

Ending AIDS in South Africa: progress and prospects

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World-wide South Africa has the largest epidemic of HIV and the biggest anti-retroviral programme. But reaching the UNAIDS 90-90-90 target by 2020 and ending AIDS by 2030 will require an expansion of surveillance and strengthening patient monitoring. Both are needed to monitor progress, identify and correct problems and to demonstrate success. Here we outline the current state of the epidemic and discuss important issues that should inform the National Strategic Plan to be launched on World AIDS Day in December.

Current state of the epidemic

South Africa accounts for almost one in five people living with HIV in the world (1). The initial response to this most devastating epidemic, which struck as South Africa was emerging from the dark night of Apartheid, was uncertain and confused (2). Now the tide has turned, South Africa has the biggest programme of anti-retroviral therapy (ART) in the world (3) and is committed campaign actively to find and support those infected with HIV and to provide ART to all everyone who tests positive as from September 2016. Backed up by good prevention programmes, South Africa should reach the UNAIDS goal of ending AIDS by 2030 (4). Here we take the opportunity to take stock of current progress to consider future prospects for the control of HIV and TB in South Africa with a focus on horizontal rather than vertical transmission.

Over the last ten years the increasing coverage of ART has led to a rapid decline in the rate of new HIV infections and AIDS deaths, but the prevalence of HIV in South Africa has remained constant as the increased life expectancy of those on ART balances the decline in the rate of new infections (5). The incidence of HIV in adults fell from a peak of 2.5% *p.a.* in 1998 to 0.6% *p.a.* in 2016; AIDS related mortality fell from a peak of 1.3% in 2008 to 0.4% *p.a.* in 2016 (5). Both HIV incidence and AIDS related mortality are still falling at a *relative* rate of 36% *p.a.* Estimates of these epidemic trends depend critically on data from the annual ante-natal clinic surveys that have been carried out among pregnant women each year since 1990 (6), on data on the number of adults that are on ART, and routine data on TB notification rates (7) combined with a detailed understanding of the natural history of HIV/AIDS and TB (5). Projecting the epidemic forward in time, the first milestone will be the

UNAIDS 90-90-90 target for 2020 when 90% of people infected with HIV should know their status, 90% of them should be on ART and 90% of those on ART should be virally suppressed. Once the 90-90-90 target has been reached South Africa will continue to provide treatment and support to the remaining 10% in each category and by 2030 the coverage of ART should be close to 100-100-100.

If South Africa is to succeed in this ambitious but vitally important project it will be essential to monitor carefully the treatment outcomes and epidemic trends in the population as a whole. Our first responsibility is to individual patients and they deserve to be encouraged to seek care and to be supported throughout the course of their treatment, however long. The *sine qua non* of a good health-care system is being able to track, follow-up and support individual patients. This is especially important for chronic conditions, of which HIV is now one, as well as for infections such as TB for which the course of treatment is in the order of months. However patient monitoring in the public sector in South Africa is still weak in many places and needs to be strengthened. The second, equally important, responsibility is to reduce overall transmission which will reduce the burden on society and on the health services and ensure that South Africa has a healthy and productive population.

Patient monitoring

Good patient monitoring depends on being able to uniquely identify individual patients. For legal residents ID numbers would suffice, but this leaves out the many non-legal residents, legal temporary residents and those under the age of 16 years. The development of a nation-wide 'Medical Card' has been considered. In some places date-of-birth followed by the first three letters of the surname has been used to identify and track individual patients. Since most people have cell-phones they could be used both to identify people and to communicate with patients. If clinic staff took a photograph on the first visit and linked it to a cell-phone number this could be effective. In any event a way of identifying and keeping track of patients has to be found.

For HIV a standard set of data must be recorded starting with an HIV-test. People that test negative

should be given advice on available and appropriate methods of prevention and advised to come back after six-months for another HIV test, perhaps focusing on those who are at greatest risk. If positive they should be given a viral load test, started immediately on ART and tested for TB. Those on ART could then be called back after one month, six months and then annually for a viral load test and clinical follow-up. If the viral load is above 400/ μ L, say, one might want to measure the drug levels in their blood and test for resistance. If patients do not return, efforts must be made to find them.

All those that test positive for TB should be tested for HIV and if positive started on ART. For those that are HIV-negative the usual protocol should be followed with a sputum smear followed by culture if smear negative, or GeneXpert or other point-of-care test where available. The outcome of treatment should be recorded in the usual way: completed, cured, defaulted, transferred out, lost to follow-up, or died. Given the recent studies showing very high rates of both relapse and reinfection after apparent cure, a protocol of following-up TB patients should be developed (8,9). This could involve follow-up visits at say 6 months, one year, two years and five years.

For both HIV and TB it is essential to have real-time data on how many patients have started treatment, are alive, dead, lost to follow-up, defaulted, cured in the case of TB, virally suppressed in the case of HIV, on first or second line regimens for HIV and TB, drug susceptible or resistant in the case of HIV.

