

HIV and tuberculosis prevention and control in South Africa: An overview

W D F Venter, FCP, MMed, DTM&H

Wits Reproductive Health and HIV Institute, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author: W D F Venter (fventer@wrhi.ac.za)

HIV and tuberculosis (TB) remain major challenges in South Africa, despite free, and widely available, effective prevention and treatment. While modest successes have been enjoyed in terms of prevention, these started from an already very high infection level, and new infections of both diseases are still among the highest in the world. This overview explores the complex and evolving epidemiology of HIV and associated TB, and the possible mechanisms for achieving control of the epidemics.

South Afr J Pub Health 2018;2(3):52-54. DOI:10.7196/SHS.2018.v2.i3.61

It is difficult to overstate the impact of HIV and tuberculosis (TB) on the health of populations in sub-Saharan Africa. In this series, I provide an overview of the status of the prevention and control of both diseases. Several decades of steady improvement in life expectancy, on the back of improved sanitation and housing, safer food and access to vaccines and improved medical care, were rapidly reversed during the 1980s and 1990s as HIV and associated TB prevalence increased rapidly. South Africa (SA), paradoxically protected by its politically and socially restricted borders during apartheid, then saw a rapid rise in HIV prevalence during the 1990s, to the point where it is now similar to that in surrounding epidemic countries.^[1-3]

The broad availability of potent antiretroviral (ARV) therapy for the treatment of HIV, with a subsequent improvement in the tolerability and effectiveness of the drug cocktail, has dramatically reduced the morbidity and mortality associated with HIV, and for the first time in decades, we have seen an associated slight decline in new diagnoses of TB.^[2,3]

However, control of these two closely interlinked diseases has remained a frustrating challenge at several levels. Common, serious, transmittable, ostensibly preventable and usually treatable, the public health importance of dealing with the dual epidemics is very clear, but the prevention of HIV and TB has proven to be remarkably difficult, with very limited success in sub-Saharan Africa.

However, better understanding of epidemiology, better interventions for infection control and chemoprophylaxis and better treatment and care packages for both diseases have given new hope to prevention efforts. In particular, efforts to reduce the toxicity of the medication used to treat both diseases, especially for HIV and multidrug-resistant TB, have begun to bear fruit. The fact that both diseases are effectively and rapidly rendered non-transmissible by effective therapy has led to focused attention

on improving treatment packages. Earlier and better diagnosis of TB, long neglected in favour of poorly sensitive microscopy, has inspired the entire field, with more ambitious attention now paid to drug development and system delivery.^[4,5]

Understanding the rise and fall of HIV

HIV in SA in the 1980s looked very similar to that in the USA and some European countries: largely confined to white haemophiliacs (infected with blood procured from the USA, before the discovery of HIV in their blood supply), men-who-have-sex-with-men (MSM) and a small number of intravenous drug users. However, the epidemic exploded in the early 1990s in the general community, owing to heterosexual sexual, pregnancy and breastfeeding transmission, which have contributed to the vast majority of new infections since then.^[1]

Initial efforts to contain the HIV epidemic were constrained by delayed epidemiological recognition of this rapid rise of new infections, especially in KwaZulu-Natal (KZN) Province, where political instability appeared to fuel a startling rise in incidence, from less than 1% of pregnant women attending antenatal clinics being affected, in sentinel surveys, to some areas showing over 60%.^[1]

Historically, HIV prevention relied on general education campaigns and steadily improved condom distribution. As data emerged, prevention of mother-to-child transmission using ARVs since 2001 has been a huge public health victory, decreasing transmission levels from 70 000 per year 10 years ago, to less than 3 000 in 2016.^[6] Medical male circumcision, shown to be highly effective in 2005, has been steadily scaled up across the country. The control of viral load in HIV-positive patients with ARVs was shown to completely stop sexual and breastfeeding transmission, allowing the decision to move to 'test and treat' models, where ARVs are offered irrespective of level of immune dysfunction.^[7,8]



Pre-exposure prophylaxis, where ARVs are given to HIV-negative people at risk for HIV, has recently become an option in SA.^[9] Finally, SA's blood supply has, crucially, remained very safe throughout the HIV-era, in contrast to many other countries in Africa. New emerging issues, such as increased intravenous drug use, and increased ease in finding sexual partners using social media apps, may challenge current prevention programmes with new and evolving microepidemics.

