

## Oscillating Migration Driving HIV and TB in sub-Saharan Africa

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Two thirds of the burden of HIV and HIV-related Tuberculosis (TB) is in sub-Saharan Africa and seven countries (Kenya, Mozambique, Nigeria, South Africa, Tanzania, Uganda in Africa and India) account for 33% of the global prevalence of HIV (WHO, UNAIDS).

In spite of the combined efforts of national governments and their global partners, such as the President's Emergency Plan for AIDS Relief (PEPFAR), The Global Fund, the Clinton Health Access Initiative (CHAI), and international non-governmental organizations (NGOs) such as Médecine sans Frontières (MSF) and many others, the incidence of HIV and TB remain very high. Recent modelling studies (1,2) have shown that modest reductions in HIV incidence are possible with high coverage of anti-retroviral therapy for people whose CD4<sup>+</sup> cell count is below 350 cells/ $\mu$ L, but substantial reductions are only possible if people are tested at intervals of about 1 year and started on treatment as soon as they are found to be infected with HIV. This approach, termed "treatment as prevention" (TasP) or "test and treat" (TnT), in which people are started on ART as soon as they are found to be HIV-positive, irrespective of their CD4<sup>+</sup> cell counts, is now recommended by the International AIDS Society (IAS) as well as the Department of Health and Social Services (DHSS) in the United States and is likely to become the treatment protocol of choice in all countries.

The recent Declaration and Code of Conduct on TB in the Mining sector signed by the SADC Ministers of Health are a recognition of the close link between mining and TB in sub-Saharan Africa (3). Not only does silicosis increase the risk of TB by about 3 times on average, but the working conditions and the living conditions in the mine hostels, especially around gold mines, are such as to greatly enhance the spread of TB (4).

HIV infection drives the epidemic of TB partly because people living with HIV are more susceptible to being infected with TB and also because those with a latent TB infection, which in some places may be up to 80% of the adult population, are more likely to break down to active disease.

For most of the past century the system of oscillating (going to and from) labour migration, especially to the gold mines in South Africa, has

helped to spread TB throughout southern Africa and it now helps to spread HIV (3,5). However, there is also evidence that other forms of migrant and seasonal labour have contributed to the spread of both infections. A behavioural study carried out on commercial agricultural farms in Mpumalanga and Limpopo (6) where 31% of the workers were migrants, found a prevalence of HIV of 40%, a case-notification rate of TB of 6% per annum with 59% of TB cases being HIV positive (2.3, 9 and 1.5 times the respective national averages).

### **The impact of transport corridors and migrant labour on the prevalence of HIV**

In a study on the impact of migrant labour in the mines in South Africa on the burden of HIV and TB in Mozambique (7) a close correlation was found between the geographical distribution of HIV and TB and patterns of migrant labour. Mozambique can be divided into 3 regions, each of which has a different burden of disease. (National data). The northern region (HIV prevalence 6%, TB incidence of 99 cases per 100,000 people per year) is relatively isolated, does not have major transport corridors passing through it and is not used for recruiting agricultural or mine workers. The central region (HIV prevalence 12%, TB incidence of 178 cases per 100,000 people per year) has the main transport corridors from Zimbabwe and Zambia to the coastal ports of Beira and Maputo. The southern region (HIV prevalence 18%, TB incidence of 327 cases per 100,000 people per year) has the transport corridors into South Africa and the transport corridor to Zimbabwe and Zambia. Records of The Employment Bureau for Africa (TEBA) over the last decade (Personal communication) show 96% of miners recruited in Mozambique for South African mines come from the southern region.

In Figures 1 and 2 we compare the HIV prevalence and the TB notification rates respectively in each of the three geographical regions. If we assume, as a first approximation, that the prevalence in the northern region is the expected prevalence without the presence of major transport corridors, then the difference between the prevalence in the central region and the northern region gives an approximate estimate of the impact of these transport corridors on the prevalence of HIV.

Similarly, the difference between the prevalence in the southern region and the central region gives an approximate estimate of the impact of migrant labour on the prevalence of HIV. This is a very conservative estimate, since the transport to Maputo

passes through the Central region, and so the burden of infection through the transport routes is likely to fall more heavily on the central region than it is on the Southern region.

