
HIV/AIDS IN BOTSWANA: ESTIMATED TRENDS AND IMPLICATIONS BASED ON SURVEILLANCE AND MODELING

*National AIDS Coordinating Agency
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ACKNOWLEDGEMENTS

This project came about as a result of NACA's recognition for the need to provide up-to-date HIV/AIDS estimates to strengthen on-going evidence-based programme development efforts in the national response. It comes at a time when Botswana is renewing its commitment to prevention of HIV infection, having aggressively pursued provision of treatment to those in need to reach one of the world's highest coverage levels at more than 88% by March 2008. It is my hope that results presented here will go a long way to reinforcing various interventions that are already underway at different levels of our response to the AIDS epidemic.

The success of the modeling exercise derives its success from a strong collaboration between NACA and a number of partner organizations. We are particularly grateful for support given by the Ministry of Health's Department of HIV/AIDS Prevention and Care in ensuring availability of accurate programme data for input into the model. The Central Statistics Office (CSO) was instrumental in providing critical population level data required for the model while University of Botswana's Departments of Mathematics and Population Studies were active members of the Task Force that was assembled to guide the project. UNAIDS supported the capacity building component of the project. The exercise also benefited from technical reviews by the African Comprehensive HIV/AIDS Partnerships (ACHAP) and BOTUSA, the Botswana USA Project.

I would also like to acknowledge input from various stakeholders who participated in both the formative workshop held in Gaborone in February 2008, and the final workshop held in June 2008 as their contributions helped shape the scope and quality of the project. Once again, the multi-sectoral nature and spirit of Botswana's national response to HIV/AIDS was abundantly demonstrated.

The Consultant, Mr. John Stover from Futures Institute showed extraordinary ability to work with a multi-disciplinary team – his patience and willingness to revise numerous versions of the report enabled us to maximize technical inputs of various local experts.

Lastly, this exercise was made possible by financial support from ACHAP - I would like to express NACA's appreciation for this strategic input.

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EXECUTIVE SUMMARY

This report describes the use of the sentinel surveillance data and the BAIS II to estimate national prevalence in Botswana today and the implications of that estimate for other indicators of interest, such as the number of people infected, the annual number of new infections and the number of people in need of ART. The estimates presented here were developed through a collaborative process involving NACA, ACHAP, Ministry of Health, Central Statistics Office, and the University of Botswana. Funding has been provided by ACHAP.

These estimates are based on the entire history of HIV surveillance among women attending antenatal clinics (to establish the trends) and the results of the national survey, BAIS II, (to set the level in 2004). These data have been used in two computer models EPP and Spectrum. EPP has been used to estimate the national trend in HIV prevalence among adults in urban and rural areas. Spectrum has been used to estimate the consequences of those trends for the number of new infections, people living with HIV, AIDS deaths and the impact of ART and PMTCT programs.

These results indicate that national prevalence among adults 15-49 peaked at 27% in 2001 and has since declined somewhat to 23% (range 22.5%-24.5%) in 2007. Prevalence has been declining slightly in urban areas and has been roughly constant in rural areas.

The annual number of new infections among adults (15+) peaked in the mid-1990s at around 33,000 when prevalence was increasing most rapidly. By 2007 it had declined by half to 18,000 (12,000 – 26,000). This implies that incidence (the percentage of the uninfected population 15-49 that is newly infected each year) peaked at about 5.0% in 1995 and has declined to 2.4% by 2007.

The annual number of new child infections rose to a peak of just under 4,600 by 1999 and then declined sharply as adult prevalence declined and as the PMTCT program expanded. By 2007 the estimated annual number of new child infections had declined to about 890.

The rapid expansion of the ART program has significantly reduced the number of AIDS deaths, averting about 50,000 adult deaths through the end of 2007. The number of lives saved in the future will depend on prevention efforts today and their effect on new infections. But for the next few years the number of people newly needing ART is already determined by past infections. If we assume that the coverage of ART remains high, we can expect ART will avert over 130,000 deaths through 2016.

As the number of people receiving ART expands each year, the number in need in future years will continue to grow. We estimate that most of those on ART in 2007 will still need ART in 2008; in addition, there will be about 23,000 adults newly needing ART in 2008. As a result the estimated total need for ART among adults in 2007 was 120,000 and for 2008 it will rise to 137,000 (116,000 – 156,000). There is an additional need for ART among children of about 7,500 (6,800 – 7,800).

The successful expansion of the ART and PMTCT programs has reduced the number of AIDS deaths by half. The challenge for the future is to continue these successful programs while, at the same time, improving prevention efforts to reduce the number of new infections still occurring each year.

BACKGROUND

Each year the Ministry of Health conducts sentinel surveillance for HIV infections at ante-natal clinics throughout the country. These data provide information on trends in HIV prevalence among pregnant women attending antenatal clinics. In 2004 a national household survey (Botswana AIDS Impact Survey, BAIS II) provided a good estimate of HIV prevalence in the population aged 18 months and above at that time. This report describes the use of the sentinel surveillance data and the BAIS II to estimate national prevalence in Botswana today and the implications of that estimate for other indicators of interest, such as the number of people infected, the annual number of new infections and the number of people in need of ART. The estimates presented here were developed through a collaborative process involving NACA, ACHAP, Ministry of Health, Central Statistics Office, and the University of Botswana. Funding has been provided by ACHAP.

A national estimation workshop was held in Gaborone on February 5-6, 2008 to prepare the initial estimate. A list of participants in that workshop is provided in Appendix A. Those results were further refined after the workshop once each of the participating agencies had reviewed the data they provided to the estimation process and reviewed the draft of this report. A final review workshop was held on June 9, 2008. This report updates a previous study on the demographic impact of AIDS in Botswana, but the conclusions regarding demographic impact are similar.¹

PURPOSE

The purpose of this activity was to provide up-to-date information for policy development, programme planning and monitoring by utilizing the latest surveillance and programme statistics to estimate the level and trend of adult prevalence and its consequences. The future implications of these trends are included to assist with future planning and programme implementation.

DEMOGRAPHIC ESTIMATES AND PROJECTIONS

The demographic estimates and projections were prepared using the Spectrum projection package. Spectrum contains a full-featured demographic projection module called DemProj, which estimates the future population by age and sex based on trends in fertility, non-AIDS mortality and migration.² The demographic projection for Botswana includes a decline in the total fertility rate from 6.2 in 1980 to 2.9 by 2008, a slow decline in mortality due to causes other than AIDS and a small amount of net immigration. The details of the projection assumptions are provided in Appendix B. The result is a population that grows from 1 million people in 1980 to just over 2 million people by 2008. The adult population (aged 15 and over) is estimated at 1.3 million in 2008.

¹ Dorrington RE, Moultrie TA, Daniel T (2006). *The Demographic Impact of HIV/AIDS in Botswana*. Gaborone: UNDP and NACA, Botswana.

² Stover J, Kirmeyer S. *DemProj: A Computer Program for Making Population Projections*. Washington, DC: USAID | Health Policy Initiative, January 2008.

ADULT HIV PREVALENCE

Adult HIV prevalence is the percentage of the population between the ages of 15 and 49 infected with HIV. Estimates of prevalence in other age groups can also be prepared but adult prevalence is the most widely used indicator of the extent of HIV infection.

The Botswana AIDS Impact Survey II conducted in 2004 measured the prevalence of HIV infection in the population aged 18 months and above.³ Although only 61% of those interviewed in this survey agreed to provide a saliva sample for HIV testing, the results of this survey are thought to provide a reasonably accurate measure of HIV prevalence in 2004. A new national survey, BAIS III, will be conducted in second half of 2008.

The HIV surveillance program conducts annual HIV surveys among women attending ante-natal clinics. Surveillance has been conducted annually since 1992 and now includes 24 sites.⁴ The results are shown in Appendix B. Since these surveys measure HIV prevalence in pregnant women they do not represent prevalence in all adults, including both men and women.

An estimate of the trend in adult prevalence from the beginning of the epidemic to 2007 can be prepared using both the BAIS II results to determine the level of prevalence and the ANC surveillance results to determine the trend over time.

The UNAIDS Reference Group on Estimates, Models and Projections has developed several tools to estimate national prevalence. One of these tools, the Estimation and Projection Package (EPP), is used in most countries in sub-Saharan Africa to estimate prevalence trends from surveillance and survey data in countries with generalized epidemics.⁵ EPP works by fitting a simple epidemic model to surveillance data from multiple sites over time. Separate estimates are made for urban and rural prevalence and then combined to produce a national estimate.

The epidemic model uses four parameters to determine the prevalence trend over time: the start year of the epidemic, the initial force of infection, the proportion of the population at risk of infection and the rate of replenishment of the population at risk when it is depleted by AIDS deaths. EPP generates 50,000 to 200,000 epidemic curves by randomly selecting values of these four parameters from plausible distributions. Each of these curves is tested to see how well it fits the surveillance and survey data. A sample of curves is drawn from the full set with the likelihood of selection proportional to the goodness of fit. The result is a most likely curve that provides a point estimate of prevalence in each year and a range around the point estimate. A more complete description of the model is available in Appendix C.

³ National AIDS Coordinating Agency (NACA), CSO and Other Development Partners. 2005. *Botswana AIDS Impact Survey II: Statistical Report*. Gaborone: National AIDS Coordinating Agency.

⁴ Ministry of Health. *Botswana Second Generation HIV/AIDS Surveillance, 2005*. Gaborone, Department of HIV/AIDS Prevention and Care.

⁵ Brown T, Grassly NC, Garnett G, Stanecki K. "Improving projections at the country level: the UNAIDS Estimation and Projection Package 2005." *Sex Trans Inf* 2006;82:34-30.

The EPP model was applied to the surveillance and survey data for Botswana.⁶

Figure 1 shows the results for the urban population. Adult HIV prevalence grew rapidly during the early 1990s, and then reached a plateau of around 26% in 2000 before declining to 24% by the time of the Botswana AIDS Impact Survey in 2004 and to about 21% in 2007. The projection beyond 2007 shown in the figure illustrates the consequences of extending the current trend; it is not intended as a forecast of what will happen. The dashed lines show the range around the trend.

Figure 1. Estimated trend in urban adult HIV prevalence

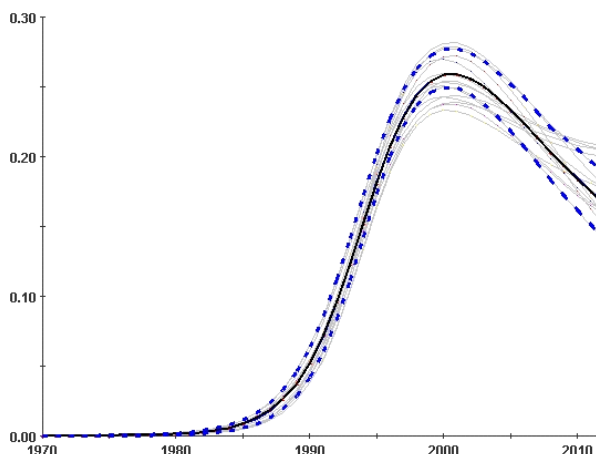


Figure 2. Estimated trend in rural adult HIV prevalence

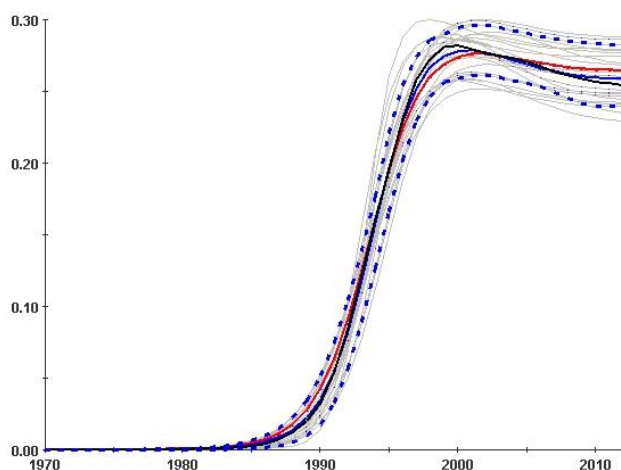
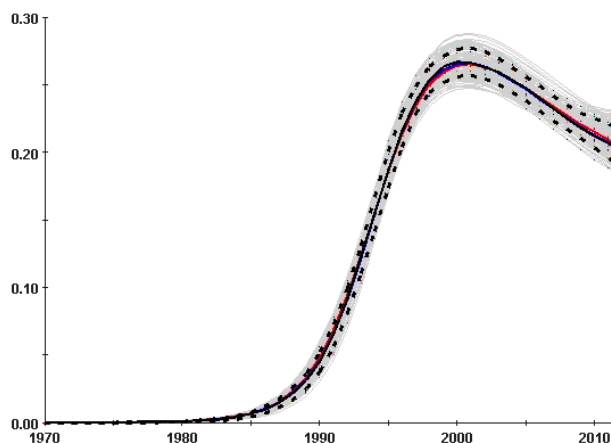


Figure 2 shows the results for the rural population. These results suggest that the rural epidemic followed a pattern similar to the urban epidemic reaching a peak of 28% around 2000. The data indicate that rural prevalence has remained relatively constant in the last few years, declining only slightly to just over 27% in 2004 and just under 27% by 2007.

