Region is projected to increase from 4.63 million in 1998 to 5.86 million in 2010 and will reach 7.17 million in 2023. Table 2 provides a summary of the most recent projections of the population of Malawi.

Table 1 indicates that population projections by NSO are lower that those produced by the US Bureau of Census and United Nations up to 2005 and thereafter the opposite is true. Also projections based on the US Bureau of Census and United Nations are close to each other although the former are lower than the latter. Overall, in the 'short run', there seems to be consensus amongst the various demographers about the future size of the population of Malawi. However, significant differences emerge in the 'long run'. These differences can be attributed to the fact that the various projections are based on difference sets of assumptions regarding fertility, mortality and migration as well as on different sets of base data.

Sex and age structure

The sex ratio of the population is expected to continuously increase from 96 males per 100 females in 1998 to 99 in 2010 and 101 in 2023. This could be attributed to higher mortality prevailing among females that is assumed to continue in future. The projections also indicate a continuation in the process of ageing. The proportion of the population under 15 years of age will increase from 44 percent in 1998 to 46 percent in 2013, before gradually declining to 45 percent in 2023. This means that during the period under review the population of Malawi will still be youthful. Other things being

equal, this is the direct consequence of the slow decline in fertility in the projected period.

The proportion of the elderly aged 65 years and over is projected to decline from 3.88 percent in 1998 to 2.6 in 2010 and to 2.6 in 2023. In absolute numbers, there will be around 46,5000 persons eligible for old age pension in 2023 against some 38,5000 in 1998.

The median age of the population is expected to decrease from 18 years in 1998 to 17 years in 2010. Thereafter the median age is expected to remain constant at 18 years.

Vital rates

The crude birth rate is expected to fall from 52.7 live births per 1,000 population in 1998 to 45.6 in 2010 and around 41.6 in 2023. The crude death rate will decrease from 24.7 to 23.6 in 2010 and 19.6 in 2023. The AIDS epidemic is known to have a substantial impact on adult mortality and also life expectancy. As a result of HIV/AIDS, life expectancy for males is expected to have dropped by three years in 2003, nine years in 2013 and 12 years in 2023 compared to what it would have been in the absence of the HIV epidemic. Similar values for females are 5, 13 and 15 years respectively. These figures suggest that the demographic impacts of AIDS are more serious among the female population than the male population.

Discussion

This study presented alternative population projections for Malawi and its regions. It also addressed the demographic impact of AIDS in the country. Malawi is unique as it combines a severe epidemic of HIV with one of the highest TFR on the continent. In such context, the rate of natural increase of population is expected to continue being positive.

One may first question the validity of the TFR estimated during the various surveys used for references in this study. The continued increase of the population pyramid among those aged less than ten years suggests a very little decrease in fertility rate in the past decade. In addition, some important changes are taking place in Malawi in the past one and half decades and some of these changes may contribute to the decrease in fertility. Chief among these is the high rate of contraceptive prevalence among sexually active women. Although previous data on contraceptive use are scanty, the use is expected to be much lower than the current rate. Available statistics seem to suggest a very small change in age at marriage (mean age at marriage increased from 17 years in 1977 to 18 years in 1998), a rise in the proportion of unmarried women at the age of 30 years (from seven percent in 1974 to 42 percent in 1995).

The estimates used for the prevalence of HIV and its projections are based on solid data and are quite conservative. Available data indicate a stabilisation of HIV prevalence rates in Malawi in the second half of the 1990s in accordance with the model used in this study.

According to reports by the US Census Bureau, population growth rates will remain positive in all sub-Saharan African countries but will be reduced significantly due to AIDS. For all 21 sub-Saharan African countries, the annual rate of population growth from 1990 to 1995 will be 2.2 percent rather than the 2.6 percent that would be projected without AIDS.

The last important component of the population growth rate is migration. It is, perhaps, the most difficult one to apprehend as quality data on its magnitude are rare and as predictions are almost impossible to make. Migration was usually ignored in previous modelling work aimed at national predictions on the assumption that most migrations occur within countries and that the balance across countries might be zero. The situation is clearly different for most sub-national populations such as regions or provinces, districts and cities, which experience high positive net migration rates.

In conclusion, the present study provides an insight into the demographic impact of AIDS in a high-fertility urban setting of Africa. Most importantly, the study revealed that, in a high-fertility society like Malawi, population growth will still be positive. This means that as more attention and resources are diverted to combat HIV/AIDS, a focus should also be on the negative impacts of the ever-present rapid population growth.

In addition, the study revealed that the epidemic has already had a significant demographic impact on the population of Malawi and will have even greater impact in the future. However, the future course of the epidemic and its demographic consequences could be altered through effective interventions, such as behavioural change toward safe sex, control of sexually transmitted diseases, and interventions for reducing mother-to-child transmission.

