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## OVERVIEW

# Benefits and Costs of Reducing Tuberculosis Among Southern Africa's Mineworkers

Today, there are about 500,000 mineworkers and 1.5 to 2 million ex-mineworkers across four countries in southern Africa—South Africa, Lesotho, Mozambique and Swaziland. Mineworkers in South Africa have the highest incidence rates of tuberculosis (TB) of any working population in the world; at 2,500-3,000 per 100,000 individuals (see Table 2). They are three times more at risk of contracting TB than the general population, where the rate is 948 per 100,000 people. The TB incidence rate among mineworkers is ten times higher than the level of a health emergency as defined by the World Health Organization (WHO). The World Bank is working closely with the governments of South Africa, Lesotho, Swaziland and Mozambique, the Stop TB Partnership, mining companies, mineworkers' associations, and other partners to help resolve the 100-year-old problem of tuberculosis (TB) among mineworkers and their home communities.

Top-level regional action is gathering momentum on TB and TB-HIV co-infection in the mining sector. Fifteen Southern African Heads of State pledged to address the TB epidemic among current and ex-mineworkers, their families and affected communities in August 2012. The World Bank is providing policy and analytical support to enhance knowledge of the drivers of the epidemic, generate expert consensus, and mobilize political and financial support. This work is being

done as part of the Government of South Africa/World Bank Knowledge and Solutions Hub. In March 2014, with high-level support from the four affected countries, a framework is being

put in place for harmonized management of TB across the mining sector, and preliminary economic analysis by the World Bank is helping to inform the way forward.

## Key Messages

- At 2,500-3,000 cases for every 100,000 people, tuberculosis (TB) incidence among mineworkers in South Africa is the highest among any working population in the world. This is ten times the level that the WHO classifies as a health emergency.
- The World Bank is working with national health ministries, the Stop TB Partnership, mining companies, mineworkers' and ex-mineworkers' associations and other partners to help resolve the 100-year-old problem of TB among mineworkers.
- The spread of TB by migrant mineworkers is a serious public health problem and financial burden across four countries—South Africa and its labor-sending neighbors Lesotho, Mozambique and Swaziland.
- Mineworkers are more susceptible to TB because many live with HIV and/or develop silicosis. Gold mineworkers are particularly at risk for silicosis with prolonged exposure to silica dust.
- While migrant mineworkers help to reduce poverty and increase national income when they send money home, they also increase the TB burden in their communities. This has long-term implications that work against productivity and prosperity.
- Preliminary findings from a study commissioned by the World Bank on the economics of TB prevention and control in these four countries suggest that the cost of testing and treating all mineworkers is significant (about R330 million or US \$33 million a year), but would result in considerable long-term benefits, as productivity increases and fewer people require treatment.
- The study will recommend a three-pronged approach to reduce TB among mineworkers:
  - Test and treat all gold mineworkers for TB over two years, followed by all mineworkers.
  - Set up a cross-border tracking and referral system to reach all former mineworkers.
  - Improve working/living conditions to reduce the risk of occupational lung disease.

## Why are mineworkers at high risk of contracting TB?

The risk of contracting TB is high among mineworkers for a number of reasons: i) Silica dust exposure which increases the risk of pulmonary TB; ii) Occupational conditions as mineworkers live and work in crowded and poorly ventilated houses and shafts, iii) High-risk behaviors among migrant mineworkers who move between countries and within

South Africa. Mineworkers are separated from their families for long periods and have high levels of HIV infection.

South Africa's large mining industry, which started with the first mine in Witwatersrand in 1886, consists of over 2,000 mines today, contributes to nearly 9 percent of GDP on a nominal basis, and accounts for 38 percent of the country's merchandise exports (as of 2011). It has historically relied on migrant workers from rural

areas and surrounding countries, particularly Lesotho, Swaziland, and Mozambique (see Table 1). Due to the high risk of infection among mineworkers and transmission to their families and communities across these countries, TB is a regional public health problem. Further, the countries from which the mineworkers come already have among the world's highest rates of TB incidence and HIV-TB co-infection (see Table 2), and all have cases of extremely drug-resistant TB (XDR-TB).

**Table 1: Cumulative number of workers recruited, terminated, and returned home, by region, 2003-2013**

Labor-sending Country	Workers recruited	Workers employment terminated	Workers medically boarded, in home-based care program	Workers medically boarded, in TB program
Botswana	692	3,777	35	6
Lesotho	55,997	61,654	2,381	24
Mozambique	47,601	56,856	1,072	6
Swaziland	4,308	7,469	230	6
<b>Total</b>	<b>108,598</b>	<b>129,756</b>	<b>3,718</b>	<b>42</b>
<b>South African province</b>				
Eastern Cape	173,384	87,689	2,440	18
Free State	81,268	45,793	158	2
Gauteng	130,594	80,656	151	1
KwaZulu Natal	27,801	18,915	700	10
Limpopo	52,954	31,663	73	3
Mpumalanga	26,782	14,128	44	—
Northern Cape	6,831	4,328	41	1
North West	184,422	95,060	201	3
Western Cape	830	502	1	—
<b>Total</b>	<b>684,866</b>	<b>378,734</b>	<b>3,809</b>	<b>38</b>

Note: This does not include contract workers.

Source: TEBA data

**Table 2: High TB incidence among the general population; higher still among mineworkers**

Population	TB Incidence Rate/100,000 people	TB/HIV Co-Infection (%)
Lesotho, general	633	77
Mozambique, general	347	66
South Africa, general	948	70
Swaziland, general	1,317	84
South Africa, mineworkers	2,500-3,000	—

## Preliminary findings and recommendations from a forthcoming economic study

An ongoing World Bank study is currently estimating the economic benefits and costs of TB prevention and control and implications for the mining industry and mineworkers and their communities in South Africa, Lesotho, Mozambique, and Swaziland. The study will detail the economic returns (benefit-cost ratio) of a program of expanded testing and treatment of gold and platinum-group metals (PGM) mineworkers in South Africa and a scaled up treatment program for mining communities and labor-sending areas.