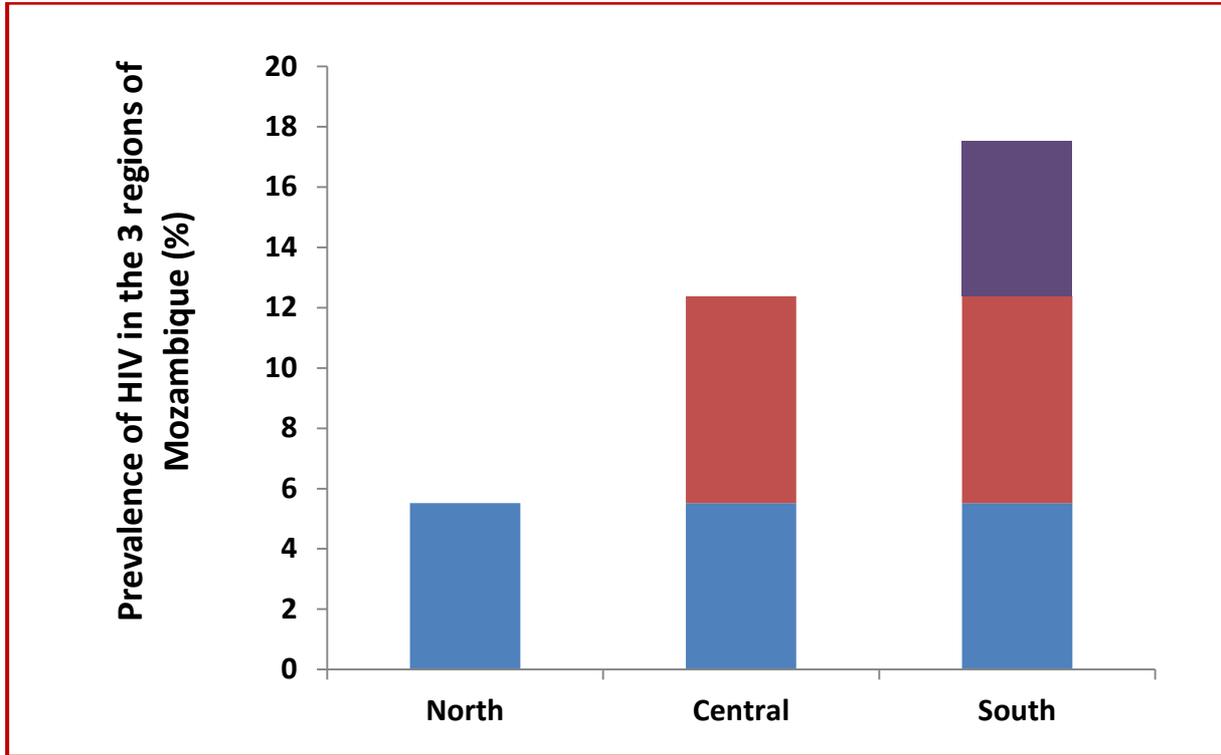


Figure 1. HIV Prevalence (%) by region showing contributions of corridors and migrant labour (14) Blue: Baseline without corridors or migrant labour. Red: Transport corridors. Purple: Migrant labour.

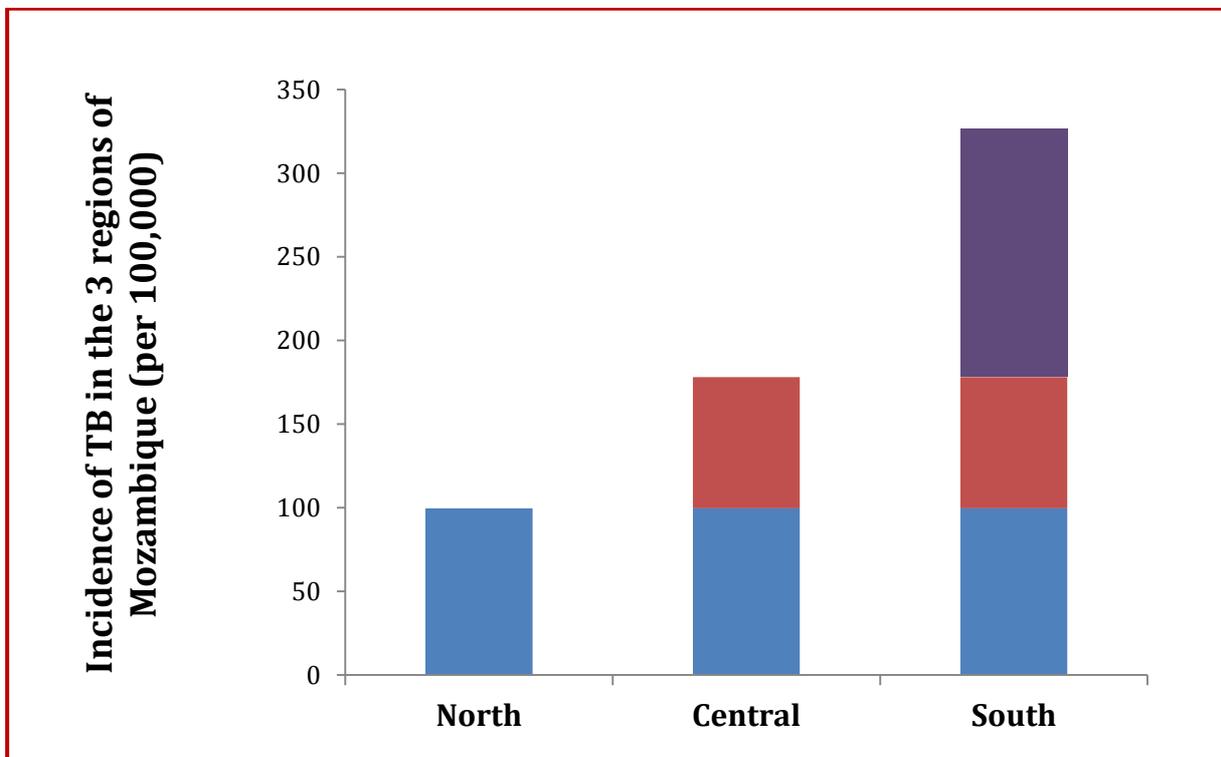


Figure 2. TB Incidence rate (per 100,000 per year) by region showing contributions of corridors and migrant labour. Blue: Baseline without corridors or migrant labour. Red: Transport corridors. Purple: Migrant miners.