One of the objections to doing this has been that the health system is overwhelmed and that such ambitious plans cannot be met by overworked health staff. But an important reason why the health system is under pressure is illustrated by data from the Chris Hani-Baragwanath Hospital where, between 2006 and 2009 14,431 people died in the hospital's medical wards, an average of 11 deaths each day; of all those that died 64% of men and 82% of women were HIV positive and of those between the ages of 30 and 40 that died 94% of men and 96% of women were HIV-positive (10). Controlling HIV and HIV-related TB will greatly reduce the burden on the health system; until that time the burden on the health staff could be reduced by training and employing community outreach workers to encourage people to be tested, to provide them with support if positive, to recognize symptoms associated with treatment failure so that they can be brought back to the clinics, and to find them if they do not come for follow-up appointments. This would have the dual benefit of

dealing with HIV and TB while creating jobs in communities.

A comprehensive system of patient monitoring will take time to develop and implement and one would probably want to start with a small number of clinics representing inner city, urban, peri-urban and rural communities to find out what works and how to make it work and then expand the programme over a period of several years to reach full coverage. This will entail substantial costs. However, the cost of the HIV-programme in South Africa is currently running at about US\$2Bn *p.a* (11). so that 1% of the current expenditure would be more than enough to develop and fund a first-class patient monitoring system. Furthermore, success in regard to HIV and TB could then be extended to provide good patient monitoring for all other chronic conditions.

Malawi provides an excellent example of good monitoring in a poor country with a substantial HIV epidemic (12). Clinics report quarterly, on the number of people that start ART, the number on ART, their viral loads, the number that have died, been lost to follow-up, transferred-out or defaulted. Their patient monitoring system for HIV is based on their TB monitoring system for which the corresponding set of indicators are measured and reported. Staff from the Department of Health (DoH) visit each clinic quarterly, go through their data, provide help, support, encouragement and advice and identify and deal with problems that arise giving clinic staff a sense of purpose and commitment. The cost of the patient monitoring and clinic support system is in the order of US\$1 million *p.a.*; the cost of the HIV-control programme is in the order of US\$100 million *p.a.* This ensures good patient monitoring and treatment outcomes while the aggregated data provide critical information for the monitoring of the performance of the health services from rural clinics all the way up to national hospitals.

Surveillance

South Africa leads the world in routine surveillance for HIV based on the annual surveys among women attending ante-natal clinics and these have provided excellent data on the state of the HIV epidemic for the past 26 years. As South Africa scales up the provision of ART and other methods of prevention it will be important to assess the impact of these various combinations of interventions and the best way to do this would be to extend and expand the annual surveys. Currently the annual ANC surveys focus on HIV-status and, historically, on syphilis. The epidemiological information gained from these surveys, on which all of our current estimates and

projections depend, would be greatly enhanced if the women were:

- Asked if they know their status and if they are on treatment.
- Tested for HIV in all cases and:
 - if HIV-positive tested for anti-retroviral drugs and had their viral load measured;
 - if on anti-retroviral drugs with high viral load they should be tested for drug-resistance.
- These data would make it possible to monitor progress on the three 90s for HIV and the extent of drug-resistance.
- All the women should be tested for syphilis, gonorrhoea, chlamydia, HSV-2 and other important sexually transmitted infections; these are important in themselves and biomarkers for the risk of infection.
- Test all women for TB, if possible using Gene Xpert or an alternative molecular assay.

The cost of such a surveillance programme will be only a small fraction of the US\$2Bn currently devoted to managing the epidemic of HIV and TB. Furthermore, the major cost of such a programme is setting up the sampling frame, finding the women, getting their consent, taking the blood and sending it to the laboratory. Once the blood samples are in the laboratory the marginal cost of the additional tests will be small.

Linking to other data

There are many other sources of data in South Africa and they should be cross-linked to the key surveillance data derived from the ante-natal clinic surveys. These include:

- Vital registration data from Stats South Africa;
- Data from the National Health Laboratory System on the results of their blood tests;
- Rates of mother-to-child transmission from ANC clinics;
- Demographic and Behavioural Surveys carried out by the Human Sciences Research Council;
- Particular data sets such as that collected at Baragwanath and referred to above;
- Data from research studies and trials including the Centre for the AIDS-Programme of Research in South Africa (CAPRISA), Wits Reproductive Health and HIV Institute (WRHI), Desmond Tutu HIV and TB Centres, as well as many others, but in particular the Africa Centre in Hlabisa.

In summary: South Africa is faced with the most devastating epidemics of HIV and TB and this in a country with great inequality of access to health services some of which are themselves over-burdened and under-funded. Ultimately the hope is

for a well-functioning national health insurance programme to make good health accessible to everyone, reducing the burden of disease on people and society, while at the same time creating employment in often marginalized communities. Nevertheless the government of South Africa is to be congratulated on a remarkable achievement in successfully driving down the rate of new infections and AIDS related mortality. With the commitment to the new recommendations from WHO to start treatment immediately for anyone found to be infected with HIV there is every reason to believe that South Africa will reach the UNAIDS 90-90-90 target by 2020 and the target to End AIDS by 2030.

However, good intent is never enough in and of itself. In order to understand, manage and eventually control the epidemics of HIV and TB it will be necessary to develop and implement a strong patient the monitoring system and expand routine surveillance to provide a key set of data with which other sets of data can be linked, compared and interpreted and which can be used to inform models to estimate current trends, project future trends and evaluate progress. Good intent is never enough and success will depend on having reliable data for both individual patients and overall trends. Malawi has shown the way forward and the advent of the new National Strategic Plan offers an ideal opportunity to stop the transmission of HIV, end AIDS and greatly reduce the burden of TB.

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