Notes

1. The National Statistical Office (NSO) is a government department responsible for collecting, analyzing and disseminating population data through demographic surveys and censuses. As such the population projections produced by NSO represents the 'official' projections of the country.

References

Arriaga, E. E. et al., *1994, Population Analysis with Microcomputers: Presentation of Techniques,* Volume One, Bureau of the Census, Washington.

Malawi Government, 1984, *Malawi Population Census 1977: Analytical Report,* (2 volumes), National Statistical Office, Zomba.

Malawi Government, 1987a, *Malawi Demographic Survey* 1982, National Statistical Office, Zomba.

Malawi Government, 1987b, 1984 *Family Formation Survey,* National Statistical Office, Zomba.

Malawi Government, 1994a, *Malawi Population and Housing Census 1987: Analytical Report* (Volume VII), National Statistical Office, Zomba.

Malawi Government, 1994b, *National Population Policy,* Office of the President and Cabinet, Department of Economic Planning and Development, Lilongwe.

Malawi Government, 1994c, *Malawi Demographic and Health Survey 1992,* National Statistical Office and Macro International Inc., Zomba.

Malawi Government, 1997, *Malawi Knowledge, Attitudes and Practices in Health Survey 1996,* National Statistical Office and Macro International Inc., Zomba.

Malawi Government, 2002, *Malawi Demographic and Health Survey 2000,* National Statistical Office and Macro International Inc., Zomba.

Malawi Government, 2002, *Malawi Population Projections 1998-2023,* National Statistical Office, Zomba.

Malawi Government, 2002, *Analytical Report: 1998 Malawi Population and Housing Census,* National Statistical Office, Zomba.

Malawi Government, 2006, *Malawi Demographic and Health Survey 2004,* National Statistical Office and Macro International Inc., Zomba.

Palamuleni, M. E., 2002, 'A Preliminary Assessment of the Quality of the 1998 Malawi Population and Housing Census Data', *African Population Studies* 17(2):113-129.

Palamuleni, M. E., 2005, 'Estimates of Net Internal Migration for Regions and Districts in Malawi', Paper presented at the Joint Population Conference, held at the University of Free State, Bloemfontein, 28-30 September 2005.

Stover, John, 1999, *AIM, Version 4: A Computer Program for Making HIV/AIDS Projections and Examining the Social and Economic Impact of AIDS.* The Policy Project, The Futures Group International, Washington, DC.

Stover, John and Sharon Kirmeyer, 1999, *DemProj, Version 4: A Computer Program for Making Population Projections.* The Policy Project, The Futures Group International, Washington, DC.

United Nations (2003) *World Population Prospects: The 2002 Revision,* New York. United State Bureau of Census.

Table 1: Projections Assumptions for Malawi and its Regions, 1998-2023

		1998	2003	2008	2013	2018	2023
Fertility	Malawi	6.5	6.3	6.0	5.8	5.5	5.3
	NR	6.5	6.3	6.0	5.8	5.5	5.3
	CR	7.1	6.8	6.6	6.3	6.1	5.8
	SR	6.1	5.9	5.7	5.4	5.2	5.0
Mortality (M)	Malawi	40.1	42.6	45.1	47.6	50.1	52.6
	NR	43.3	45.8	48.3	50.8	53.3	55.8
	CR	44.0	46.5	49.0	51.5	54.0	56.5
	SR	34.3	36.8	39.3	41.8	44.3	46.8
Mortality (F)	Malawi	43.2	45.7	48.2	50.7	53.2	55.7
	NR	49.5	52.0	54.5	57.0	59.5	62.0
	CR	51.0	53.5	56.0	58.5	61.0	63.5
	SR	40.3	42.8	45.3	47.8	50.3	52.8
Migration	Malawi	0.0	0.0	0.0	0.0	0.0	0.0
	NR	2000	2000	2000	2000	2000	2000
	CR	3000	3000	3000	3000	3000	3000
	SR	-5000	-5000	-5000	-5000	-5000	-5000
HIV/AIDS	Malawi	14.5	14.8	13.5	13.2	13.3	12.9
	NR	11.5	13.0	12.0	11.4	11.6	11.5
	CR	9.4	11.0	10.4	9.9	10.0	9.9
	SR	19.7	18.7	16.9	17.0	17.2	16.7

Table 2: Projected Population for Malawi and Regions, 1998-2023 (No migration)