There are inexplicable significant differences in the evolution of prevalence by province. The increase in KZN was followed rapidly by similar increases in Mpumalanga and Gauteng, while the Northern Cape and Western Cape have remained far less affected. Currently, almost all the other SA provinces have similar high prevalence rates, with the exception of these two.^[4,5]

HIV new incident infections now appear to be on a downward trend. SA has a rich source of independently collected data that chronicles the HIV incident evolution over the last two decades. The country has several sources of this data, including from the Human Sciences Research Council surveys, the pregnant women survey conducted by the Department of Health, and audits of death certificates nationally, by Statistics SA.^[10-12] In addition, more geographically constrained research projects, such as the Africa Centre, the Centre for the AIDS Programme of Research in Africa (CAPRISA) and the HIV Incidence Provincial Surveillance System (HIPSS), all in KZN, have documented interesting changes in demography and access to care in the last decade.^[13-15] Most studies appear to demonstrate a decrease in new infections, especially among younger people, although the absolute number remains very high.

More recently, the widespread availability of effective ART has confounded some of these studies, as people live for decades on treatment, achieving near-normal life expectancies, with a resulting steady increase in prevalence. Simple and cheap antibody-based assays were previously used to document changes in epidemiology, but accurately documenting new incident infections has become necessary, to understand where new microepidemics are occurring. These tests, including techniques using 'detuned' ELISA assays, antibody avidity assays and pooled RNA remain controversial in terms of interpretation, and are often expensive, posing new challenges to surveillance efforts.

Understanding the rise of TB in SA

TB remains the number one killer in SA, where its incidence is the second highest in the world, largely owing to the scale of the HIV epidemic, which renders HIV-positive people at increased risk of TB, even in the presence of ARV therapy. A newly described epidemic among healthcare workers points to inadequate ventilation within health facilities, which adds another at-risk population to the traditionally recognised groups, such as prisoners and miners. Poor access to effective isoniazid (INH) prevention therapy for people with HIV has meant that this population continues to contribute to new infection rates.^[4,5]

TB has been effectively brought under control within most developed countries, with large numbers of developing countries outside of sub-Saharan Africa now making progress in epidemic

control. Reports that demonstrate global improvements in TB control gloss over the fact that sub-Saharan Africa is actually still experiencing an overall rise in numbers. As with HIV, the epidemiology is not straightforward, with the Western Cape Province having the highest prevalence despite having a far lower HIV burden than the rest of the country. The places with lower HIV rates predictably report lower HIV-TB coinfection rates. There is even high variation between districts, and while some of these findings may be due to reporting issues, this does not fully explain the differences, which differ fourfold between the highest- and lowest-incident districts.^[3,5]

The reporting of TB is complex, as it has relied traditionally on poorly sensitive sputum tests, which lose sensitivity even further in the presence of HIV, so that accurate numbers are hard to derive. Autopsy studies suggest that TB is underdiagnosed, even in academic institutions.

In parallel, the area has seen the rise of multidrug-resistant TB, made more apparent by the rise of sensitive new polymerase chain reaction-based technologies that allow rapid diagnosis of resistance. While traditionally blamed on poor patient adherence, it has increasingly been recognised that other factors are probably responsible for this rise, including inadequately potent regimens with inadequate serum concentrations of active drug, inadequate ventilation and infection control in health facilities, and more widespread community and health facility transmission than previously thought.

A national survey is planned in 2018 that may allow more accurate tracking of the epidemiological evolution of TB in SA. While traditional TB control programmes often trumpet the fact that 'TB can be cured', long-term consequences even in cured TB often include impact on affected organs, including lung, bone and brain; the term 'respiratory cripple' needs little explanation, and is a consequence in a significant number of TB survivors.^[5]

In terms of research, TB is an orphan when compared with HIV when it comes to research money and effort. However, this is changing, with the first new diagnostics and chemotherapy agents in decades being tested and rolled out. The pace is still slow, but the development of shorter, more effective treatment regimens for both drug-sensitive and drug-resistant TB looks promising, and may contribute substantially to better epidemic control. However, far more so than HIV, TB is a disease of poverty, and social and economic improvement is probably a key component of control, going forward.^[3]

Conclusions

Both the HIV and TB epidemics are complex and still evolving. The huge victories around treatment, and more limited ones in the identification of effective prevention techniques in the HIV field, have fuelled new resolve within the TB research and public health world, long constrained by a lack of research and programme funding and, arguably, by a lack of ambition.

Both epidemics require attention from a public health perspective; the HIV programme alone consumes a massive proportion of the health budget, and TB has a huge impact on the nation's health, even in people successfully treated. Understanding



the nuances of the epidemiology, with proper scientific surveys, will allow more nuanced and effective prevention targeting.

