The AIDS epidemic has reached alarming levels in much of sub-Saharan Africa. In some countries of southern Africa, one-quarter to one-third of adults, aged 15-49 years, are infected with HIV. The AIDS epidemic is causing important changes in key demographic factors, such as increases in death to adults aged 30-49 years, reductions in life expectancy, and increases in the number of orphans. In most of sub-Saharan Africa, fertility rates are so high that even the increased death rate due to AIDS will not stop population growth. However, in a few places, low fertility coupled with increased numbers of deaths due to AIDS may lead to negative population growth. This is particularly true in such southern African countries as in Zimbabwe, Botswana, and South Africa. The article by Mekonnen et al. in this issue examines the case of Addis Ababa (1).

Addis Ababa is unique in eastern Africa in that the total fertility rate is already below replacement level—the level that would eventually produce a population with zero annual growth. The authors show that, in this setting, HIV prevalence of 10% in adults results in a negative rate of natural increase. That is, there will be more deaths than births each year. Since migration into Addis Ababa from the countryside is expected to continue, the population will continue to grow, albeit at a very low rate. Other important demographic consequences of AIDS include a tripling in the annual number of adult deaths and a reduction in life expectancy at birth by 14 years within 2004.

The projections are made using the AIDS Impact Model (AIM), which is a component in the SPECTRUM system of policy models. The AIM combines epidemiological calculations regarding new HIV infections, progression to AIDS-related death, and the impact of HIV on fertility with demographic projections that track the population over time by age and sex. HIV/AIDS affects the demographic projections through increased adult and child mortality and a reduction in fertility among HIV-infected women. The demographic projection affects the HIV/AIDS calculations through changes in the age structure of the population and the underlying fertility and non-AIDS mortality rates. A different approach is used by the United Nations Population Division and the U.S. Census Bureau. They make demographic projections for every country in the world every two years. Each of them uses a separate model to project the number of AIDS-related deaths. The United Nations has used EpiModel with UNAIDS estimates of HIV prevalence to project total AIDS-related deaths. These deaths are then distributed by age and sex according to a standard pattern. These AIDS-related deaths are then added to deaths due to causes other than AIDS calculated by the UN demographic model to determine total number of deaths and life expectancy. The U.S. Census Bureau uses the iwgAIDS model to develop standard scenarios of AIDS-related deaths by age and sex. They then calibrate these scenarios to the estimated prevalence level in a particular country to determine AIDS-related deaths by age and sex. These deaths are added to the non-AIDS deaths calculated by their demographic model to determine total deaths. The advantage of this approach is that this allows both organizations to continue to use their standard demographic models. The disadvantage is that there is no interaction between the HIV projections and the demographic projections. For example, there is no competing risk of mortality. That is, the models ignore the possibility that people infected with HIV might die of causes other than AIDS before they die of AIDS.

A third approach is the use of full-scale simulation models, such as iwgAIDS. In this case, the model uses epidemiological factors, such as number of sex partners, coital frequency, prevalence of sexually transmitted infections, and condom use, to calculate the incidence of HIV. The number of AIDS-related deaths by age and sex is determined from incidence and is fully integrated with the demographic projection processes. This approach is especially useful for investigating the impact of interventions to change behaviour. However, we rarely have enough data to specify a simulation model correctly for a particular setting, such as Addis Ababa.

The approach used in the AIM takes a middle ground. It links the demographic and epidemiological projections but uses an exogenous estimate of HIV prevalence rather than trying to simulate the incidence of HIV.
endogenously. This approach has been adopted by UNAIDS for its bi-annual epidemic updates. These updates include estimates of the number of adults and children infected with HIV, new infections, AIDS-related deaths, and AIDS orphans for about 150 countries. The latest update, which will be released in July 2002, was prepared using the AIM.

The AIM is also used in numerous national programmes for making projections for purposes of awareness-raising, advocacy, and strategic planning. In these countries, the AIM is used for projecting the consequences of the AIDS epidemic. Policy presentations using this information are prepared and used with high-level audiences to engage them in dialogue about the consequences of the AIDS epidemic and the need for effective action. The AIM projections are also used as part of the strategic planning process for estimating future requirements for care and support. The AIM presentations have been prepared by a number of countries in the last few years, including Ethiopia, Kenya, Zambia, Zimbabwe, Ghana, Benin, Cote d’Ivoire, Burkina Faso, Cambodia, Honduras, and Panama.

The greatest limitation in these types of projections is that these are based on assumptions about future HIV prevalence levels. In the paper on Addis Ababa, the authors assume that prevalence in adults will stabilize at 10%. In the UNAIDS projections, a separate model—Epidemic Projection Package (EPP)—is used for projecting prevalence on the basis of surveillance in clinics for antenatal care. These projections are inherently risky. In the early 1990s, few people expected the epidemics in southern Africa to reach the levels seen today, and few people expected the rapid decline in prevalence we have seen in Uganda.

However, these exercises are not about predicting the future so much as these 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 Addis Ababa, 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.

REFERENCE


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1 SPECTRUM is a system of policy models to support awareness-raising, advocacy, and strategic planning for reproductive health. It is produced by the POLICY Project, a USAID-funded project implemented by the Futures Group International in cooperation with the Research Triangle Institute and the Center for Population and Development Activities. SPECTRUM is available from the Futures Group website at www.tfgi.com

2 EpiModel was developed by Jim Chin at the Global Programme on AIDS. It is available from the UNAIDS website at www.unaids.org

3 iwgAIDS is produced by Steve Seitz at the University of Illinois

4 EPP was developed by the UNAIDS Reference Group on Estimates, Models and Projections. The model and manual are available at www.tfgi.com