		Population in Million						
	Malawi	NR	CR	SR	Malawi	NR	CR	SR
1998	9.9	1.2	4.1	4.6	100.0	12.4	41.0	46.6
1999	10.2	1.3	4.2	4.7	100.0	12.4	41.2	46.3
2000	10.5	1.3	4.4	4.8	100.0	12.5	41.5	46.0
2001	10.8	1.4	4.5	4.9	100.0	12.5	41.7	45.8
2002	11.1	1.4	4.7	5.0	100.0	12.5	42.0	45.5
2003	11.4	1.4	4.8	5.2	100.0	12.6	42.2	45.2
2004	11.7	1.5	5.0	5.3	100.0	12.6	42.5	45.0
2005	12.0	1.5	5.1	5.4	100.0	12.7	42.6	44.7
2006	12.3	1.6	5.3	5.5	100.0	12.7	42.9	44.4
2007	12.6	1.6	5.4	5.6	100.0	12.7	43.1	44.2
2008	12.9	1.7	5.6	5.7	100.0	12.8	43.4	43.9
2009	13.2	1.7	5.8	5.8	100.0	12.8	43.6	43.6
2010	13.5	1.7	5.9	5.9	100.0	12.8	43.9	43.3
2011	13.8	1.8	6.1	6.0	100.0	12.9	44.1	43.0
2012	14.1	1.8	6.3	6.1	100.0	12.9	44.3	42.8
2013	14.4	1.9	6.4	6.1	100.0	12.9	44.6	42.5
2014	14.8	1.9	6.6	6.2	100.0	12.9	44.8	42.2
2015	15.1	2.0	6.8	6.3	100.0	12.9	45.1	42.0
2016	15.4	2.0	7.0	6.4	100.0	13.0	45.3	41.7
2017	15.8	2.1	7.2	6.5	100.0	13.0	45.6	41.4
2018	16.1	2.1	7.4	6.6	100.0	13.0	45.8	41.2
2019	16.5	2.2	7.6	6.7	100.0	13.1	46.1	40.9
2020	16.8	2.2	7.8	6.8	100.0	13.1	46.3	40.6
2021	17.2	2.3	8.0	7.0	100.0	13.1	46.6	40.3
2022	17.6	2.3	8.3	7.1	100.0	13.1	46.9	40.0
2023	18.1	2.4	8.5	7.2	100.0	13.1	47.1	39.8

Table 3: Projected Population for Malawi and Regions, 1998-2023 (with migration)

	Malawi	NR	CR	SR	Malawi	NR	CR	SR
1998	9.9	1.2	4.1	4.6	100.0	12.4	41.0	46.6
1999	10.2	1.3	4.2	4.7	100.0	12.5	41.2	46.2
2000	10.5	1.3	4.4	4.8	100.0	12.6	41.5	45.9
2001	10.8	1.4	4.5	4.9	100.0	12.7	41.8	45.6
2002	11.1	1.4	4.7	5.0	100.0	12.8	42.0	45.2
2003	11.4	1.5	4.8	5.1	100.0	12.8	42.3	44.9
2004	11.7	1.5	5.0	5.2	100.0	12.9	42.6	44.5
2005	12.0	1.6	5.2	5.3	100.0	13.0	42.8	44.2
2006	12.3	1.6	5.3	5.4	100.0	13.0	43.0	43.9
2007	12.7	1.7	5.5	5.5	100.0	13.1	43.3	43.6
2008	13.0	1.7	5.6	5.6	100.0	13.2	43.5	43.3
2009	13.3	1.8	5.8	5.7	100.0	13.3	43.8	43.0
2010	13.6	1.8	6.0	5.8	100.0	13.3	44.0	42.6
2011	13.9	1.9	6.2	5.9	100.0	13.4	44.3	42.3

2012	14.2	1.9	6.3	6.0	100.0	13.5	44.5	42.0
2013	14.5	2.0	6.5	6.1	100.0	13.6	44.8	41.7
2014	14.8	2.0	6.7	6.1	100.0	13.6	45.0	41.3
2015	15.2	2.1	6.9	6.2	100.0	13.7	45.3	41.0
2016	15.5	2.1	7.1	6.3	100.0	13.7	45.5	40.7
2017	15.9	2.2	7.3	6.4	100.0	13.8	45.8	40.4
2018	16.2	2.2	7.5	6.5	100.0	13.8	46.1	40.1
2019	16.6	2.3	7.7	6.6	100.0	13.9	46.3	39.8
2020	17.0	2.4	7.9	6.7	100.0	13.9	46.6	39.5
2021	17.4	2.4	8.1	6.8	100.0	14.0	46.8	39.2
2022	17.8	2.5	8.4	6.9	100.0	14.0	47.1	38.9
2023	18.2	2.6	8.6	7.0	100.0	14.1	47.4	38.5

Table 4: Comparisons of Different Sets of Projections

		US	UN	NSO
2000	10.5	11.3	11.5	10.5
2005	12.0	12.7	12.9	12.3
2010	13.5	14.3	14.3	14.6
2015	15.0	16.1	16.0	17.0
2020	16.7	18.0	17.8	20.1
2025	17.8	20.0	19.7	22.2

Martin E. Palamuleni,
Population Training and Research Unit,
Faculty of Human and Social Sciences,
North-West University,
Private Bag X2046,
Mmabatho 2735.
South Africa
palamulenim@uniwest.ac.za