Figure 3 shows the national estimate created by combining the urban and rural data. These results indicate that national prevalence among adults 15-49 peaked at 27% in 2001 and has since declined somewhat to 23% (range 22.5%-24.5%) in 2007.

Figure 3. Estimated trend in national HIV prevalence



⁶ The EPP fit to the urban data is based on generating 200,000 curves with the following *a priori* parameter distributions **to**: 1970-1975, **r**: 0.5-150, **fo**: 0.3-0.7, **phi**: mean of 0 scale of 50. The fit to the rural data is based on 50,000 curves using the default *a priori* parameter distributions of **to**: 1970-1990, **r**: 0.5-150, **fo**: 0-1, **phi**: mean of 100 scale of 50.

CONSEQUENCES OF ADULT HIV PREVALENCE LEVELS AND TRENDS

The estimates of adult HIV prevalence are used in the AIDS module of Spectrum⁷ to estimate the other indicators of interest such as the number of people living with HIV, new infections, AIDS deaths, need for treatment and the number of orphans.

The major inputs and outputs of the AIDS module of Spectrum are shown in Figure 4. The HIV projections start with an estimate and projection of adult prevalence, which is combined with information on the age and sex distribution of prevalence and progression to death to estimate the number of new adult infections by age and sex. New infant infections are estimated from prevalence among pregnant women and the rate of mother-to-child transmission, which is dependent on infant feeding practices and the coverage of prophylaxis with ARVs. New infections progress over time to a symptomatic stage where ART is needed.

The rate of progression from infection to AIDS deaths is a distribution drawn from cohort studies in sub-Saharan Africa.⁸ The median time from infection to AIDS death without treatment is 11 years. Eligibility for ART is assumed to occur at a median of three years before AIDS death based on estimates derived from cohort studies that track the evolution of CD4 counts throughout disease progression.⁹ Those who receive first- and/or second-line ART experience extended survival. Based on treatment cohort data the default assumptions in the Spectrum model are that 85% survive the first year on ART and that 95% survive each subsequent year.⁹ First year survival is lower than in subsequent years since some people start ART too late and die before it has a chance to restore their immune system function. In Botswana, data are available on the proportion of ART who are known to be alive by time since the initiation of therapy. These data show that after 12 months, 91.3% of ART patients are known to be still alive, and after five year 86% of ART patients are still alive. These rates are likely to overstate the true survival since a significant proportion of those who were lost to follow-up (i.e. their status is unknown) have probably died. Nevertheless we have used these data in these projections and also show the effects of using the lower survival rates based on global data.

People at any stage are subject to non-AIDS mortality at the same rates as those who are not infected. AIDS and non-AIDS orphans are estimated from the number of adult deaths each year, the fertility history of those who die and the rates of child survival.

Spectrum estimates the uncertainty around the estimate of each indicator by using a Monte Carlo approach. One thousand projections are calculated using different prevalence curves provided by EPP and drawing random values of other key parameters (such as the progression time to AIDS death, and the effectiveness of ART) for each projection. The results are analyzed to produce 5% and 95% plausibility bounds¹⁰ around each point estimate.

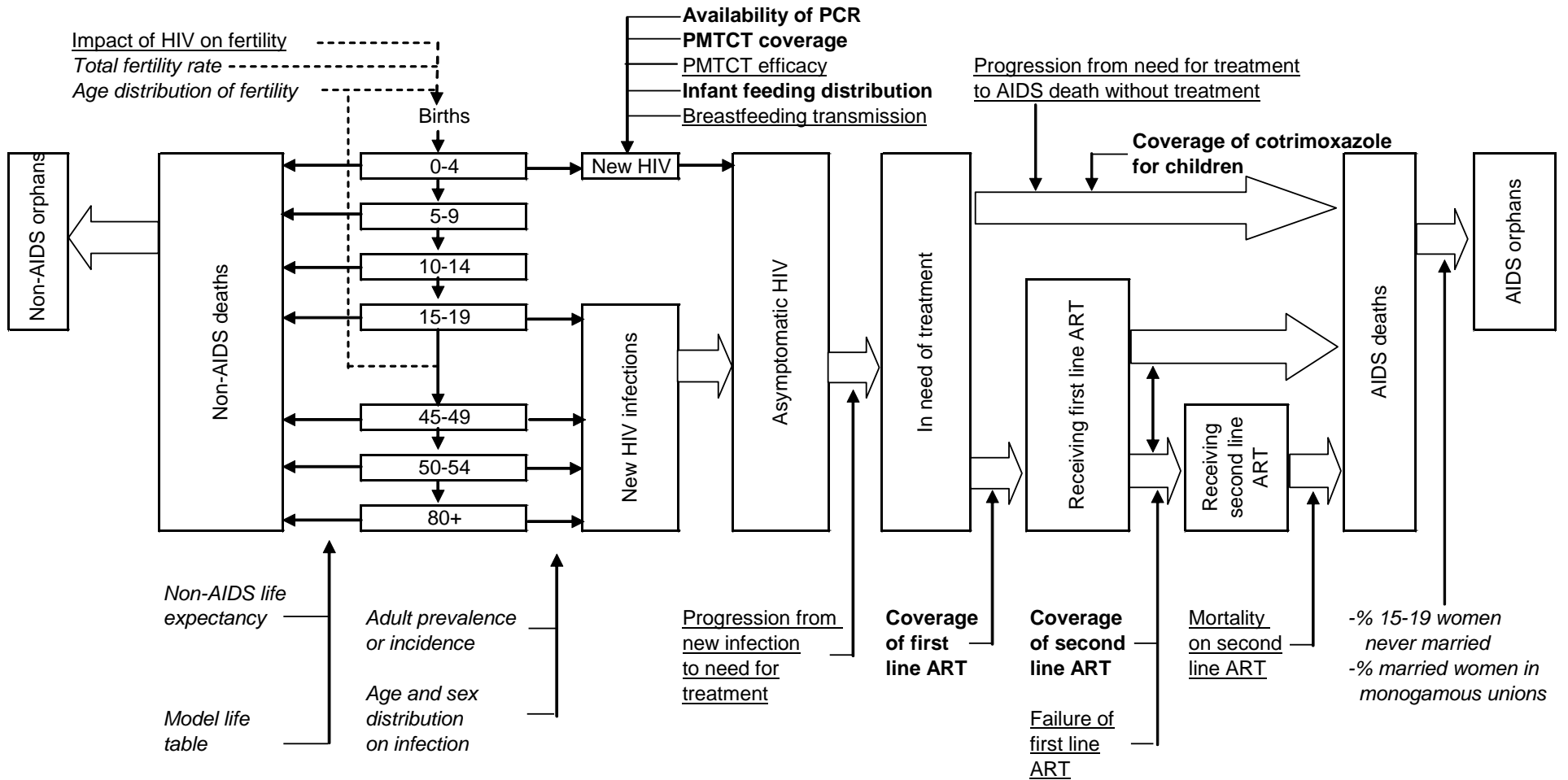
⁷ Stover J. *AIM: A Computer Program for Making HIV/AIDS Projections and Examining the Demographic and Social Impacts of AIDS*. Washington, DC: USAID | Health Policy Initiative, January 2008.

⁸ Todd J, Glynn J, Marston M, Rangsin R, Lutalo T, Biraro S, Sonnenberg P, Mwitwa W, Nelson K, Fitzgerald D, Karita E, Zaba B. "Time from HIV sero-conversion to death prior to ART: a collaborative analysis of eight studies in six developing countries." 2007. *AIDS* vol 21 sup 6: S55-S63

⁹ Stover J, Johnson P, Zaba B, Zwahlen M, Dabis F, Ekpini R. "The Spectrum projection package: improvements in estimating mortality, ART needs, PMTCT impact and uncertainty bounds." *Sexually Transmitted Infections* 2008 [forthcoming].

¹⁰ The bounds are not true confidence intervals since the errors around the input assumptions are not measured directly and we cannot include all sources of error. Thus, they are called 'plausibility bounds'.

Figure 4. Inputs, outputs and process of the demographic and AIDS modules in Spectrum

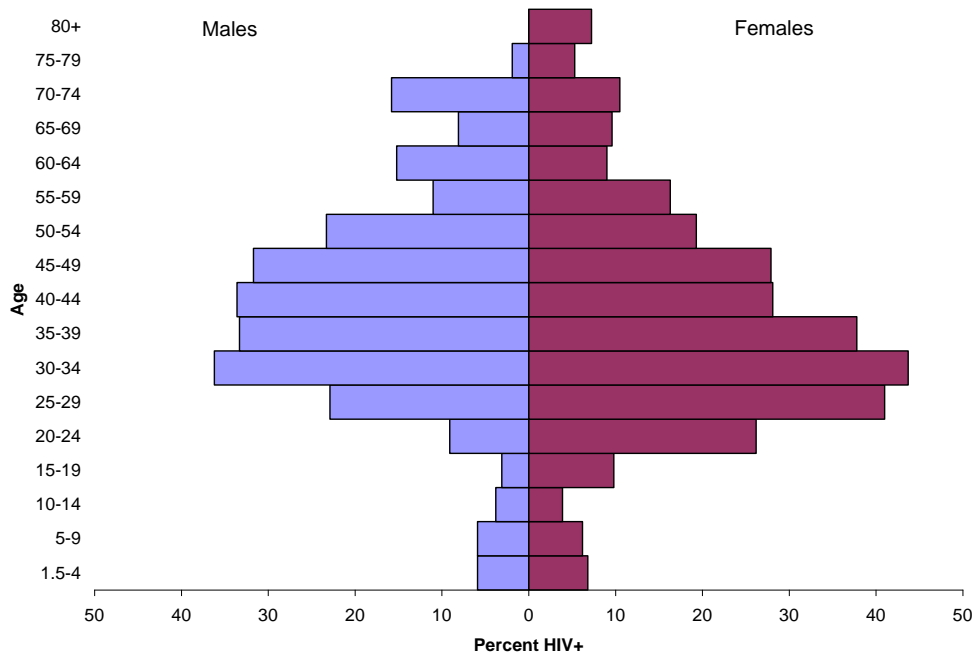


Variables in italics are country-specific demographic and epidemiological inputs
Variables in bold are based on country-specific service statistics and projections
Variables in underlined type are based on international studies
 ART = Antiretroviral therapy; PMTCT = prevention of mother-to-child transmission

HIV AMONG ADULTS

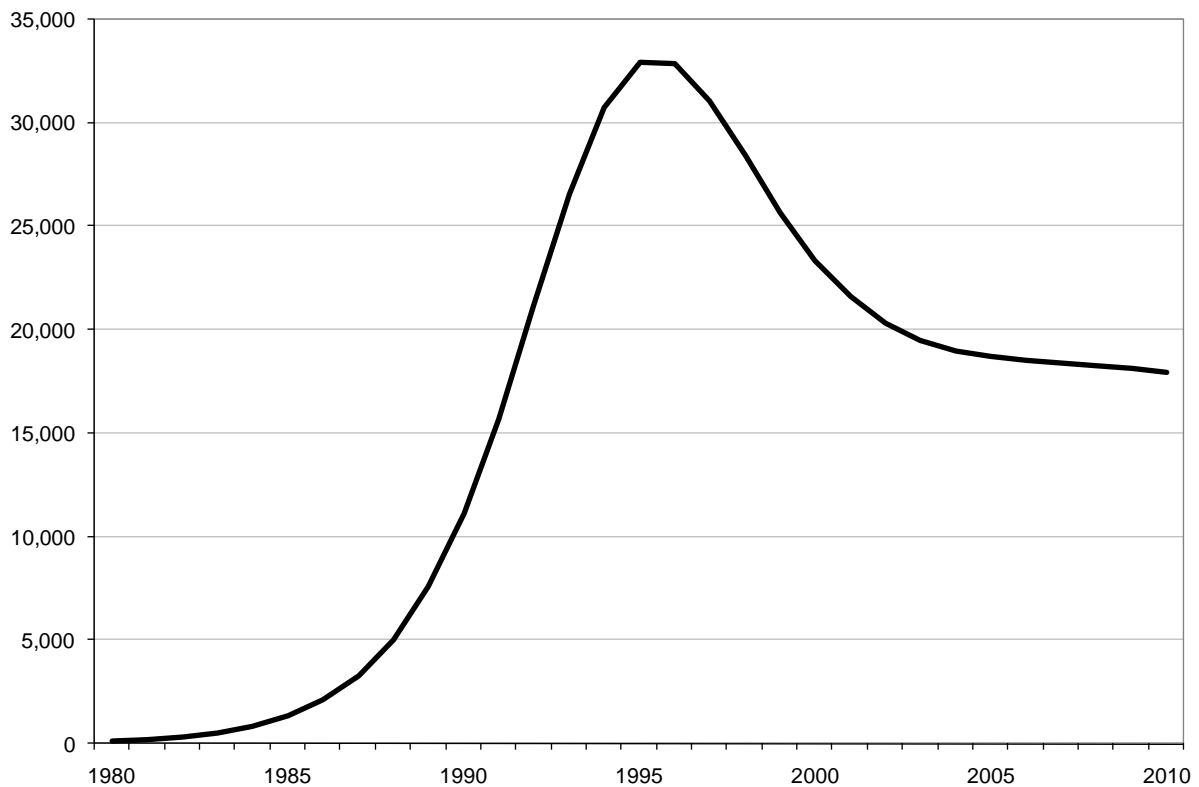
The adult prevalence estimates prepared using EPP can be extended to all adults over the age of 15 by using the prevalence pattern by age from the BAIS II survey, Figure 5. Applying this pattern to the 15-49 prevalence estimate from EPP and combining it with the estimated population by age and sex in 2007 produces an estimate of 310,000 (299,000 – 325,000) adults living with HIV in 2007, and 322,000 (310,000 – 337,000) in 2008.