The patterns of the circulatory migration in the three groups (miners, agricultural workers and truck drivers) differ in the frequency of migration and in the time the migrants spend away from their homes. But in all three cases they spend a lot of time away from home, are relatively well paid, have little to spend their money on when away from home, and have little with which to occupy themselves, do not have the social support and intimacy that they would have when at home and visiting sex workers becomes more attractive (8). Furthermore, many sex workers are also migrants seeking work and money (9). Finally, the wives or partners of migrant workers who remain in the labour sending areas are themselves often living in poverty, are isolated and without male support and may also engage in risky sexual behaviour (10).

### Migration key issue in the regional HIV and TB epidemics

Modelling studies have shown that even if we maintain the same patterns of sexual behaviour the presence or absence of migration can lead to dramatically different outcomes. HIV can only be transmitted by direct, intimate contact, and sexual transmission of HIV is very inefficient; each person with HIV only infects one other person every one to two years, on average. For HIV to spread over wide areas it must be carried by people who move from one place to another. Without migration the prevalence may reach high levels locally but those infected will die and the epidemic will not spread. Even if the proportion of migrants is quite modest the epidemic can spread over large geographical areas provide the migrants move sufficiently far. Because the gold mines of South Africa have traditionally recruited men from almost all of the countries in southern Africa the countries in the region become epidemiologically one and this may be the main reason why the nine worst affected countries in the world are all in southern Africa.

Although there is a strong link between mining and TB and HIV the spread of both diseases in sub-Saharan Africa depends critically on migration, especially of agricultural workers, truck drivers and mine workers. The problem is not simply that men work in the mines but rather the migrant nature of their employment, their living and social conditions, and in particular the breakdown of family life that is associated with the particular form of oscillating migration in southern Africa (13). While we have focused on three of the key groups, migrant workers are also employed extensively in the construction industry and as domestic workers and for other casual labour. Although they may not necessarily live in similar confined social conditions, they are isolated from their families and often live in shared accommodation in informal settlements.

Unless a comprehensive and fully coordinated multi-country and multi-sectoral programme is

implemented and followed through, we may find that the HIV and TB epidemics are far more resilient than consideration of the epidemics in each country suggests.

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### References:

1. Granich RM, Gilks CF, Dye C, De Cock KM, Williams BG. Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model. *Lancet*. 2008; 373(9657): 48-57.
2. Williams BG, Granich R, De Cock K, Glaziou P, Sharma A, Dye C. Anti-retroviral therapy for the control of HIV-associated tuberculosis: modelling the potential effects in nine African countries. *Proc Nat Acad Sc USA*. 2010; 107(42): 17853-4.
3. Stuckler D, Basu S, McKee M, Lurie M. Mining and risk of tuberculosis in sub Saharan Africa. *American Journal of Public Health*. June 2010.
4. Leon R, Davies A, Salomon M, Davies J. *Leon Commission of Enquiry into Safety and Health in the Mining Industry*. Pretoria: Government Printers; 1995.
5. Williams BG, Gouws E, Lurie M, Crush J. *Spaces of Vulnerability: Migration and HIV/AIDS in South Africa*. Cape Town: Queens University, Kingston, Canada; 2002.
6. Integrated biological and behavioural surveillance survey (IBBS) in the commercial agricultural sector in South Africa. Pretoria: International Organisation for Migration; 2010. Link to report: [http://www.maromi.co.za/archived/pdfs/IBBS\\_Report\\_Web.pdf](http://www.maromi.co.za/archived/pdfs/IBBS_Report_Web.pdf)
7. Bennett R. Economic impact of occupational disease derived from migrant mine workers on communities and the burden on the health system in Mozambique. Maputo: International Organisation for Migration; 2012 (Unpublished).
8. Campbell C. *Letting them die: why HIV/AIDS prevention programmes fail*. Bloomington: Indiana University Press; 2003.
9. Auvert B. HSV-2 is a major risk factor for HIV infection among young women in Carletonville (South Africa). Paper presented at: XIII International AIDS Conference; July 9-14, 2000; Durban, South Africa. Link to abstract: [http://www1.aegis.org/conferences/iac/2000/LbPeC708\\_0.html](http://www1.aegis.org/conferences/iac/2000/LbPeC708_0.html)
10. Lurie M, Williams BG, Zuma K, et al. Who infects whom? HIV-1 concordance and discordance among migrant and non-migrant couples in South Africa. *AIDS*. 2003;17: 2245-2252. Link to abstract <http://journals.lww.com/aidsonline/pages/articleviewer.aspx?year=2003&issue=10170&article=00013&type=abstract>