

# Investing in the Future

## The Potential Impact of New Tuberculosis Vaccines on Mineworker Health and Productivity

Efforts to accelerate the research and development (R&D) of new tools are urgently needed to address the burgeoning tuberculosis (TB) epidemic among Southern Africa’s mining workforce. The mining sector is a significant employer and a substantial contributor to GDP in Southern Africa. TB rates in the industry’s workforce, however, are amongst the highest in the world — as high as 3,000-7,000 TB cases per 100,000 workers in some areas.<sup>1</sup> **The impact of TB on mineworkers’ health and productivity threatens the long-term economic viability of the region’s mining industry by imperiling its ability to remain competitive in the global market.** New preventative TB vaccines could have a transformative impact on the spread of TB, both among the region’s miners and in the communities where they live.

In the 15 member countries of the Southern African Development Community (SADC), a 60% efficacious TB vaccine, delivered to 50% of the population, could prevent 3.7 million new adolescent and adult TB cases over a 20-year period. An additional 700,000 TB cases could be averted among infants in the same timeframe.<sup>2</sup> Such an impact would save lives, prevent hundreds of millions of dollars in lost worker productivity, and improve the long-term economic viability of the Southern African mining industry.

On August 18, 2012, the heads of state of the SADC member countries pledged to confront the rising TB crisis by signing on to the Declaration on TB in the Mining Sector, committing to use all appropriate legislative and regulatory authority and public health resources to protect mineral miners in Southern Africa from the threat of TB and other occupational diseases. Initiating more appropriate disease surveillance, treatment, and care programs is an essential first step to reducing the

harm done by TB to the health and economic wellbeing of the Southern African region. However, these programs will be insufficient to significantly reduce the transmission of TB among mineral miners or to eliminate the disease as an occupational hazard in the mining sector.

The most effective way to stop an epidemic like TB is to prevent its spread, and a new preventative TB vaccine would be the single most cost-effective tool in mitigating the epidemic, both in the mining community and throughout the SADC region. **Alongside efforts to boost TB control programs targeting the special circumstances of mineworkers, SADC governments, the mining industry, and civil society groups must collaborate to support the critical need for R&D efforts aimed at developing new drugs, diagnostics, and preventive TB vaccines.** SADC governments, the mining industry, and civil society groups all have a role to play to advance the TB R&D agenda, contributing to a long-term solution to TB that can help prevent sickness, save lives, and sustain the economic viability of the Southern African mining sector (see Taking Action, pg. 4).



**SADC Member States:** Angola, Botswana, Democratic Republic of the Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe, Madagascar

## Background

Mineral mining is a major contributor to economic growth in Southern Africa, playing a considerable role in job creation in the region and comprising up to 25 % of GDP in some countries.<sup>4</sup> While regional exports of key minerals are of substantial importance to domestic economies, however, they constitute only a small portion of overall supply in global commodities markets. In order to continue capitalizing on the region's abundant natural resources and generate economic returns, it is essential that the region's mining industry remain competitive with mines operating in other geographies.

Remaining competitive in a globalized economy is not simple, as mining remains an industry fraught with risk. Success and failure often rest with long-term business decisions, and a number of factors outside of the control of the mining industry (e.g. energy costs and commodity price volatility) can have substantial bearing on profit margins. Viable mining sites are an extremely scarce commodity, and when one is discovered it is essential that the resource be fully capitalized to justify the investment made in prospecting and mine site development.<sup>5</sup>

Maintaining a productive mining workforce is essential to extracting full value from a mine site. **Without a productive workforce, a mining site – no matter how well endowed with resource potential – will be unable to generate the output required to cover the costs of mining operations, imperiling that mine's ability to compete on the global stage.**

**The mining industry is estimated to be responsible for 760,000 new cases of TB each year in sub-Saharan Africa, making it the single biggest driver of the TB epidemic after HIV.**

