THE BOTTOM LINE
Promoting equity and shared prosperity calls for a closer look at the working and living conditions of millions of mine workers in Africa, where tuberculosis imposes a high burden on mining economies and constitutes a regional public health crisis. Health hazards are perpetuated by poor enforcement of mining legislation, limited application of best international practices, weak institutions, and inadequate equipment and skills. Attention by Africa’s regional economic communities and the international donor community is needed.

The Importance of Health and Safety at African Mine Sites

Why is this issue important?
Sub-Saharan Africa has the highest rates of tuberculosis and the weakest prevention schemes in the world

Tuberculosis (TB), which kills about two million of the world’s people each year, is one of the greatest public health challenges of the twenty-first century. In 2015 it surpassed HIV/AIDS as the globe’s most fatal infectious disease. Yet TB is a highly preventable and curable condition. Although the Millennium Development Goal to reduce the incidence of TB has been met, the world in 2015 still confronted 9.6 million new cases and 1.5 million deaths (WHO 2015). Nearly all (99 percent) cases are in low-income countries, where they inflict a tremendous burden on poor households (Zignol and others 2006).

Although the global incidence of TB decreased by 45 percent between 1990 and 2014, incidence rates in Africa have continued to rise, exceeding by far those seen in other regions. The continent accounts for 13 percent of the world’s population but a disproportionate 28 percent of the world’s burden of TB and 34 percent of deaths from the disease (World Bank 2016). Sub-Saharan Africa has about 281 new TB cases per 100,000 population, more than double the global average of 133. Around a third of the world’s 22 high-burden TB countries are in Africa, more specifically in Southern Africa, and most countries in the subregion are above the WHO threshold for a TB emergency (250 cases per 100,000). Eight of the 14 countries in the world with the highest TB incidence (at least 400 cases per 100,000) are in Africa (World Bank 2016).

TB remains among the top five causes of death in Sub-Saharan Africa. In terms of the years of life lost to TB, the pandemics in countries such as Botswana, Lesotho, and Namibia are striking. In those countries, TB has recently been the second-leading cause of death; in South Africa, the third; in Swaziland and Zimbabwe, the fourth; in Malawi and Mozambique, the fifth; and in Zambia, the sixth (GBD 2013 Mortality and Causes of Death Collaborators 2015).

Why is TB such a serious problem for Africa?
Africa depends on mines, and mines are a high-risk environment for TB transmission

The exploitation of mineral and energy resources has long been the predominant source of revenue for resource-rich countries in Sub-Saharan Africa. The region as a whole is second only to the Middle East in its dependence on extractive industries. States such as Angola, Botswana, Sierra Leone, and Zambia are among the most heavily mineral-dependent in the world. But seven of the region’s economies derive at least half of their foreign exchange from the mineral sector. In addition to the three just mentioned, they are Democratic Republic of Congo, Guinea, Namibia, and Niger (Bocoum 2013 and 2014). In Southern Africa, mining generates more than 60 percent of the subregion’s foreign exchange and employs more than a million people (Bocoum 2003).

While the unprecedented rise in TB cases in Africa has been largely driven by the HIV epidemic, mining is implicated directly as well. In fact, a third of new TB cases in Sub-Saharan Africa are attributed to mining (Fitzpatrick and others 2013). In Southern Africa alone, TB incidence is four to seven times higher among miners and ex-miners than among the general population (World Bank 2014a). In Zambia, a recent national survey found that TB prevalence in mining
“In uncontrolled mining operations and communities of the type common in Africa, several factors combine to form a perfect storm for TB infection and transmission.”

areas such as Ndola, Kitwe, and Kolwezi was three to five times higher than the national average (Government of Zambia 2014).

In uncontrolled mining operations and communities of the type common in Africa, several factors combine to form a perfect storm for TB infection and transmission. Mines are high-risk environments for TB transmission because of poor ventilation and exposure to silica dust. Prolonged exposure to silica dust damages the lungs and creates susceptibility to silicosis, a fibrogenic lung disease that is perhaps the most ancient of occupational hazards and a risk factor for TB. But silica exposure is associated with TB even in the absence of silicosis.1

Exposure to silica is common in a range of industries, including mining, quarrying, stone cutting, and construction, with the result that many millions of people around the world are silica-exposed. Among the highest recorded rates of TB occur in silica-exposed populations, with an incidence as high as 7,000/100,000 among South African gold miners. Exposure to silica permanently raises the risk that one will contract TB at some point in life.