In the future, this series will look at these aspects of prevention, reviewing the current status of the field in terms of medical efficacy, the current and future impact on each epidemic in the SA context, and the implementation challenges of each for public health programmes.

Acknowledgements. None.

Author contributions. Sole author.

Funding. WDFV is supported by the United States Agency for International Development (USAID), the SA Medical Council and Unitaid.

Conflicts of interest. WDFV is part of the OPTIMIZE consortium, which evaluates new antiretroviral approaches to improve access to treatment, which has included drug donations for studies. He has accepted honoraria from multiple pharmaceutical manufacturers for talks and participation on advisory boards.

1. Simelela N, Venter WDF. A brief history of South Africa's response to AIDS. *S Afr Med J* 2014;104(3):249-251. <https://doi.org/10.7196/SAMJ.7700>
2. Joint United Nations Programme on HIV/AIDS (UNAIDS). 90-90-90: An ambitious treatment target to help end the AIDS epidemic. Geneva: UNAIDS, 2014. http://www.unaids.org/sites/default/files/media_asset/90-90-90_en.pdf (accessed 5 May 2018).
3. World Health Organization. Global tuberculosis report 2016. Geneva: WHO, 2016. http://www.who.int/tb/publications/global_report/en/ (accessed 5 May 2018).
4. South African National AIDS Council. Draft South African National Strategic Plan 2017 - 2022. Pretoria: SANAC, 2016. <http://nsp.sanac.org.za/2017/02/01/the-draft-of-the-new-nsp-2017-2022-is-now-ready-for-review> (accessed 5 May 2018).

5. Health Systems Trust. District Health Barometer 2015/2016. <http://www.hst.org.za/publications/Pages/District-Health-Barometer-201516.aspx> (accessed 5 May 2018).
6. AfricaCheck. Are fewer than 6 000 babies born HIV+ every year in SA, as Zuma said? AfricaCheck, 2017. <https://africacheck.org/reports/fewer-6000-babies-born-hiv-every-year-sa-zuma-said/> (accessed 5 May 2018).
7. Abdool Karim SS, Abdool Karim Q. Antiretroviral prophylaxis: A defining moment in HIV control. *Lancet* 2011;378(9809):e23-e25. [https://doi.org/10.1016/s0140-6736\(11\)61136-7](https://doi.org/10.1016/s0140-6736(11)61136-7)
8. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med* 2011;365(20):493-450. <https://doi.org/10.1056/nejmc1110588>
9. Eakle R, Venter WDF, Rees H. Pre-exposure prophylaxis for HIV prevention: Ready for prime time in South Africa? *S Afr Med J* 2013;103(8):515-516. <https://doi.org/10.7196/samj.6937>
10. Shisana O, Rehle T, Simbayi LC, et al. South African National HIV Prevalence, Incidence and Behaviour Survey, 2012. Cape Town: HSRC Press, 2014.
11. Statistics South Africa. Mid-Year Population Estimates, 2015. Cape Town: StatsSA, 2015. <https://www.statssa.gov.za/publications/P0302/P03022015.pdf> (accessed 5 May 2018).
12. National Department of Health, South Africa. The 2013 National Antenatal Sentinel HIV Prevalence Survey South Africa. Pretoria: NDoH, 2013. <https://www.health-e.org.za/wp-content/uploads/2016/03/Dept-Health-HIV-High-Res-7102015.pdf> (accessed 5 May 2018).
13. Abdool Karim Q, Baxter C, Bix D. Prevention of HIV in adolescent girls and young women: Key to an AIDS-free generation. *J Acquir Immune Defic Syndr* 2017;75(Suppl 1):S17-S26. <https://doi.org/10.1097/qai.0000000000001316>
14. Grobler A, Cawood C, Khanyile D, Puren A, Kharsany ABM. Progress of UNAIDS 90-90-90 targets in a district in KwaZulu-Natal, South Africa, with high HIV burden, in the HIPSS study: A household-based complex multilevel community survey. *Lancet HIV* 2017;4(11):e505-e513. [https://doi.org/10.1016/s2352-3018\(17\)30122-4](https://doi.org/10.1016/s2352-3018(17)30122-4)
15. Tanser F, Barnighausen T, Grapsa E, Zaidi J, Newell M-L. High coverage of ART associated with decline in risk of HIV acquisition in rural KwaZulu-Natal, South Africa. *Science* 2013;339(6122):966-971. <https://doi.org/10.1126/science.1228160>

Accepted 2 March 2018.