Both historically and today, occupational diseases have posed a significant threat to the physical wellbeing and productivity of mineworkers in the Southern African region. A number of illnesses and hazards drive workforce attrition in the mining industry, but TB and its co-morbidity with HIV stand out as exceptionally high contributors to mineworker illness and productivity losses in Southern Africa. An estimated 9.6 million work days are lost in the region's mining sector every year as a result of TB, and in South Africa alone the annual monetary cost of these productivity losses is estimated to be almost US \$568 million, with an additional US \$320 million in lost wages suffered by the miners themselves (See Figure 1).<sup>6</sup>

Working conditions in mines are characterized by tight, poorly ventilated spaces that contribute to TB transmission, and silica dust exposure increases mineworkers' susceptibility to developing infectious, pulmonary TB. Among the estimated 500,000 mineworkers in Southern Africa, an estimated 89% have latent TB infection.<sup>7</sup> In a geographic region already struggling with a high disease burden, miners face a risk of TB disease that can be as much as 10x higher than that faced by the general population, and they are 3.6x more

The \$1.2B Annual Costs of TB on Mining in South Africa

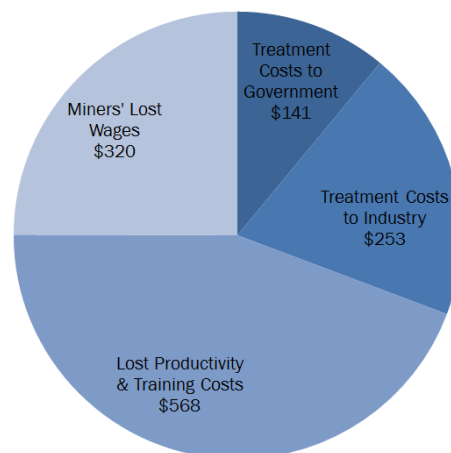


Figure 1. The annual costs of tuberculosis to people, government and industry in South Africa, shown in millions \$USD.

likely to die of TB than other workers.<sup>8</sup> The South African government and the mining industry together spend more than US \$390 million annually on TB treatment for mineworkers, yet South African mines produce some of the highest rates of TB in the world.<sup>7</sup> TB incidence among South African gold miners is estimated to be as high as 3,000 to 7,000 cases per 100,000 mineworkers per year, and very high rates of over 1,000 per 100,000 have also been reported among miners in other Southern African countries.<sup>1,8</sup>

**Reduced worker productivity as a result of TB within the mines is threatening the economic viability of one of Southern Africa's most important industries.** The reach and influence of the mining industry's TB epidemic, however, is not restricted solely to those working in the sector: TB in the mines is also a significant contributor to the region's broader TB epidemic.<sup>9</sup> Circular migration to and from labor-exporting countries spreads mine-acquired TB across the continent, disrupting TB treatment and care for those already diagnosed and transforming a concentrated, localized epidemic at mining sites into a truly regional problem.<sup>10</sup> The mining industry is estimated to be responsible for 760,000 new cases of TB each year in the general population in sub-Saharan Africa, making it the single biggest driver of the TB epidemic after HIV.<sup>7</sup>

### Box 1. Private Sector Efforts to Fight TB in Mines

Larger mining companies such as AngloGold Ashanti (AGA) and Gold Fields have taken innovative steps to combat TB and HIV, using engineering, administrative, and personal controls to (1) manage mine-related TB risk factors such as silica dust, (2) integrate TB and HIV diagnostic and treatment services, and (3) shift toward less dense housing arrangements for miners. AGA is using both stationary and mobile clinics to implement active TB case-finding through bi-annual chest x-rays, and is promoting case-finding at each point of contact in its health care system. Gold Fields has plans to build hundreds of two-bedroom homes at their mine sites in order to reduce the dense living conditions that can facilitate TB transmission.