Because of the high opportunity cost of accessing care and fear of stigma and job loss, miners are not likely to seek early diagnosis and treatment. The risk of transmission of TB to other household members and to the mining and source communities is high. That migrant and temporary labor is common in silica-exposed workplaces helps to transmit TB widely in distant communities often poorly served by health services.

TB burdens in silica-exposed populations have also been strongly influenced by the HIV pandemic, partly because the TB risks of silicosis and HIV infection combine multiplicatively. A TB incidence of 16,100 per 100,000 person-years has been reported among HIV-positive gold miners with silicosis.

Overall, small-scale mines, which are on the rise in low-income countries, are reported to be more hazardous than large ones in terms of health risks, accidents, and injuries. In their study of silica exposure in small-scale gold mining operations, Gottesfeld, Andrew, and Dalhoff (2015) show that exposures to silica are more than two hundred times greater in small-scale artisanal mines than in larger mines. Small-scale mines tend to employ younger and less-experienced workers, and sometimes children. Other hazards exist as well (table 1). For example, deep mines are said to produce more severe problems for workers (high blood pressure, heat exhaustion, myocardial infarction, nervous system disorders). Mining of coal, granite, and rock produces high levels of dust that is harmful when inhaled. Coal, asbestos, and uranium are hazardous to mine, and some health impacts are specific to these products.

All of these factors contribute to a strong link between TB in the mining population and in the general population that in several countries in Sub-Saharan Africa is disproportionate to the level of employment in mining and other silica-producing sectors.

Remedies are available. For example, empirical analysis has shown that reducing dust reduces rates of TB among workers. Even in resource-poor settings, water spray controls have been shown to reduce silica by 80 percent in small stone-crushing mills in India (Pantoja and others 2009). What has been lacking is will.

What are the obstacles to progress?

**Wide gaps exist between international goals and best practices and Africa’s current performance**

A 2015 survey of diagnostic and treatment practices by Médecins Sans Frontières (MSF) and the Stop TB Partnership in 24 countries, including Mozambique, found huge gaps between current TB control policies and best practices critical to meet a global target of 90 percent reduction in TB incidence and 95 percent reduction in TB mortality by 2035. To meet the internationally agreed Sustainable Development Goals by 2030, countries and regions that still lag behind will have to scale up their implementation of best practices. In such environments, alas, changes are often slow to materialize.

Responding to the health and safety dangers posed by mining is not a simple matter. Limited resources exist to help miners prevent or even to mitigate occupational hazards such as silicosis, chronic lung disease, and respiratory failure, as well as other serious health issues associated with long years of mining. Even in countries with a long mining tradition (South Africa, Zambia) occupational safety and health standards and policies remain deficient. Legislation and regulation related to monitoring and control of mine dust, technology to prevent dust inhalation, monitoring and evaluation of miners who become ill, post-employment screening, and workers’ compensation are scarce. Where they are found they may be poorly enforced.

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1 More information on TB at mine sites can be found at www.worldbank.org/en/topic/health/brief/tuberculosis-control.
While it is commonly agreed that there is an urgent need to improve transparency and accountability at all levels of the African mining industry, it is unlikely that government, industry, workers, and international organizations will soon reach agreement on sharing responsibility for the negative health impacts of the sector or on remedial action. Even where support has been forthcoming from governments, industry, and unions, improvements have come slowly and painfully. Clear and simple-to-administer policy initiatives are rare.

Mine workers have been able to use scientific evidence to improve “hazard visibility” and to obtain changes in health and safety legislation, even though much of the small-scale mining sector still falls outside formal legislative protection or scientific analysis in many places. Companies have provided a range of community initiatives, including vaccination programs and health services.

But much remains to be done to bring mining practices into line with the African Union’s Mining Vision (African Union 2009). Policies, regulatory capacity, and services related to mine health need to be vastly improved, and standardized service delivery models need to be established both nationally and regionally. The practice of allowing mining companies to self-report on health issues should be eliminated. Legislation on the health aspects of mining operations in Africa must be developed in line with international standards and best practices.