Figure 5. Prevalence by age from the BAIS II



The number of new adult HIV infections each year is calculated as the number of new infections required to match the estimated adult prevalence. (Since the number of HIV-positive adults is derived from the prevalence trend estimated from ANC surveillance and BAIS II, we can estimate the number of new infections each year as the increase required to match the change in the total number of people infected and to replace those dying from AIDS.) The resulting trend of new infections is shown in Figure 6. The annual number of new infections peaked in the mid-1990s at around 33,000 when prevalence was increasing most rapidly. By 2007 it had declined by half to 18,000 (12,000 – 26,000). This implies that incidence (the percentage of the uninfected population 15-49 that is newly infected each year) peaked at about 5.0% in 1995 and has declined to 2.4% by 2007.

Figure 6. Annual number of new adult HIV infections



It is encouraging to note the decline in incidence from the peak in the mid-1990s. However, from the surveillance and survey data on prevalence it is not possible to determine how much of the decline is due to natural epidemic dynamics and how much might be due to behavior change.

HIV AMONG CHILDREN

HIV can be transmitted from an infected mother to her child. With no interventions to prevent mother-to-child transmission, about 30% of children born to HIV-infected mothers will be infected themselves. This rate can be reduced to about 20% with replacement feeding and even lower through the use of anti-retroviral drugs for the mother and child. The average rate of transmission depends on the infant feeding practices and prophylaxis with ARV.

Botswana has an extensive program to prevent mother-to-child transmission (PMTCT) that covers most pregnant women. It includes testing and, for those women who are found to be HIV+, provision of anti-retroviral drugs and counseling on infant and young child feeding following WHO criteria of affordability, feasibility, acceptability, sustainability and safety. Formula is provided for women who choose formula feeding. Table 1 shows the estimated percentage of HIV+ women giving birth that received PMTCT by the type of treatment they received and the estimated transmission rate.

Table 1. Distribution of HIV+ Pregnant Women by Type of PMTCT Treatment and Estimated Mother-to-Child Transmission Rate

<i>Regimen</i>	<i>Percent of HIV+ Pregnant Women Receiving this Regimen</i>	<i>Estimated Mother-to-Child Transmission Rate</i>
No program	6%	0.240
Single dose Nevirapine	<1%	0.130
AZT or AZT + NVP	69%	0.028
Triple Prevention Therapy	7%	0.019
Triple Therapy to Treat Mother	17%	0.009
Total	100%	
Weighted Average		0.037

Source: Tlale J, Keapoletswe K, Anderson MG, Gomez FdIH, Mmelesi M, Seipone K. Mother-to-child transmission rate in Botswana – analysis of dried blood spot (DBS) results from the national PMTCT programme, Abstract presented at the International AIDS Conference, Mexico City, August 2008, THAC0402.

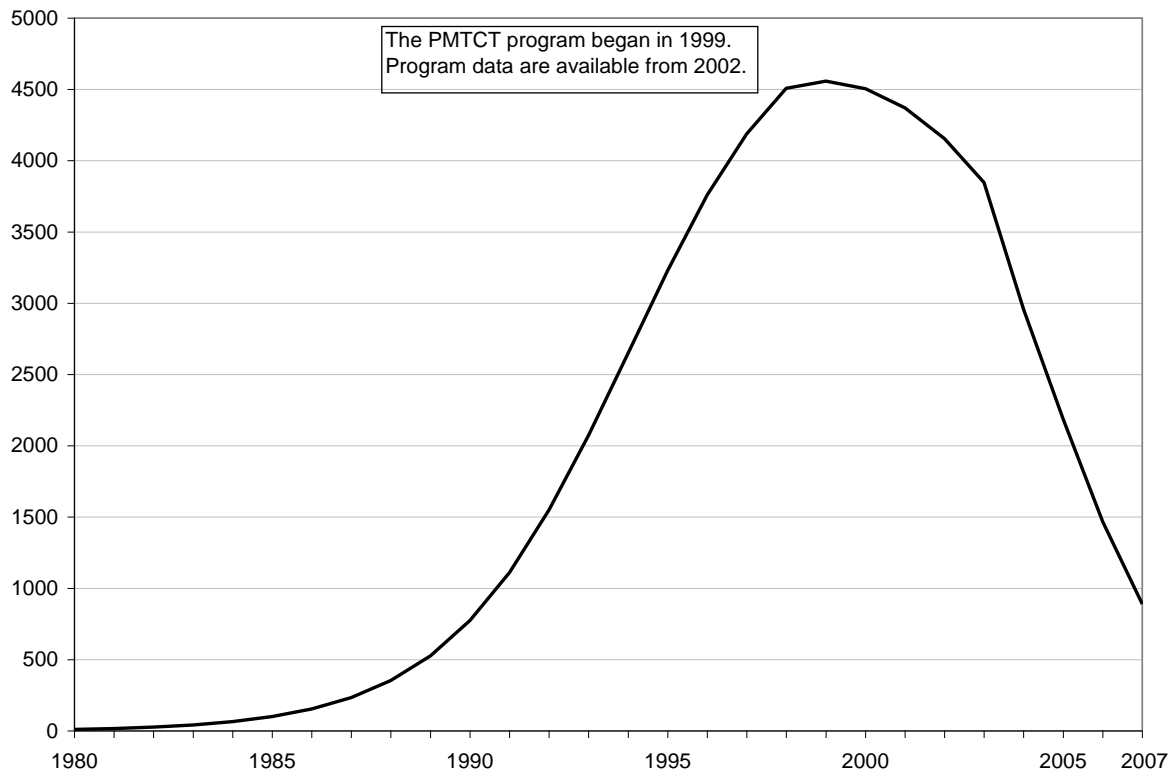
Programme data on the number of women receiving PMTCT services are available from 2002. The program actually started in 1999 so we have estimated the increase in coverage from 1999 to 2002 to provide a smooth trend.

HIV+ women generally have lower fertility rates than HIV- women of the same age.¹¹ This is due to higher rates of miscarriage among HIV-positive women and higher rates of secondary sterility due to a history of sexually transmitted infections. We assume that fertility is reduced by 30% by HIV infection among women aged 20 or older.

11 Lewis J, Ronsmans C, Ezeh A, and Gregson S. “The Population Impact of HIV on Fertility in sub-Saharan Africa.” *AIDS* 2004; 18 (suppl. 2): S35-S43.

This information implies that new child infections rose to a peak of just under 4,600 by 1999 and then declined sharply as adult prevalence declined and as the PMTCT program expanded (Figure 7). By 2007 the estimated annual number of new child infections had declined to about 890.

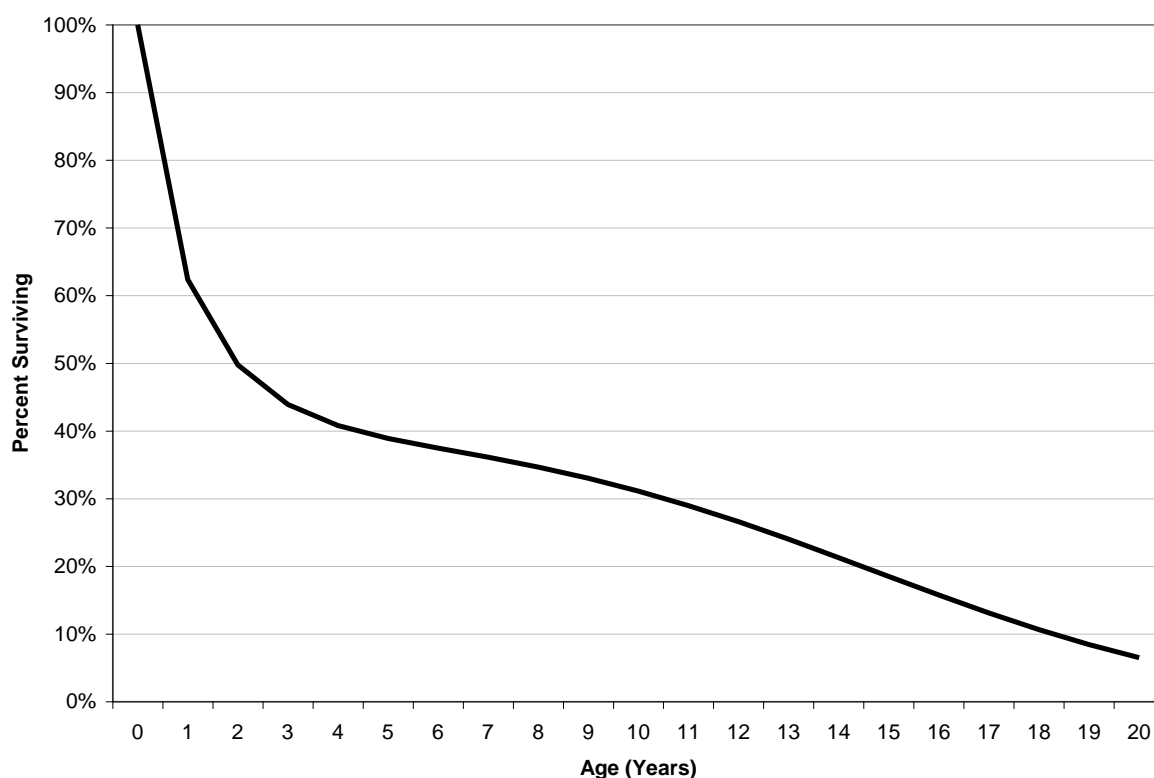
Figure 7. New HIV infections among children



The net survival of children after HIV infection at birth is represented in Spectrum by a double Weibull curve (a form of S-shaped curve that fits HIV patterns well) fitted to longitudinal data¹² (Figure 8). This pattern reflects the fact that some children progress from infection to death quickly while others progress more slowly. The current number of infected children is a function of the past pattern of new infections and the survival rates of those children. For 2007 the estimated number of HIV+ children is 19,600 (18,000 – 21,000).

¹² Marston M, Zaba B, Solomon JA, *et al.* “Estimating the net effect of HIV on child mortality in African populations affected by generalized HIV epidemics.” *J Acquir Immune Defic Syndr* 2005; 38: 219-27.

Figure 8. Percentage of children infected with HIV at birth surviving by age



NUMBER RECEIVING TREATMENT

Botswana has an extensive program of treatment with anti-retroviral drugs that has achieved coverage rates that are among the highest in the world. The program also provides co-trimoxazole for children to prevent opportunistic infections. The estimated number of people receiving treatment by year is shown in Table 2.

Table 2. Number of People Receiving ART by Year Reported by the MOH

<i>Year</i>	<i>Adults Receiving ART</i>	<i>Children Receiving ART</i>	<i>Children Receiving Co-trimoxazole</i>
2000	932		
2001	1,865		
2002	2,811		
2003	10,346		
2004	31,449	2,142	5,475
2005	51,661	3,503	8,115
2006	81,874	5,564	8,830
2007	85,497	7,435	9,858

AIDS DEATHS

The number of AIDS deaths each year is determined by the number of new HIV infections in the past, the rate of progression from infection to death and the coverage and effectiveness of treatment. In Spectrum we assume that the median time from infection to AIDS death without treatment is 11 years, but that ART reduces mortality to produce 91% survival of those on ART for the first year and 99% in each subsequent year.

The resulting estimate of the number of AIDS deaths is shown in Figure 9. The number of adult AIDS deaths probably peaked in 2003 and has declined by half since then as a result of the rapid expansion of ART. The slight increase in 2007 is due to the slower rate of increase in the number of people on ART as coverage has grown toward universal access and the number of people newly needing ART remains high.

According to these estimates the expansion of the ART coverage has averted about 50,000 adult deaths through the end of 2007. The number of lives saved in the future will depend on prevention efforts today and their effect on new infections. But for the next few years the number of people newly needing ART is already determined by past infections. If we assume that the coverage of ART remains high, we can expect ART will avert over 130,000 deaths through 2016.

The large number of AIDS deaths shown in Figure 9 has changed the overall mortality pattern significantly. Figure 10 shows the estimated number of deaths from all causes by age for 2007. The dashed line shows the number of deaths from causes other than AIDS while the solid line shows the total number of deaths. It is apparent that AIDS has caused mortality to increase substantially among adults between the ages of 20-60 and has had a smaller effect on the death rate among young children.