## Short-Term Solutions and a Way Forward

In recognition of the threat posed by TB to the health and wellbeing of the region's mining workforce, its general population, and to the mining sector's significant contribution to economic growth and productivity, the heads of state of the 15 SADC countries have pledged to confront the rising TB crisis by signing on to the Declaration on TB in the Mining Sector. This document is an impressive display of political commitment that calls for the immediate implementation of a comprehensive package of best-practice TB control strategies and social programs in mining communities around the region.

### About 9.6 million work days are lost in the mining sector every year due to TB.

If fully implemented, the World Bank estimates that the economic benefits of improving workforce health through such programs could exceed the costs of inaction by more than US \$780 million. Achieving these benefits, however, will require sustained investments of greater than US \$500 million per year to support ongoing health and social programs targeting miners.<sup>6</sup> Furthermore, while these investments may greatly reduce the threat posed by TB, but they will never eliminate the risk.

The most effective way to stop an epidemic like TB is to prevent its spread. TB control programs may be able to reduce transmission by limiting the number of sick, infectious individuals who are active in a mine site, but there is no way to adequately protect any mineworker against infection if they come into contact with a contagious individual. Some mining companies are already making admirable efforts to address the TB epidemic among their workforce, particularly in the gold industry, but **the social and occupational conditions engendered by the mining industry have resulted in rates of TB transmission among miners that are simply overpowering traditional TB control interventions** (see Box 1).<sup>7</sup>

In a recent clinical trial among South African gold miners, even universal provision of isoniazid preventive therapy — intended to prevent the progression from latent TB infection to TB disease — was found to have no lasting effect on TB incidence among mineworkers.<sup>11</sup> Because rates of TB among miners are so high, significantly reducing the spread of TB will not be possible without transformative new technologies that can more effectively halt transmission.

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Throughout the world, immunization through vaccination has prevented more morbidity, mortality, and permanent disability than any other medical intervention.<sup>12</sup> Just as with other infectious

diseases of history, a vaccine that can protect adolescents and adults from TB, and that will be safe in people living with HIV, would be the single most cost-effective tool in mitigating the TB epidemic.<sup>13</sup> Such a vaccine will be essential to controlling and ultimately eliminating TB, both in the mining sector and beyond.<sup>13</sup> **In the 15 SADC member countries, a 60% efficacious TB vaccine, delivered to 50% of the population, could prevent 3.7 million new TB cases in adolescents and adults over a 20-year period.** An additional 700,000 TB cases could be averted among infants in the same timeframe (see Figure 2).<sup>2</sup> Without such a vaccine, TB transmission will continue, rendering efforts to save lives and reduce disease burden increasingly difficult and expensive.

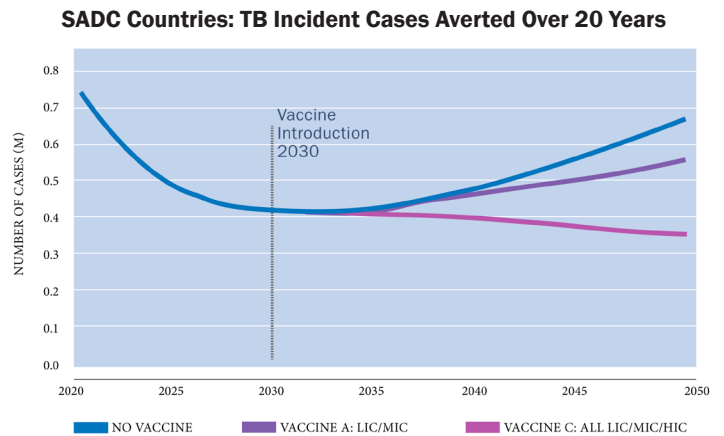


Figure 2. The potential impact of a new TB vaccine, introduced in 2030 with 50% coverage, in SADC nations: cases averted, money and lives saved.