The results of the economic analysis are intended to inform expert discussions on policy, financing, and program interventions in the region. Based on preliminary findings, the benefits from a comprehensive approach to testing and treatment in mines significantly outweigh the costs. The report will suggest a three-pronged approach to the problem: (i) Testing and treating mineworkers (ii) Setting up a cross-border tracking and referral system to reach all former mineworkers in the labor-supplying provinces in the four countries, and (iii) Improving working/living conditions to reduce the risk of occupational lung disease.

### TESTING AND TREATING ALL MINEWORKERS

The preliminary analysis shows that testing and treating all current mineworkers would cost about R330 million (US \$33

million) a year. An approximate 40 to 1 benefit-cost ratio is estimated, implying that the benefits to society of this investment would exceed R13 billion.

The foremost benefit is reduced deaths due to TB and reduced TB incidence among mineworkers and their communities. It is estimated that about 3,000 lives could be saved over a 15-year horizon (2015-2030), with roughly two-thirds of this positive impact seen in South Africa. Other benefits include increased productivity among these individuals, which contributes to poverty reduction, and lower treatment and morbidity costs. These benefits would then complement the positive effects of migrant worker remittances to their home communities and countries. Left uncontrolled, high TB transmission among workers and their communities takes away from the long-term benefits of remittances.

Workers in gold mines are at particularly high risk for occupational lung diseases such as silicosis (with greater exposure to silica dust) and pneumoconiosis, further raising their risk of TB infection. Large numbers of gold mineworkers are medically boarded in a home-based care program—nearly 5,400 workers between 2003 and 2013, in contrast to 1,700 in PGM mines. Therefore a key recommendation is to roll out a testing and treatment program among gold mineworkers first, over a period of two years, and then extend the program to all mineworkers, with the objective of reducing their risk to at least the level among the general population in the four countries. While such a program

offers significant benefits across all types of mines, benefits are particularly high in PGM mines that take in larger numbers of ex-gold mineworkers.

GeneXpert is the diagnostic technology cost used in the analysis, with the GeneXpert cartridge procured at reduced public cost. Privately procured cartridges cost R480 to R700 (US \$48-70) whereas the public sector cost is just R100 (US \$10). Making the cartridges available to mining companies at public cost would vastly reduce the cost of testing. Such a program would also include provision of treatment by existing mining company health facilities in remote locations where public sector facilities are weak or non-existent.

Nearly 42,000 mineworkers in South Africa have TB, and about 70 percent of occupational TB cases go undetected. While South African mineworkers are eligible to be tested for occupational disease once a year and can claim compensation for this, the drawback is that there are only 187 accredited test providers. Further, migrant mineworkers from the other countries are not covered by these service providers, even though they are legally eligible for compensation if they are found to have occupational disease. The incentive to report occupational disease is thus reduced. If workers could gain access to the Medical Bureau of Occupational Diseases (MBOD) claims process in Swaziland, Lesotho and Mozambique, this would create an incentive to come in for testing at regular intervals, and would be more economical than trying to trace them in remote communities.

## SETTING UP A CROSS-BORDER TRACKING AND REFERRAL SYSTEM

More often than not, the public health system in labor-sending countries is unaware of the health profile or needs of returning mineworkers—for example, whether they have been diagnosed with TB or occupational lung disease, whether they have received treatment in the past, or any future needs that they might have. A returning mineworker with a history of multi-drug resistant TB (MDR-TB) could enter his home country without his need for future treatment being made known to the public health system.

To take the example of Swaziland, a June 2013 tracking survey showed that of about 250 ex-mineworkers, 38 showed TB symptoms and 12 were found to have TB. These ex-mineworkers also had high rates of MDR-TB and XDR-TB.<sup>1</sup> Further, tracking mineworkers in Swaziland

is becoming more difficult. In previous years, most mineworkers from Swaziland were recruited through The Employment Bureau of Africa (TEBA), but today many approach mine employers directly without going through TEBA.

A tracking system across all four countries is therefore critical to transmit health information across national borders in two directions—as mineworkers return home, and as they return to the mines (exposure to MDR-TB could have occurred in home provinces as well). To further strengthen the public health systems in these countries, the tracking and referral system should not be restricted to TB alone, but should cover all occupational diseases and HIV/AIDS.

In addition, given the multiple sources of funding for TB diagnosis and treatment among mineworkers—national governments, donors, the mining industry, and mineworkers

themselves—a trans-boundary pooled TB fund would result in efficiency gains. Such a fund could operate, for example, with a one-time cost of R120 million (US \$12 million) and recurrent draw of R250 million (US \$25 million) a year, with contributions from all sources. Such a regional initiative would cover TB tracking, testing, and treatment for current and former mineworkers in Lesotho, Mozambique, South Africa, and Swaziland.

## REDUCING OCCUPATIONAL LUNG DISEASE RISK

Occupational lung diseases raise the risk of TB among mineworkers. Although unrelated to testing and treatment, broad measures to improve working and living conditions and reduce dust exposure among mineworkers would greatly reduce the risk of silicosis and pneumoconiosis and hence of contracting TB.

Further analysis is necessary to explore the interventions that would yield the best health results.

<sup>1</sup> Dlamini and Calnan, Tracking Survey. Ministry of Health and University Research Consortium, Swaziland. June 2013.