Figure 9. Estimated number of adult AIDS deaths

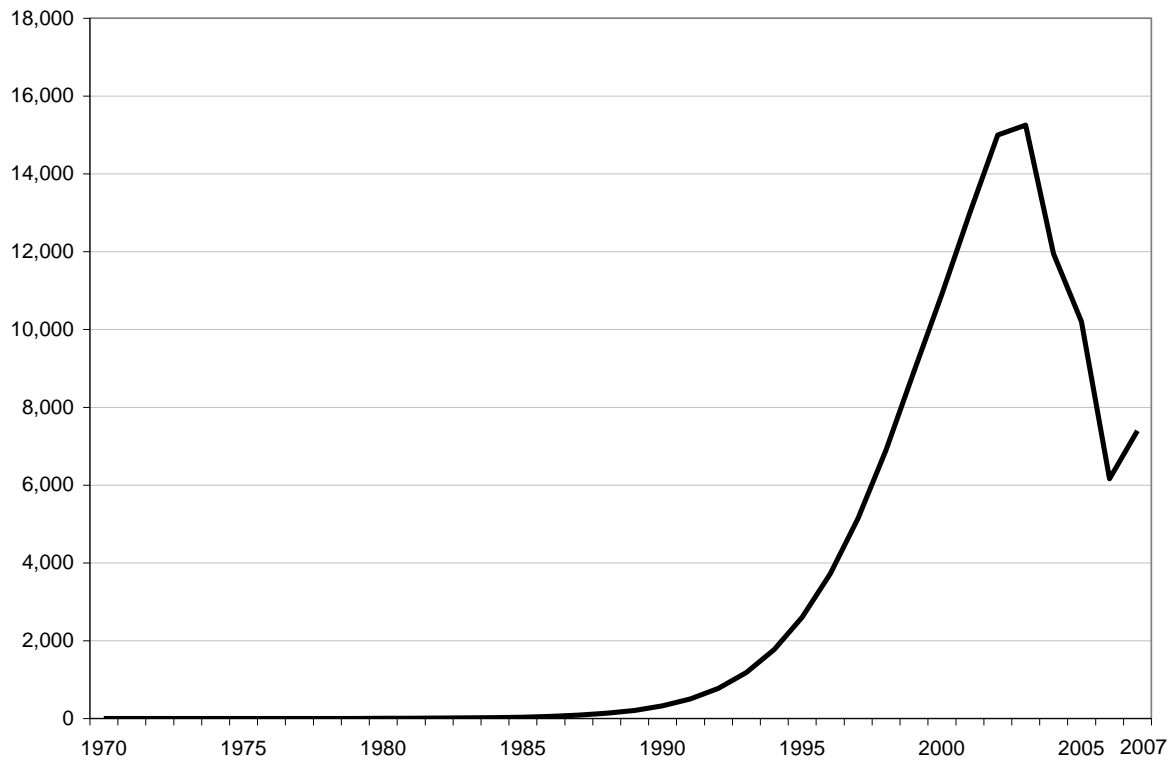
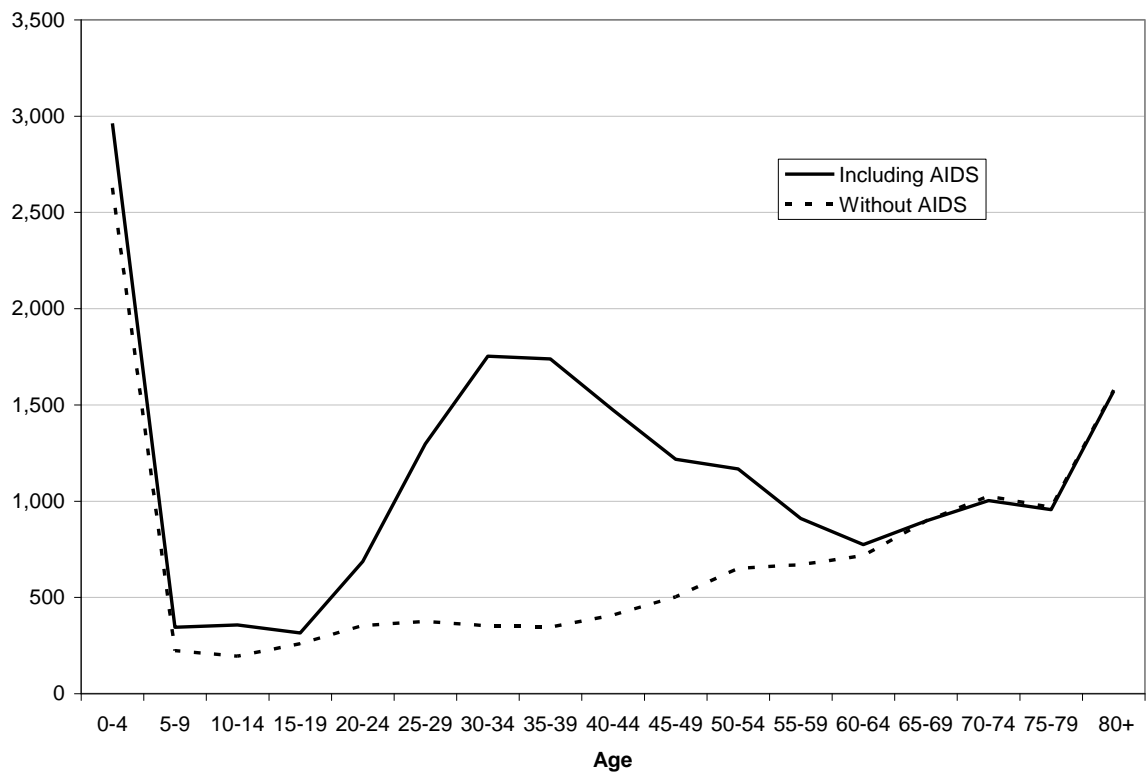


Figure 10. Annual deaths by age with and without AIDS - 2007

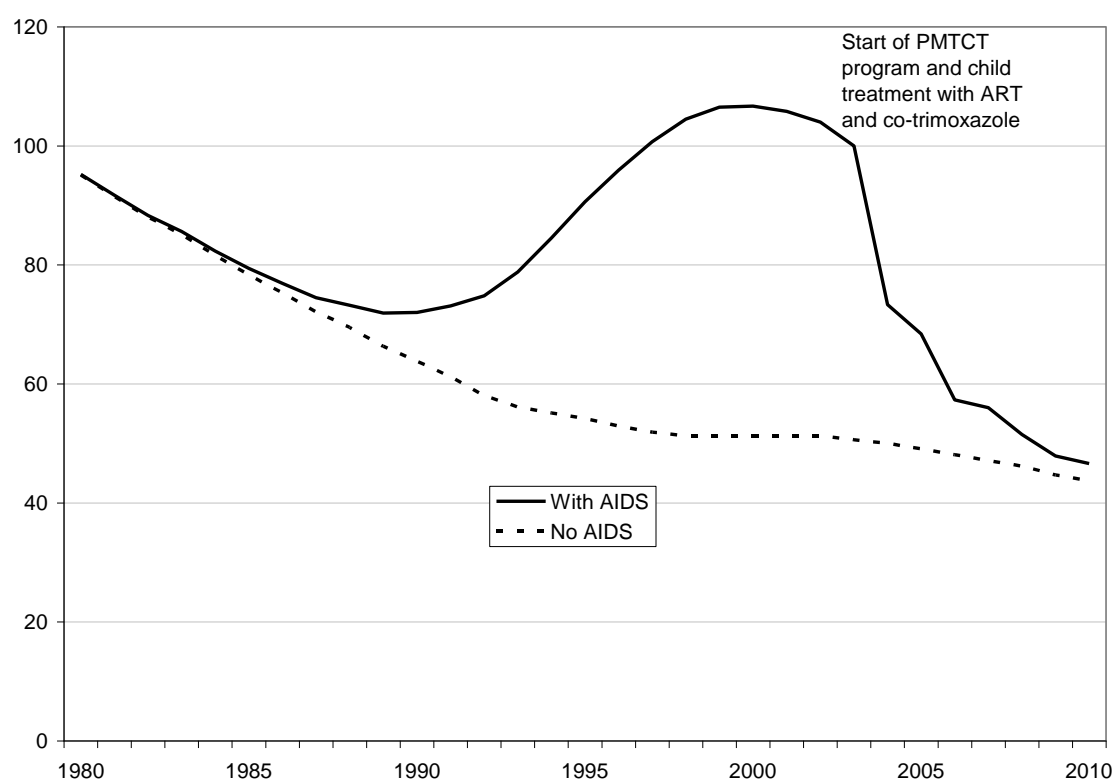


The increased mortality due to AIDS has affected the most commonly used indicators of mortality as shown in Table 3. Life expectancy is estimated to be about 10 years shorter due to HIV but somewhat higher than the figure of 55.7 years estimated for 2001 from the census because the expanding coverage of ART has led to a rise in life expectancy after many years of decline. Infant mortality is not much affected by AIDS today because of the success of the program to prevent mother-to-child transmission of HIV. Figure 10 shows that AIDS significantly raised the child mortality rate before the advent of the PMTCT program, but that rapid expansion of that program has reduced AIDS deaths dramatically.

Table 3. Mortality Indicators with and without AIDS, 2007

<i>Indicator</i>	<i>With AIDS</i>	<i>Without AIDS</i>
Life expectancy at birth	57	67
Infant mortality rate	41	38
Under five mortality rate	56	47

Figure 10. Under five mortality rate with and without AIDS



NEED FOR ART

The number of people needing ART in any year includes all those who continue successfully on ART from the previous year plus all those newly needing treatment in that year. As the number of people receiving ART expands each year, the number in need in future years will continue to grow. We estimate that most of those on ART in 2007 will still need ART in 2008; in addition, there will be about 23,000 adults newly needing ART in 2008. As a result the estimated total need for ART among adults in 2007 was 120,000 and for 2008 it will rise to 137,000 (116,000 – 156,000). There is an additional need for ART among children of about 7,500 (6,800 – 7,800).

The number of adults newly needing ART will decline slightly from 23,000 in 2008 to 19,000 by 2016. Maintaining nearly universal coverage will require providing ART for these people plus continuing ART for current patients. As a result the number needing ART will continue to grow each year as shown in Table 4. The number of children needing ART will grow from 7,400 in 2008 to 13,500 by 2016.

Table 4. Number of Adults in Need of ART, 2008 – 2016

<i>Year</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>
Number of adults in need of ART	137,000	153,000	167,000	178,000	186,000	193,000	198,000	203,000	207,000
Number of children needing ART	8,000	8,700	9,200	10,000	10,800	11,600	12,300	12,900	13,500

ORPHANS

The large number of AIDS deaths has increased the total number of adult deaths and, therefore, the number of children that are orphaned. Spectrum calculated the number of orphans from the pattern of mortality and fertility.¹³ Table 5 shows the estimated number of orphans by type in 2007.

Table 5. Number of Orphans by Type in 2007

Maternal Orphans	
AIDS	65,100
Non-AIDS	15,700
Total	80,800
Paternal Orphans	
AIDS	53,500
Non-AIDS	25,900
Total	79,400
Double Orphans	
AIDS	31,900
Non-AIDS	1,700
Total	33,600
All AIDS orphans	89,700
Total Orphans	126,700

Note: Maternal orphans are children under the age of 18 who have lost their mother. Paternal orphans are those who have lost their father. Double orphans are children who have lost both parents. Double orphans are also counted as both maternal and paternal orphans, therefore, the total number of orphans is calculated as maternal plus paternal orphans minus double orphans.

¹³ Grassly NC, Timaeus IM. "Methods to Estimate the Number of Orphans as a Result of AIDS and Other Causes in sub-Saharan Africa." *Journal of Acquired Immune Deficiency Syndromes* 2005, July 1; 39 (3) 365-375.

PROJECTIONS TO 2016

The methods employed to estimate the historical trend in prevalence can be used to extrapolate that trend into the future. However, such projections should be treated with caution since they assume that current trends will continue. While that may be largely true for the short term the longer term is more uncertain. Clearly we hope that prevention efforts will change the trend in new infections dramatically. Nevertheless some indicators will change slowly. Even if the number of new infections drops in the near future there will be a lag before it will affect the number of people newly needing ART.

If the current trend continues HIV prevalence among adults would drop to 24% by 2016. The total number of people living with HIV would rise from 330,000 today to nearly 380,000 by 2016. If the coverage of ART remains high then the need for ART among adults would rise from 120,000 today to 207,000 by 2016 while the number of adults on ART would rise to 154,000.

With continued high coverage of PMTCT programs and treatment for children the number of HIV-positive children would remain constant at just under 20,000 while the number of new infections would drop from 890 per year to 720 by 2016 and the number of AIDS deaths among children would drop from 790 to about 750.

CONCLUSIONS

Botswana has an HIV surveillance system and a national HIV survey that provide the basis for estimates of the extent of the HIV epidemic and its dynamics. Table 6 shows estimates of key indicator along with plausibility bounds around each. Estimates of the number of people living with HIV and the need for treatment by district are presented in Appendix E.