## Box 2. Short-Term Impact of TB Vaccine R&D

Investing in and contributing to TB vaccine R&D has numerous ancillary benefits for the TB-endemic countries where clinical research must be carried out:

- Development of local research capacity, as research infrastructure must be built and staff trained for epidemiological and clinical study sites
- Increased community awareness and education, as community-based clinical studies provide a powerful vehicle for strong engagement with families, health clinics and schools through community health education outreach and counseling services
- Improved knowledge about local TB epidemiology, as the preparation of new trial sites requires detailed study of local disease burden

Cross-sector collaboration and public-private partnerships working towards the development of new tools could save millions of lives, facilitate economic growth for the region, and improve perceptions regarding the mining industry's role in the global community.

## Benefits of Investing in TB Vaccine R&D

Significant scientific progress in TB vaccine R&D is well underway. Investments of more than US \$600 million over the past decade have resulted in a robust global TB vaccine portfolio comprised of more than 25 early stage discovery leads and preclinical candidates, and more than a dozen candidates for which clinical trials are underway. Using a highly efficient portfolio management approach — as part of which vaccine candidates are subjected to rigorous selection criteria and the relative performance of similar candidates are directly compared so that only the most promising candidates advance in the development process — making new, effective, preventative TB vaccines available to the world is estimated to cost less than US \$1 billion over the next 10-15 years.<sup>14</sup> **Increased investments in TB vaccine R&D today can accelerate the timeline by which a new vaccine can be introduced, maximizing their health impact and the benefit that such a tool can accrue to the mining industry, the Southern African region, and the world.**

The fundamental business of the mining industry shares an intrinsic characteristic with the R&D of new preventative TB vaccines: both are long-term, high-risk endeavors. The likelihood that any prospected location will produce a full mine site is minimal.<sup>5</sup> The likelihood that a scientific discovery will translate into a licensed vaccine product is also very low. Yet both of these activities are carried out because the potential payoff is enormous if a prospected site or a vaccine candidate yields successful outcomes.

There are numerous short-term benefits to investing in TB vaccine R&D (see Box 2), but ultimately the true benefit of such an investment is the prospect of contributing to a healthier future for all. **For Southern Africa's mining sector, a healthy, productive workforce free of TB could mean the difference between fielding a competitive industry and a scenario where cost-prohibitive mining operations leads to capital flight and the loss of billions in GDP and thousands of jobs.**

## Taking Action

Just as the years-long journey to develop a new mine site begins today, so too must the effort to protect tomorrow's mining workforce from the physical and economic burden of TB. Alongside efforts to boost comprehensive TB control programs targeting the special circumstances of mineworkers, SADC countries, the mining industry, and civil society groups around the world should also take action to advocate for, invest in and contribute to R&D efforts aimed at developing new preventative TB vaccines.

**Southern African leaders and the mining industry have set out to achieve zero new TB infections and zero deaths from TB, but this goal will ultimately be unattainable without a new preventative TB vaccine.** In addition to doing what they can to prevent and treat TB in the mining sector today, meeting both the spirit and letter of the Declaration on TB in the Mining Sector demands that SADC country governments, industry partners, and civil society organizations also invest in the development of new tools for tomorrow.

## What SADC Governments Can Do

- Strengthen language in the Declaration on TB in the Mining Sector around TB R&D
- Improve national policies and resources for TB R&D
- Contribute to the global dialogue around TB control by calling for the development of new preventative TB vaccines

## What the Mining Industry Can Do

- Partner with research organizations to advance TB R&D efforts, such as by evaluating the feasibility of conducting epidemiological and clinical research studies at mining sites and among mining communities
- Collaborate with civil society to advocate TB R&D as a policy priority among national governments in SADC countries

## What Civil Society Can Do

- Educate policymakers about the need for new tools to fight TB, including new preventative TB vaccines
- Develop R&D champions among policymakers and other government officials
- Advocate TB R&D as a policy priority among national governments in SADC countries

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