Given the scope of the problem and the importance of mining to the region’s economy, a systematic approach is needed to address the crisis of occupational health hazards, particularly TB, in Africa’s mines and to ensure that the economic benefits of mining, including the growing artisanal and small-scale mining industry, are not eroded. The historical patterns of migration in the subregion (from labor-sending countries to South Africa) underscore the regional nature of the problem and the need for coordinated, collective action. In a word, mining’s toll on human health must be recognized as a regional public health crisis. Half a million miners currently work in South Africa’s mines, where the incidence of TB has skyrocketed, and there are an estimated three million ex-miners living in South Africa, Mozambique, Lesotho, and Swaziland World Bank 2014b).

### Table 1. Health hazards associated with selected types of mining operations

<table>
<thead>
<tr>
<th>Mineral/mining type</th>
<th>Main causes and/or health impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open pit/cast mining</td>
<td>Dust exposure, noise</td>
</tr>
<tr>
<td>Underground mining</td>
<td>High blood pressure, heat exhaustion, myocardial infarction, and nervous system disorders</td>
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<tr>
<td>Small-scale mining</td>
<td>At least as hazardous as large-scale mines</td>
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<tr>
<td></td>
<td>Risks of accidents or injuries</td>
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<td></td>
<td>Child labor poses high risks</td>
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<tr>
<td>Uranium mining</td>
<td>Long-term health impacts (for more than 20 years after cessation of work)</td>
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<tr>
<td></td>
<td>Lung cancer</td>
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<tr>
<td>Coal mining</td>
<td>Dust exposure: Black lung and other chronic and fatal conditions</td>
</tr>
<tr>
<td>Mercury (used in mining gold)</td>
<td>Severe poisoning include weakness, mouth ulcers, bleeding gums, loose teeth, tremors, nausea, abdominal pain, headaches, diarrhea, and cardiac weakness</td>
</tr>
<tr>
<td>Copper mining</td>
<td>Respiratory tract irritation, systemic poisoning, and pneumoconiosis</td>
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<tr>
<td>Dust</td>
<td>Dust from blasting and drilling accumulates in the lungs causing pneumoconiosis, silicosis, and fibrosis</td>
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<tr>
<td>Radon</td>
<td>A radioactive, odorless gas, radon is associated with several types of underground mining. Long-term exposure can cause lung cancer.</td>
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What is the way forward?

Public-private partnerships coordinated by Africa’s regional development communities offer promise

The continent’s regional development communities should act urgently to establish public-private partnerships capable of ensuring that mining in fact benefits the region’s people in their path toward sustainable development. The goal should be the adoption of preventive measures to avoid further damage to the region’s health and skilled human capital. The necessary partnerships will have to engage the major players on the African mining scene in cooperation toward common objectives.

The first priority must be preventive—that is, to prevent exposure to silica. Without prevention, silicosis can be mitigated but not cured, because once silicosis is detected by a chest X-ray, it is already too late: the affected lung will never be normal again. Primary prevention aims at interrupting the chain of exposure—the process by which hazardous agents are formed or used and then transmitted from their source to the worker.

The constraints on adequate TB response, detection, and monitoring must be addressed. In addition to spotty and nonstandardized prevention methods, those constraints include poor laboratory diagnostic capacity, lack of legislation, inadequate resources to enforce those policies that do exist, poor compliance of mining companies with standards established by governments, and a generalized lack of funding to combat the proliferation of TB in mining economies.

The World Bank is contributing to the effort to lift these constraints.

The Bank already supports African countries affected by TB epidemics through the Southern Africa TB in the Mining Sector Initiative, a multi-stakeholder effort involving representatives from ministries of health, mineral resources, and, labor in ten countries; mining companies; associations of current and former mineworkers; labor unions; development agencies; civil society, and research institutions. The Bank Group is investing $120 million in a regional project to scale up TB prevention and treatment in the mining sector in Lesotho, Malawi, Mozambique, and Zambia. TB-related pilot initiatives are being developed in ongoing World Bank technical assistance programs in Nigeria and the Democratic Republic of Congo. Other areas of strategic undertaking by the Bank include helping the region adopt strategies and protocols for health care quality assurance and treatment, which in turn would gain by being standardized across countries.

References


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