Table 6. Key HIV Indicators and Plausibility Bounds in 2007

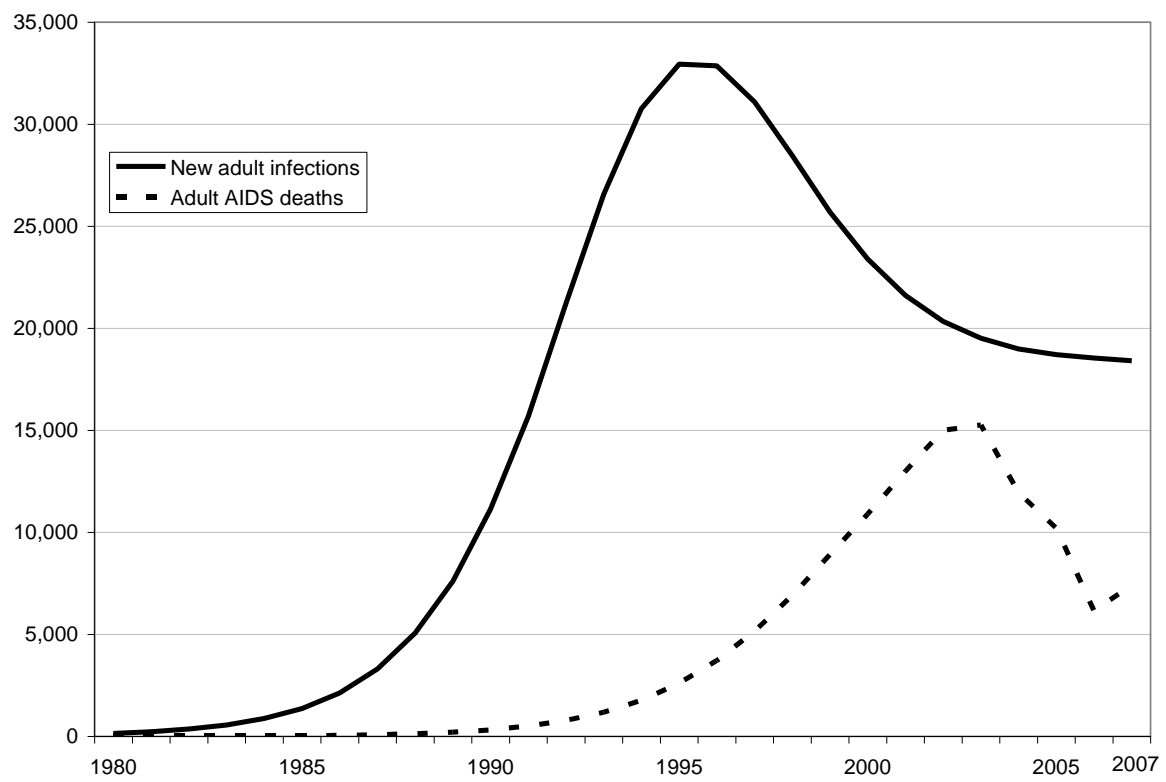
<i>Indicator</i>	<i>Value in 2007</i>	<i>Plausibility Bounds</i>	<i>Value in 2008</i>	<i>Plausibility Bounds</i>
HIV Adults + Children	330,000	318,000 – 345,000	342,000	329,000 – 356,000
HIV Adults 15+	311,000	299,000 – 325,000	322,000	310,000 – 337,000
HIV population- Children	19,561	18,000 – 21,000	19,000	18,000 – 21,000
Prevalence Adult	25.7	24.8 - 26.7	23.1	22.3 - 23.9
New HIV infections- Adult	18,000	12,000 – 26,000	18,000	12,000 – 26,000
New HIV Infections- Children	890	810 - 980	870	790 - 960
Annual AIDS deaths- Adult	7,400	5,000 – 11,000	6,500	4,000 – 10,000
Annual AIDS deaths- Children	790	600 - 1020	580	440 - 750
Need for ART- Adult (15+)	120,000	101,000 – 136,000	137,000	116,000 – 156,000
Need for ART- Children	7,400	6,800 – 7,800	8,000	7,400 – 8,500
Mothers needing PMTCT	15,000	13,000 – 16,000	15,000	14,000 – 16,000
AIDS orphans	90,000	76,000 – 103,000	131,000	111,000 – 151,000

Figure 11 illustrates the key dynamics of the epidemic. The number of new infections rose rapidly during the early 1990s, peaking in the mid-1990s before falling to around 17,000 new infections per year today. The number of AIDS deaths started to grow rapidly about 10 years later than the rise in new infections, peaking at about 16,000 just before the expansion of ART. Around 2003 the number of new infections was approximately equal to the number of AIDS deaths.¹⁴

The successful expansion of the ART program has reduced the number of AIDS deaths by half. The challenge for the future is to continue the successful ART and PMTCT programs while, at the same time, improving prevention efforts to reduce the number of new infections still occurring each year.

¹⁴ This figure is for the adult population 15 and older. The pattern is similar for 15-49-year-old adults. Although in 2003 the number of new infections is somewhat larger than the number of AIDS deaths, prevalence is declining because of the additional effects of HIV+ adults reaching age 50 and aging out of the 15-49 age group, uninfected children reaching age 15 and entering the 15-49 age group, and non-AIDS deaths occurring to HIV+ adults.

Figure 11. New adult HIV infections and adult AIDS deaths



APPENDICES

Appendix A. Participants in National Estimation Workshop, Gaborone, February 5-6, 2008

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Appendix B. Modeling Assumptions

Demographic Inputs

<i>Year</i>	<i>TFR</i>	<i>Non-AIDS LE</i>		<i>Immigration</i>
		<i>Male</i>	<i>Female</i>	
1970	6.6	52.8	56.4	-800
1971	6.6	53.3	56.9	-640
1972	6.6	53.8	57.5	-480
1973	6.5	54.4	58.1	-160
1974	6.5	55.0	58.8	320
1975	6.5	55.6	59.5	800
1976	6.4	56.3	60.2	1,280
1977	6.4	56.9	60.9	1,760
1978	6.3	57.4	61.5	1,660
1979	6.3	57.9	62.0	980
1980	6.2	58.4	62.5	300
1981	6.1	58.9	63.0	-380
1982	6.0	59.4	63.5	-1,060
1983	5.9	59.8	63.9	-1,240
1984	5.7	60.3	64.4	-920
1985	5.5	60.8	64.9	-600
1986	5.4	61.2	65.3	-280
1987	5.2	61.7	65.8	40
1988	5.0	62.1	66.2	460
1989	4.9	62.6	66.7	980
1990	4.7	63.0	67.1	1,500
1991	4.6	63.4	67.5	2,020
1992	4.4	63.9	68.0	2,540
1993	4.3	64.2	68.3	2,980
1994	4.1	64.4	68.4	3,340
1995	4.0	64.6	68.6	3,700
1996	3.9	64.7	68.8	4,060
1997	3.8	64.9	68.9	4,420
1998	3.7	65.0	69.0	4,540
1999	3.5	65.0	69.0	4,420
2000	3.4	65.0	69.0	4,300
2001	3.3	65.0	69.0	4,180
2002	3.2	65.0	69.0	4,060
2003	3.2	65.1	69.1	3,900
2004	3.1	65.2	69.2	3,700
2005	3.0	65.3	69.4	3,500
2006	3.0	65.5	69.5	3,300
2007	2.9	65.6	69.7	3,100
2008	2.9	65.8	69.9	2,900
2009	2.8	66.0	70.1	2,700
2010	2.8	66.2	70.4	2,500
2011	2.8	66.4	70.6	2,300
2012	2.7	66.6	70.8	2,100

Source: UN Population Division, World Population Prospects: The 2006 Revision.

HIV Epidemiology Inputs

1. Progression from infection to need for ART: Normal pattern in Spectrum. This describes a progression with a median time from infection to need for ART of 7.5 years for adult men, 8.5 years for adult women, and 2 years for children.
2. Progression from need for treatment to AIDS death without ART (adults). Normal pattern in Spectrum which describes a progression with a median time of 3 years.
3. Survival on ART (percent surviving to following year).
 - a. Adult first year on ART: 91%
 - b. Adult subsequent years: 99%
 - c. Children under the age of one year: 80%
 - d. Children over one in first year of ART: 90%
 - e. Children over one in subsequent years: 95%
4. Age distribution of HIV: The default pattern for generalized epidemics adjusted for the actual distribution in 2004 from BAIS II.
5. Percent of HIV+ mothers receiving prophylaxis to prevent mother-to-child transmission

<i>Year</i>	<i>None</i>	<i>SD NVP</i>	<i>Dual ART</i>	<i>Triple ART</i>	<i>Total</i>
1998	100	0	0	0	100
1999	93.4	6.6	0	0	100
2000	86.8	13.2	0	0	100
2001	80.2	19.8	0	0	100
2002	73.6	26.4	0	0	100
2003	67.0	33.0	0	0	100
2004	52.1	24.8	20.8	2.2	100
2005	37.2	16.7	41.4	4.5	100
2006	22.4	8.6	62.2	6.8	100
2007	7.6	0.4	83.0	9.0	100

6. Percent of children born to HIV-positive mothers by type of feeding

<i>Year</i>	<i>Mixed</i>	<i>Exclusive Breastfeeding</i>	<i>Replacement Feeding</i>	<i>Total</i>
1998	100	0	0	100
1999	93	1	6	100
2000	87	1	12	100
2001	81	1	18	100
2002	74	2	24	100
2003	67	3	30	100
2004	52	3	45	100
2005	36	4	60	100
2006	21	4	75	100
2007	5	5	90	100

7. Probability of transmission of HIV from mother to child

<i>Prophylaxis</i>	<i>Mixed Feeding</i>	<i>Exclusive Breastfeeding</i>	<i>Replacement Feeding</i>
None	34	24	27
SD NVP	23	13	16
Dual ART	13	2.8	6
Triple ART	5	1.9	3

8. Ratio of fertility of HIV infected women to the fertility of uninfected women

<i>Age</i>	<i>Ratio</i>
15-19	1.50
20-24	0.70
25-29	0.70
30-34	0.70
35-39	0.70
40-44	0.70
45-49	0.70

9. Number of adults receiving ART

<i>Year</i>	<i>First Line ART</i>	<i>Second Line ART</i>	<i>Total</i>
2000	932	0	932
2001	1865	0	1865
2002	2797	14	2811
2003	10,264	82	10,346
2004	30,600	849	31,449
2005	50,044	1617	51,661
2006	79,490	2384	81,874
2007	91,780	2753	94,533

10. Number of children receiving ART and Co-trimoxazole

<i>Year</i>	<i>ART</i>	<i>Co-trimoxazole</i>
2004	2142	5474
2005	3503	8115
2006	5564	8830
2007	6251	9858

Appendix C. Percentage of Pregnant Women HIV+ at Antenatal Clinic Surveillance Sites

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Urban Sites																	
Gaborone	17.0	14.9	19.2	27.8	28.7	31.3	34.0	39.1	37.1	36.2	38.6	38.2	44.8		34.4	35.3	33.2
Francistown	16.0	23.7	34.2	29.7	39.6	43.1	42.9	43.0	42.7	44.4	49.6	40.2	45.8		42.3	36.7	37.9
Southern				16.0		21.7		24.7		40.7	34.0	33.1	25.7		28.2	25.0	22.8
South East											32.1	26.5	27.9		32.1	27.6	26.7
Kweneng East						23.9		37.2		30.4	29.6	29.2	32.1		31.5	31.7	33.4
Mahalapye							28.2		32.0		31.9	39.8	37.4		36.2	29.9	30.4
Serowe Palapye			19.9		29.9		34.4		41.8		44.6	36.7	43.3		37.5	36.8	37.3
Lobatse			17.8		38.9		33.7		31.3		30.6	34.6	32.4		29.0	28.4	28.7
Selebi-Pikwe				27.0		37.8		49.9		50.3	50.0	48.1	52.2		46.5	41.1	49
Jwaneng															34.9	20.0	21.4
Rural Sites																	
North East											40.0	42.4	40.4		34.9	35.4	38.8
Bobirwa district											44.3	45.3	49.3		29.8	37.6	42.9
Boteti											36.7	35.6	31.9		35.4	29.0	33.7
Gantsi			9.5		18.9			22.3			21.8	18.8	-		20.9	27.0	26.6
Chobe			18.3		37.9		38.3		50.8		38.3	42.9	47.0		42.0	45.6	
Kgalagadi									21.8		28.5	28.3	28.9		26.2	19.1	31
Tutume				23.1		33.2		37.5		35.4	51.1	40.7	37.7		41.3	39.9	38.7
Kweneng West						30.1		26.5			25.3	28.7	27.0		27.0	28.1	23.9
Goodhope											33.1	26.3	40.9		20.8	23.0	26.5
Okavango											40.6	34.2	32.7		29.2	29.1	34.7
Hukuntsi											23.3	40.0	28.4		29.4	29.4	32.7
Ngami	8.0	12.7		19.4		32.3		33.5			35.8	40.7	38.4		27.3	35.4	39.7
Kgatleng							30.5		29.5		24.9	30.9			30.1	24.3	30.8
Mabutsane																26.4	25.3

Appendix D. The UNAIDS Reference Group Model and EPP

The Estimates and Projection Package is a computer program that implements a simple epidemic model developed by the UNAIDS Reference Group on Estimates, Models and Projections. The UNAIDS model is designed to produce a curve fit to HIV surveillance data that depicts the trend of adult HIV prevalence. This is done with a simple epidemic model in order to reproduce the typical dynamics of an HIV epidemic. The model is necessarily a simplification of the full dynamics in order to reduce the number of parameters needed to produce the fit.

The structure of the UNAIDS model is shown in Figure D1. The model describes the population as divided into three major groups:

1. Those who are at low or no risk of acquiring HIV. This group includes those who are not sexually active and those in mutually faithful partnerships with uninfected partners.
2. Those who are at risk of acquiring an HIV infection. This group includes those with multiple partners who do not use condoms consistently.
3. Those who are infected with HIV.

The adult population is increased by those reaching age 15. These new entrants are distributed between the 'not-at-risk' and the 'at-risk' group according to the value of the variable f . The initial value of f is determined by the curve fit. After the first year f may change in response to the changing proportion of the population at risk.

The 'at-risk' population is subject to a risk of infection determined by the force of infection, r , and the prevalence of HIV in the population. Those who become infected progress to AIDS death over a period of time. All population groups are subject to non-AIDS mortality.

The major parameters of the model are:

- t_0 – The year in which significant spread of HIV began
- f – The initial fraction of the population at risk
- r – The force of infection
- Φ – A parameter that determines the extent to which those in the 'at-risk' population are replaced by new entrants when they die from AIDS

The equations of the model are:

$$\begin{aligned}X(t) &= X(t-1) + (1 - f) * \text{entrants}(t) - \mu * X(t-1) \\S(t) &= S(t-1) + f * \text{entrants}(t) - (\mu + r * H(t-1)/T(t-1)) * S(t-1) \\H(t) &= H(t-1) + r * H(t-1)/T(t-1) * S(t-1) - \mu * H(t-1) - A(t) \\A(t) &= \text{function describing the proportion that die from AIDS by time since infection} \\T(t) &= X(t) + S(t) + H(t) \\f &= \{ fo/(1-fo) + \phi * (X(t-1)/T(t-1) - (1-fo)) \} / \{ fo/(1-fo) + \phi * (X(t-1)/T(t-1) - (1-fo)) + 1 \} \\f &= (\exp(\phi * (X(t-1)/T(t-1)) - (1 - fo)) / (\exp(\phi * (X(t-1)/T(t-1)) - (1 - fo)) + 1/fo - 1)\end{aligned}$$

where:

X = population not at risk
S = susceptible population (at-risk but not infected)
H = population with HIV
A = AIDS deaths
T = total adult population
entrants = 15-year-olds
f = fraction of 15-year-olds entering at-risk population
mu = non-AIDS death rate
r = force of infection
phi = behavior response scaling factor

The EPP program implements the UNAIDS model. It fits the model to surveillance data by finding the combination of values for t_0 , f_0 , r and Φ that give the best fit to the data. In most applications the model is fit separately to urban and rural data, and then the two resulting prevalence curves are combined to produce a national curve of adult HIV prevalence over time.

The fitting process uses Bayesian Melding. In this approach values of each of the four parameters are selected randomly from prior distributions. This process generates a large number of potential prevalence curves, usually 50,000 – 200,000 curves. Each of these curve is tested to see how well it fits the data. A smaller sample of 3,000 curves is drawn from the full set with the probability of selection proportional to how well the curve fits the data. Curves may be selected multiple times in this re-sampling if they provide much better fits to the data than other curves. This final sample of curves is used to determine the most likely trend and the uncertainty around the trend.

The fitting procedure recognizes that the data come from individual surveillance sites and from national surveys. The site data are used to determine the overall trend. That level of the curve is adjusted to prevalence found in the national survey in that year. In this way the full time series of ANC surveillance is used to inform the trend of the curve and the national survey is used to inform the level of prevalence in that year.

For more details please see:

Ghys PD, Brown T, Grassly NC, Garnett G, Stanecki K, Stover J, Walker N. “The UNAIDS Estimation and Projection Package: A software package to estimate and project national HIV epidemics.” *Sexually Transmitted Infections* Volume 80, Supplement 1. August 2004, pps. i5-i9.

Brown T, Grassly NC, Garnett G, Stanecki K. “Improving projections at the country level: the UNAIDS Estimation and Projection Package 2005.” *Sex Trans Inf* 2006;82:34-30.

Appendix E. Number of People Living with HIV and Need for Treatment by District for 2007

<i>District</i>	<i>Number HIV+</i>	<i>Need for ART</i>
Barolong	8,160	3,280
Bobonong	11,260	4,520
C.Kgalagado.G.R	150	60
Central-Boteti	7,420	2,980
Chobe	4,430	1,780
Francistown	21,420	8,600
Gaborone	47,450	19,050
Ghanzi	3,490	1,400
Jwaneng	2,880	1,160
Kgalagadi-North	2,510	1,010
Kgalagadi-South	3,930	1,580
Kgatleng	10,290	4,130
Kweneng-East	31,600	12,690
Kweneng-West	5,290	2,120
Lobatse	5,280	2,120
Mahalapye	15,530	6,240
Ngamiland-Delta	630	250
Ngamiland-East	12,860	5,160
Ngamiland-West	7,100	2,850
Ngwaketse-West	1,370	550
North-East	6,960	2,800
Orapa	1,780	710
Selebi-Phikwe	15,300	6,140
Serowe-Palapye	26,670	10,710
South-East	11,190	4,490
Southern	11,850	4,760
Sowa-Pan	670	270
Tutume	18,890	7,580
Total	296,360	119,000

Note: These estimates are based on the national estimate of number living with HIV and number in need of treatment distributed by district according to the estimated distribution of total infections in Dorrington RE, Moultrie TA, Daniel T (2006). *The Demographic Impact of HIV/AIDS in Botswana*. Gaborone: UNDP and NACA, Botswana.

Appendix F. Indicators for the Total Population

HIV population	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Total	0	0	9	14	23	36	56	100	158	251
Males	0	0	7	11	16	24	36	60	91	138
Females	0	0	2	3	6	11	20	40	67	113
Prevalence (15-49)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Annual HIV+ births										
Total	0	0	0	0	0	1	1	2	4	6
Percent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative AIDS deaths										
Total	0	0	0	0	0	1	2	3	7	12
Males	0	0	0	0	0	0	1	2	4	7
Females	0	0	0	0	0	0	1	1	3	5
HIV population	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	396	625	984	1,546	2,423	3,785	5,912	9,221	14,281	21,880
Males	209	318	484	739	1,130	1,727	2,649	4,069	6,211	9,409
Females	187	307	499	806	1,293	2,058	3,263	5,153	8,070	12,471
Prevalence (15-49)	0.1	0.1	0.2	0.3	0.4	0.7	1.0	1.5	2.2	3.3
Annual HIV+ births										
Total	10	17	27	42	65	101	154	234	353	526
Percent	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.5	0.7	1.1
Cumulative AIDS deaths										
Total	20	34	56	91	146	232	365	570	885	1,365
Males	12	20	32	51	81	127	196	303	464	708
Females	8	14	24	40	65	106	169	268	421	657
HIV population	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total	32,995	48,620	69,674	95,889	125,920	157,490	188,009	215,417	238,489	256,615
Males	14,059	20,588	29,416	40,368	53,000	66,368	79,295	90,939	100,805	108,569
Females	18,937	28,032	40,258	55,521	72,920	91,122	108,714	124,478	137,685	148,046
Prevalence (15-49)	4.7	6.7	9.2	12.1	15.3	18.3	21.0	23.1	24.5	25.4
Annual HIV+ births										
Total	774	1,111	1,550	2,072	2,651	3,231	3,760	4,189	4,507	4,558
Percent	1.6	2.3	3.2	4.2	5.4	6.5	7.5	8.4	8.9	9.0
Cumulative AIDS deaths										
Total	2,092	3,179	4,778	7,080	10,316	14,745	20,649	28,309	37,985	49,831
Males	1,074	1,618	2,414	3,550	5,138	7,297	10,156	13,840	18,464	24,083
Females	1,017	1,560	2,364	3,530	5,178	7,448	10,493	14,468	19,522	25,748
HIV population	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	270,273	279,845	285,915	290,633	298,632	307,430	319,928	330,347	341,613	350,557
Males	114,358	118,348	120,790	122,661	126,086	129,879	135,323	139,838	144,767	148,712
Females	155,916	161,497	165,125	167,972	172,546	177,551	184,606	190,509	196,846	201,844
Prevalence (15-49)	25.9	26.0	25.8	25.5	25.4	25.4	25.6	25.7	25.9	26.0
Annual HIV+ births										
Total	4,504	4,370	4,155	3,847	2,959	2,185	1,467	890	874	870
Percent	8.8	8.5	8.1	7.5	5.7	4.1	2.8	1.7	1.6	1.6
Cumulative AIDS deaths										
Total	63,736	79,758	97,744	115,899	129,323	140,846	147,738	155,923	163,036	172,250
Males	30,632	38,123	46,471	54,849	60,974	66,203	69,309	72,968	76,121	80,165
Females	33,105	41,636	51,273	61,050	68,350	74,643	78,429	82,955	86,916	92,085
HIV population	2010	2011	2012	2013	2014	2015	2016			
Total	357,847	363,105	366,861	369,630	372,161	375,091	378,602			
Males	151,966	154,382	156,183	157,580	158,868	160,341	162,069			
Females	205,881	208,723	210,678	212,049	213,292	214,750	216,533			
Prevalence (15-49)	25.9	25.8	25.6	25.3	25.0	24.7	24.4			
Annual HIV+ births										
Total	860	843	819	791	764	740	716			
Percent	1.6	1.5	1.5	1.5	1.4	1.4	1.3			
Cumulative AIDS deaths										
Total	183,335	196,544	211,267	226,763	242,596	258,403	274,024			
Males	85,004	90,749	97,136	103,852	110,717	117,584	124,391			
Females	98,331	105,795	114,130	122,911	131,879	140,819	149,633			

Appendix G. Indicators for Adults 15+

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
HIV population										
Total	0	0	9	14	22	35	54	98	154	243
Males	0	0	7	11	16	24	35	59	89	134
Females	0	0	2	3	6	11	19	39	65	109
Adult prevalence	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
New HIV infections										
Total	0	0	9	5	8	13	20	44	58	92
Males	0	0	7	4	5	8	12	24	31	47
Females	0	0	2	1	3	5	8	20	27	45
Adult HIV Incidence	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual AIDS deaths										
Total	0	0	0	0	0	0	0	1	1	2
Males	0	0	0	0	0	0	0	1	1	1
Females	0	0	0	0	0	0	0	0	0	1
Total need for ART										
Total	0	0	0	0	0	1	2	4	7	12
Male	0	0	0	0	0	1	2	3	5	8
Female	0	0	0	0	0	0	0	1	2	4
Total number receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number in need of first line therapy										
Total	0	0	0	0	0	1	2	4	7	12
Male	0	0	0	0	0	1	2	3	5	8
Female	0	0	0	0	0	0	0	1	2	4
Number newly needing first line therapy										
Total	0	0	0	0	0	1	1	2	4	6
Male	0	0	0	0	0	1	1	2	3	4
Female	0	0	0	0	0	0	0	1	1	2
Number receiving first line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number receiving second line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Unmet need for first line therapy										
Total	0	0	0	0	0	1	2	4	7	12
Male	0	0	0	0	0	1	2	3	5	8
Female	0	0	0	0	0	0	0	1	2	4
Adult population 15+										
Total	365,400	379,107	393,302	407,980	423,260	439,225	455,915	473,365	491,465	509,933
Male	167,900	174,953	182,252	189,786	197,610	205,758	214,252	223,113	232,289	241,654
Female	197,500	204,154	211,051	218,194	225,650	233,467	241,663	250,253	259,175	268,279

Appendix G. Indicators for Adults 15+ (Cont.)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
HIV population										
Total	383	604	950	1,492	2,338	3,651	5,704	8,902	13,794	21,143
Males	404	404	404	404	404	404	404	404	404	404
Females	181	297	483	780	1,251	1,992	3,161	4,995	7,830	12,107
Adult prevalence	0.1	0.1	0.2	0.3	0.4	0.6	0.9	1.3	2.0	2.9
New HIV infections										
Total	145	228	358	560	876	1,359	2,123	3,306	5,057	7,601
Males	404	404	404	404	404	404	404	404	404	404
Females	73	118	190	305	484	760	1,201	1,885	2,913	4,399
Adult HIV Incidence	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.5	0.8	1.1
Annual AIDS deaths										
Total	3	5	9	14	22	34	54	85	133	208
Males	2	4	6	8	13	20	30	45	69	106
Females	1	2	3	5	9	15	24	40	64	102
Total need for ART										
Total	19	31	49	77	121	189	297	464	726	1,133
Male	13	20	30	45	69	105	159	243	372	570
Female	6	11	19	31	52	85	137	221	354	563
Total number receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number in need of first line therapy										
Total	19	31	49	77	121	189	297	464	726	1,133
Male	13	20	30	45	69	105	159	243	372	570
Female	6	11	19	31	52	85	137	221	354	563
Number newly needing first line therapy										
Total	9	15	24	37	58	91	143	223	348	542
Male	6	9	14	21	32	49	75	114	175	268
Female	3	6	10	16	26	42	68	109	173	274
Number receiving first line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number receiving second line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Unmet need for first line therapy										
Total	19	31	49	77	121	189	297	464	726	1,133
Male	13	20	30	45	69	105	159	243	372	570
Female	6	11	19	31	52	85	137	221	354	563
Adult population 15+										
Total	528,649	549,130	569,183	588,949	608,703	628,619	652,076	676,691	702,632	730,051
Male	251,152	261,537	271,709	281,737	291,751	301,841	313,712	326,152	339,253	353,087
Female	277,498	287,593	297,474	307,212	316,952	326,778	338,364	350,539	363,379	376,963

Appendix G. Indicators for Adults 15+ (Cont.)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
HIV population										
Total	31,893	46,998	67,335	92,611	121,469	151,653	180,615	206,359	227,720	244,240
Males	13,500	19,767	28,231	38,707	50,745	63,411	75,549	86,350	95,349	102,300
Females	18,393	27,231	39,104	53,903	70,724	88,242	105,066	120,009	132,372	141,941
Adult prevalence	4.2	6.0	8.2	10.9	13.7	16.5	18.9	20.9	22.3	23.2
New HIV infections										
Total	11,133	15,685	21,207	26,571	30,769	32,949	32,864	31,090	28,473	25,689
Males	4,660	6,559	8,900	11,120	12,978	14,016	14,028	13,371	12,388	11,287
Females	6,473	9,125	12,307	15,452	17,792	18,933	18,836	17,719	16,084	14,402
Adult HIV Incidence	1.6	2.2	2.9	3.5	4.0	4.3	4.3	4.0	3.6	3.2
Annual AIDS deaths										
Total	324	503	775	1,180	1,770	2,599	3,716	5,150	6,897	8,911
Males	162	248	377	568	844	1,231	1,750	2,412	3,214	4,131
Females	162	255	398	612	926	1,368	1,966	2,738	3,683	4,780
Total need for ART										
Total	1,762	2,723	4,166	6,278	9,275	13,348	18,617	25,076	32,558	40,746
Male	872	1,329	2,010	3,001	4,401	6,295	8,734	11,707	15,121	18,818
Female	890	1,394	2,156	3,278	4,874	7,053	9,883	13,370	17,438	21,928
Total number receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number in need of first line therapy										
Total	1,762	2,723	4,166	6,278	9,275	13,348	18,617	25,076	32,558	40,746
Male	872	1,329	2,010	3,001	4,401	6,295	8,734	11,707	15,121	18,818
Female	890	1,394	2,156	3,278	4,874	7,053	9,883	13,370	17,438	21,928
Number newly needing first line therapy										
Total	840	1,289	1,951	2,895	4,188	5,858	7,887	10,200	12,664	15,128
Male	410	622	932	1,374	1,976	2,750	3,685	4,741	5,852	6,945
Female	430	667	1,018	1,522	2,212	3,108	4,203	5,459	6,812	8,183
Number receiving first line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Number receiving second line therapy										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Unmet need for first line therapy										
Total	1,762	2,723	4,166	6,278	9,275	13,348	18,617	25,076	32,558	40,746
Male	872	1,329	2,010	3,001	4,401	6,295	8,734	11,707	15,121	18,818
Female	890	1,394	2,156	3,278	4,874	7,053	9,883	13,370	17,438	21,928
Adult population 15+										
Total	758,919	789,202	820,907	853,682	887,127	920,968	955,025	988,925	1,021,840	1,052,986
Male	367,644	382,910	398,891	415,413	432,290	449,396	466,651	483,890	500,718	516,763
Female	391,275	406,292	422,016	438,269	454,837	471,572	488,374	505,035	521,121	536,223

Appendix G. Indicators for Adults 15+ (Cont.)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
HIV population										
Total	256,424	264,678	269,625	273,462	280,073	288,151	300,135	310,786	322,228	331,432
Males	107,341	110,665	112,538	113,963	116,686	120,115	125,298	129,932	134,951	139,029
Females	149,082	154,013	157,087	159,498	163,387	168,036	174,836	180,854	187,277	192,403
Adult prevalence	23.7	23.9	23.8	23.6	23.6	23.6	24.0	24.2	24.5	24.6
New HIV infections										
Total	23,395	21,614	20,342	19,510	18,987	18,708	18,548	18,408	18,271	18,129
Males	10,303	9,544	8,988	8,623	8,392	8,282	8,197	8,151	8,105	8,055
Females	13,092	12,070	11,354	10,886	10,595	10,427	10,351	10,257	10,166	10,075
Adult HIV Incidence	2.9	2.6	2.4	2.3	2.1	2.1	2.0	1.9	1.9	1.8
Annual AIDS deaths										
Total	10,899	13,000	14,998	15,254	11,946	10,203	6,160	7,397	6,539	8,732
Males	5,025	5,959	6,833	6,907	5,376	4,561	2,735	3,260	2,862	3,800
Females	5,874	7,041	8,165	8,346	6,570	5,642	3,426	4,137	3,677	4,931
Total need for ART										
Total	49,216	57,629	65,662	72,976	80,926	91,227	104,333	120,059	137,097	153,048
Male	22,598	26,302	29,787	32,904	36,274	40,672	46,291	53,042	60,337	67,128
Female	26,619	31,327	35,875	40,072	44,652	50,555	58,042	67,017	76,761	85,920
Total number receiving ART										
Total	932	1,865	2,811	10,346	31,449	51,661	81,874	94,533	108,450	114,150
Male	428	853	1,281	4,675	14,118	23,082	36,381	41,869	47,871	50,282
Female	504	1,012	1,530	5,671	17,331	28,579	45,493	52,664	60,579	63,868
Number in need of first line therapy										
Total	49,216	57,629	65,648	72,894	80,077	89,610	101,949	117,306	133,647	148,898
Male	22,598	26,302	29,780	32,867	35,891	39,946	45,226	51,816	58,806	65,293
Female	26,619	31,327	35,868	40,027	44,186	49,664	56,723	65,490	74,841	83,605
Number newly needing first line therapy										
Total	17,439	19,466	21,126	22,370	23,193	23,628	23,726	23,559	23,198	22,710
Male	7,955	8,821	9,510	10,005	10,304	10,428	10,404	10,269	10,058	9,804
Female	9,485	10,645	11,615	12,366	12,890	13,199	13,321	13,290	13,140	12,907
Number receiving first line therapy										
Total	932	1,865	2,797	10,264	30,600	50,044	79,490	91,780	105,000	110,000
Male	428	853	1,274	4,638	13,736	22,357	35,315	40,642	46,340	48,448
Female	504	1,012	1,523	5,626	16,864	27,687	44,174	51,138	58,660	61,552
Number receiving second line therapy										
Total	0	0	14	82	849	1,617	2,384	2,753	3,450	4,150
Male	0	0	6	37	383	726	1,065	1,226	1,531	1,835
Female	0	0	8	45	466	891	1,319	1,527	1,919	2,315
Unmet need for first line therapy										
Total	48,284	55,764	62,851	62,630	49,477	39,566	22,459	25,526	28,647	38,898
Male	22,170	25,449	28,506	28,229	22,155	17,589	9,910	11,174	12,466	16,846
Female	26,114	30,315	34,345	34,401	27,322	21,977	12,549	14,353	16,181	22,052
Adult population 15+										
Total	1,082,221	1,109,591	1,135,061	1,160,258	1,188,692	1,218,724	1,252,576	1,284,806	1,317,555	1,347,750
Male	531,967	546,366	559,948	573,458	588,473	604,232	621,708	638,463	655,432	671,273
Female	550,254	563,225	575,113	586,800	600,218	614,491	630,868	646,343	662,124	676,477

Appendix G. Indicators for Adults 15+ (Cont.)

	2010	2011	2012	2013	2014	2015	2016
HIV population							
Total	338,734	343,931	347,597	350,369	352,823	355,570	358,786
Males	142,289	144,674	146,430	147,829	149,078	150,459	152,037
Females	196,445	199,258	201,167	202,541	203,745	205,111	206,749
Adult prevalence	24.6	24.5	24.4	24.2	24.0	23.8	23.7
New HIV infections							
Total	17,965	17,791	17,560	17,336	17,292	17,364	17,432
Males	7,964	7,899	7,806	7,714	7,673	7,709	7,742
Females	10,001	9,892	9,754	9,622	9,620	9,655	9,690
Adult HIV Incidence	1.8	1.7	1.7	1.6	1.6	1.6	1.5
Annual AIDS deaths							
Total	10,584	12,659	14,126	14,864	15,165	15,098	14,868
Males	4,585	5,466	6,085	6,396	6,527	6,508	6,426
Females	5,999	7,193	8,041	8,468	8,638	8,590	8,442
Total need for ART							
Total	167,004	178,064	186,530	193,074	198,264	202,806	207,120
Male	73,039	77,702	81,271	84,058	86,308	88,324	90,279
Female	93,965	100,362	105,259	109,017	111,957	114,482	116,841
Total number receiving ART							
Total	119,850	125,550	131,250	137,000	142,700	148,400	154,100
Male	52,691	55,099	57,509	59,951	62,383	64,830	67,295
Female	67,159	70,451	73,741	77,049	80,317	83,570	86,805
Number in need of first line therapy							
Total	162,154	172,514	180,280	186,074	190,564	194,406	198,020
Male	70,901	75,262	78,530	80,995	82,946	84,664	86,321
Female	91,253	97,252	101,750	105,080	107,618	109,743	111,699
Number newly needing first line therapy							
Total	22,151	21,557	20,955	20,358	19,783	19,253	18,787
Male	9,533	9,264	9,009	8,774	8,559	8,369	8,207
Female	12,619	12,293	11,946	11,584	11,224	10,884	10,581
Number receiving first line therapy							
Total	115,000	120,000	125,000	130,000	135,000	140,000	145,000
Male	50,553	52,658	54,768	56,889	59,021	61,170	63,337
Female	64,447	67,342	70,232	73,111	75,979	78,830	81,663
Number receiving second line therapy							
Total	4,850	5,550	6,250	7,000	7,700	8,400	9,100
Male	2,138	2,440	2,741	3,063	3,362	3,660	3,958
Female	2,712	3,110	3,509	3,937	4,338	4,740	5,142
Unmet need for first line therapy							
Total	47,154	52,514	55,280	56,074	55,564	54,406	53,020
Male	20,348	22,603	23,762	24,106	23,925	23,494	22,984
Female	26,806	29,910	31,518	31,968	31,640	30,912	30,036
Adult population 15+							
Total	1,375,769	1,401,578	1,425,718	1,448,634	1,470,875	1,493,481	1,516,543
Male	686,163	700,090	713,283	725,919	738,226	750,693	763,336
Female	689,606	701,488	712,435	722,715	732,648	742,789	753,207

Appendix H. Indicators for Children 0-14

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
HIV population										
Total	0	0	0	0	0	1	1	2	4	7
Males	0	0	0	0	0	0	1	1	2	4
Females	0	0	0	0	0	0	1	1	2	4
New HIV infections										
Total	0	0	0	0	0	1	1	2	4	6
Males	0	0	0	0	0	0	1	1	2	3
Females	0	0	0	0	0	0	1	1	2	3
Annual AIDS deaths										
Total	0	0	0	0	0	0	1	1	2	3
Males	0	0	0	0	0	0	0	1	1	2
Females	0	0	0	0	0	0	0	1	1	2
Population 0-14										
Total	335,900	345,610	356,181	367,662	380,284	394,059	409,011	425,210	442,252	459,648
Male	168,200	173,127	178,476	184,275	190,649	197,603	205,156	213,342	221,947	230,717
Female	167,700	172,484	177,705	183,387	189,635	196,456	203,855	211,868	220,306	228,931
Children needing cotrimoxazole										
Total	0	0	0	0	1	1	2	4	6	11
Male	0	0	0	0	0	1	1	2	3	5
Female	0	0	0	0	0	0	1	2	3	5
Children receiving cotrimoxazole										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Children needing ART										
Total	0	0	0	0	0	0	1	1	2	4
Male	0	0	0	0	0	0	0	1	1	2
Female	0	0	0	0	0	0	0	1	1	2
Children receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Mothers needing PMTCT	0	0	0	1	1	2	3	7	11	19
Mothers receiving PMTCT	0	0	0	0	0	0	0	0	0	0
HIV population	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	13	21	34	54	86	134	207	319	487	737
Males	6	10	17	27	43	68	105	162	247	373
Females	6	10	17	27	42	66	102	158	240	364
New HIV infections										
Total	10	17	27	42	65	101	154	234	353	526
Males	5	8	14	21	33	51	78	119	179	267
Females	5	8	13	21	32	50	76	115	174	259
Annual AIDS deaths										
Total	5	8	13	21	33	51	79	120	182	272
Males	3	4	7	11	17	26	40	61	92	138
Females	3	4	7	10	16	25	39	59	90	134
Population 0-14										
Total	477,198	493,460	510,546	528,070	545,876	563,981	579,176	593,716	607,332	619,920
Male	239,554	247,742	256,343	265,163	274,130	283,258	290,926	298,272	305,161	311,542
Female	237,644	245,717	254,203	262,907	271,747	280,722	288,250	295,444	302,171	308,378
Children needing cotrimoxazole										
Total	18	29	47	75	119	185	286	439	669	1,009
Male	9	15	24	38	60	94	145	223	339	511
Female	9	14	23	37	59	91	141	217	330	498
Children receiving cotrimoxazole										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Children needing ART										
Total	6	10	16	25	39	60	93	142	215	322
Male	3	5	8	13	20	31	47	72	109	163
Female	3	5	8	12	19	30	46	70	106	159
Children receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Mothers needing PMTCT	30	49	78	124	193	296	453	688	1,038	1,548
Mothers receiving PMTCT	0	0	0	0	0	0	0	0	0	0

Appendix H. Indicators for Children 0-14 (Cont.)

HIV population	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total	1,102	1,622	2,339	3,278	4,451	5,837	7,394	9,058	10,769	12,375
Males	558	822	1,185	1,661	2,255	2,957	3,746	4,589	5,456	6,269
Females	544	800	1,154	1,617	2,196	2,880	3,648	4,469	5,313	6,106
New HIV infections										
Total	774	1,111	1,550	2,072	2,651	3,231	3,760	4,189	4,507	4,558
Males	393	564	787	1,051	1,345	1,639	1,908	2,126	2,287	2,313
Females	381	547	764	1,021	1,306	1,591	1,852	2,064	2,220	2,245
Annual AIDS deaths										
Total	403	584	825	1,122	1,465	1,830	2,188	2,510	2,780	2,934
Males	204	296	418	569	743	928	1,109	1,273	1,410	1,488
Females	199	288	407	553	722	902	1,079	1,237	1,371	1,447
Population 0-14										
Total	631,481	641,921	651,045	659,103	666,121	672,065	676,979	680,793	684,056	686,992
Male	317,416	322,731	327,391	331,524	335,142	338,221	340,775	342,779	344,508	346,063
Female	314,065	319,190	323,655	327,579	330,979	333,845	336,204	338,013	339,548	340,930
Children needing cotrimoxazole										
Total	1,505	2,206	3,163	4,400	5,916	7,667	9,581	11,568	13,549	15,309
Male	763	1,118	1,603	2,230	2,998	3,885	4,855	5,862	6,866	7,757
Female	743	1,088	1,560	2,170	2,918	3,782	4,726	5,706	6,684	7,552
Children receiving cotrimoxazole										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Children needing ART										
Total	478	695	986	1,349	1,778	2,248	2,732	3,200	3,639	3,979
Male	242	352	500	684	901	1,140	1,385	1,622	1,845	2,017
Female	236	343	486	665	876	1,108	1,347	1,578	1,794	1,962
Children receiving ART										
Total	0	0	0	0	0	0	0	0	0	0
Male	0	0	0	0	0	0	0	0	0	0
Female	0	0	0	0	0	0	0	0	0	0
Mothers needing PMTCT	2,277	3,268	4,560	6,094	7,797	9,502	11,058	12,322	13,257	13,899
Mothers receiving PMTCT	0	0	0	0	0	0	0	0	0	917
HIV population	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	13,849	15,167	16,290	17,171	18,559	19,279	19,793	19,561	19,385	19,125
Males	7,016	7,683	8,252	8,698	9,401	9,764	10,024	9,906	9,816	9,684
Females	6,833	7,484	8,038	8,473	9,159	9,514	9,769	9,656	9,569	9,441
New HIV infections										
Total	4,504	4,370	4,155	3,847	2,959	2,185	1,467	890	874	870
Males	2,285	2,217	2,108	1,952	1,502	1,109	745	452	444	441
Females	2,219	2,153	2,047	1,895	1,458	1,076	723	438	431	429
Annual AIDS deaths										
Total	3,007	3,022	2,988	2,902	1,478	1,320	731	788	575	482
Males	1,524	1,532	1,515	1,471	749	669	370	399	291	244
Females	1,482	1,490	1,473	1,431	729	651	361	389	284	238
Population 0-14										
Total	689,725	691,964	693,691	695,414	698,910	702,933	707,890	713,487	719,762	726,560
Male	347,503	348,686	349,605	350,515	352,316	354,372	356,893	359,732	362,899	366,328
Female	342,222	343,278	344,086	344,899	346,594	348,561	350,996	353,754	356,863	360,232
Children needing cotrimoxazole										
Total	16,856	18,189	19,278	20,073	20,037	20,598	20,524	20,350	19,960	19,607
Male	8,540	9,215	9,767	10,169	10,150	10,433	10,395	10,305	10,107	9,928
Female	8,316	8,973	9,511	9,904	9,887	10,165	10,130	10,044	9,853	9,679
Children receiving cotrimoxazole										
Total	0	0	0	0	4,864	7,146	8,332	8,930	10,358	11,796
Male	0	0	0	0	2,464	3,620	4,220	4,522	5,245	5,973
Female	0	0	0	0	2,400	3,527	4,112	4,408	5,113	5,823
Children needing ART										
Total	4,258	4,502	4,717	4,895	4,823	5,779	6,479	7,362	7,989	8,658
Male	2,158	2,282	2,390	2,481	2,443	2,927	3,281	3,728	4,045	4,384
Female	2,100	2,220	2,327	2,415	2,379	2,852	3,198	3,634	3,944	4,274
Children receiving ART										
Total	0	0	0	0	2,142	3,503	5,564	6,251	7,401	8,551
Male	0	0	0	0	0	973	1,579	2,532	2,821	3,330
Female	0	0	0	0	0	949	1,539	2,469	2,751	3,247
Mothers needing PMTCT	14,294	14,432	14,345	14,197	14,250	14,399	14,611	14,742	14,863	14,854
Mothers receiving PMTCT	1,887	2,857	3,787	4,685	6,819	9,028	11,331	13,622	13,734	13,725

Appendix H. Indicators for Children 0-14 (Cont.)

	2010	2011	2012	2013	2014	2015	2016
HIV population							
Total	19,113	19,174	19,264	19,260	19,337	19,521	19,816
Males	9,677	9,708	9,754	9,751	9,790	9,882	10,032
Females	9,435	9,466	9,510	9,509	9,548	9,639	9,784
New HIV infections							
Total	860	843	819	791	764	740	716
Males	436	428	415	401	388	376	363
Females	424	415	403	389	376	365	353
Annual AIDS deaths							
Total	501	550	597	633	668	709	753
Males	254	279	302	320	338	359	381
Females	247	272	295	312	330	350	372
Population 0-14							
Total	734,161	741,984	749,694	756,487	762,635	768,459	773,815
Male	370,170	374,122	378,010	381,422	384,502	387,428	390,123
Female	363,991	367,863	371,685	375,065	378,132	381,031	383,692
Children needing cotrimoxazole							
Total	19,613	19,724	19,861	19,893	20,006	20,230	20,569
Male	9,931	9,987	10,056	10,072	10,128	10,242	10,413
Female	9,682	9,737	9,805	9,821	9,877	9,989	10,156
Children receiving cotrimoxazole							
Total	12,943	13,972	15,000	16,000	17,000	18,000	19,000
Male	6,554	7,074	7,595	8,101	8,607	9,113	9,619
Female	6,390	6,897	7,405	7,899	8,393	8,887	9,381
Children needing ART							
Total	9,236	10,033	10,853	11,632	12,297	12,939	13,554
Male	4,677	5,080	5,495	5,889	6,225	6,549	6,861
Female	4,560	4,953	5,358	5,743	6,072	6,389	6,693
Children receiving ART							
Total	9,700	10,850	12,000	13,000	14,000	15,000	16,000
Male	3,795	4,259	4,716	5,161	5,555	5,946	6,322
Female	3,701	4,154	4,600	5,034	5,419	5,801	6,168
Mothers needing PMTCT	14,755	14,554	14,237	13,861	13,505	13,182	12,841
Mothers receiving PMTCT	13,634	13,448	13,155	12,807	12,478	12,180	11,865

Appendix I. Orphans (Ages 0-17)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Maternal Orphans										
AIDS	0	0	0	0	0	0	0	0	1	2
Non-AIDS	0	0	0	0	0	23377	22942	22541	22181	21869
Total	0	0	0	0	0	23377	22942	22541	22182	21871
Paternal Orphans										
AIDS	0	0	0	0	0	0	1	2	3	6
Non-AIDS	0	0	0	0	0	32365	31983	31685	31478	31349
Total	0	0	0	0	0	32365	31984	31687	31481	31355
Double Orphans										
AIDS	0	0	0	0	0	0	0	0	1	1
Non-AIDS	0	0	0	0	0	6649	6258	5898	5572	5281
Total	0	0	0	0	0	6649	6258	5898	5573	5282
Total Orphans	0	0	0	0	0	49093	48668	48330	48090	47944
All AIDS orphans	0	0	0	0	0	0	1	2	4	7
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Maternal Orphans										
AIDS	4	8	14	24	41	69	114	187	304	489
Non-AIDS	21,600	21,366	21,160	20,991	20,832	20,693	20,554	20,409	20,263	20,095
Total	21,604	21,374	21,174	21,014	20,873	20,762	20,668	20,596	20,568	20,584
Paternal Orphans										
AIDS	10	16	26	40	62	95	145	219	330	495
Non-AIDS	31,285	31,273	31,298	31,362	31,434	31,492	31,535	31,526	31,453	31,286
Total	31,295	31,289	31,324	31,403	31,496	31,587	31,679	31,745	31,783	31,781
Double Orphans										
AIDS	2	3	5	8	13	20	31	48	73	110
Non-AIDS	5,020	4,786	4,575	4,384	4,257	4,116	3,954	3,764	3,541	3,380
Total	5,022	4,790	4,580	4,392	4,270	4,136	3,985	3,811	3,613	3,490
Total Orphans	47,877	47,873	47,918	48,026	48,099	48,213	48,362	48,530	48,737	48,875
All AIDS orphans	13	22	36	59	94	150	238	374	585	910

Appendix I. Orphans (Ages 0-17) (Cont.)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Maternal Orphans										
AIDS	779	1,229	1,916	2,948	4,461	6,618	9,601	13,574	18,649	24,979
Non-AIDS	19,916	19,721	19,487	19,240	19,010	18,768	18,513	18,263	18,011	17,767
Total	20,695	20,950	21,403	22,187	23,470	25,386	28,114	31,837	36,660	42,746
Paternal Orphans										
AIDS	741	1,101	1,624	2,372	3,433	4,915	6,942	9,629	13,053	17,476
Non-AIDS	31,027	30,652	30,121	29,486	28,801	28,138	27,532	27,009	26,593	26,339
Total	31,768	31,753	31,744	31,858	32,233	33,053	34,474	36,638	39,646	43,815
Double Orphans										
AIDS	167	287	536	845	1,251	1,805	2,576	3,660	5,165	7,302
Non-AIDS	3,219	3,058	2,893	2,731	2,580	2,443	2,319	2,211	2,120	2,049
Total	3,386	3,345	3,429	3,577	3,832	4,248	4,895	5,871	7,285	9,351
Total Orphans	49,076	49,358	49,718	50,469	51,872	54,190	57,693	62,604	69,021	77,210
All AIDS orphans	1,407	2,123	3,122	4,647	6,890	10,080	14,460	20,217	27,436	36,336
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Maternal Orphans										
AIDS	32,251	40,362	49,065	56,939	62,397	65,702	65,230	65,106	62,788	61,840
Non-AIDS	17,518	17,265	17,018	16,760	16,496	16,220	15,960	15,709	15,463	15,226
Total	49,769	57,627	66,082	73,700	78,893	81,922	81,190	80,815	78,251	77,066
Paternal Orphans										
AIDS	22,638	28,459	34,814	40,889	46,781	51,031	52,405	53,498	51,862	51,062
Non-AIDS	26,146	25,994	25,885	25,799	25,900	25,945	25,933	25,919	25,742	25,586
Total	48,784	54,453	60,699	66,688	72,681	76,975	78,338	79,417	77,603	76,648
Double Orphans										
AIDS	10,098	13,646	17,987	22,519	26,837	30,096	31,031	31,862	30,557	29,915
Non-AIDS	1,989	1,934	1,884	1,837	1,807	1,773	1,738	1,704	1,660	1,618
Total	12,087	15,580	19,871	24,357	28,644	31,869	32,768	33,566	32,217	31,533
Total Orphans	86,466	96,500	106,910	116,031	122,930	127,028	126,759	126,666	123,637	122,181
All AIDS orphans	46,298	57,039	68,137	77,897	85,195	89,646	89,591	89,708	86,909	85,716

Appendix I. Orphans (Ages 0-17) (Cont.)

	2010	2011	2012	2013	2014	2015	2016
Maternal Orphans							
AIDS	61,983	63,323	65,366	67,598	69,742	71,617	73,183
Non-AIDS	14,998	14,758	14,514	14,245	13,971	13,697	13,407
Total	76,982	78,081	79,880	81,843	83,713	85,314	86,590
Paternal Orphans							
AIDS	50,972	51,673	52,826	54,070	55,212	56,131	56,807
Non-AIDS	25,474	25,405	25,361	25,331	25,305	25,260	25,216
Total	76,446	77,078	78,187	79,401	80,517	81,390	82,023
Double Orphans							
AIDS	29,765	30,189	30,900	31,654	32,287	32,703	32,894
Non-AIDS	1,580	1,543	1,505	1,465	1,425	1,382	1,337
Total	31,346	31,732	32,405	33,119	33,711	34,084	34,231
Total Orphans	122,082	123,427	125,662	128,124	130,518	132,620	134,381
All AIDS orphans	85,876	87,501	90,022	92,787	95,480	97,883	99,944