

KEY POPULATIONS BRIEF

A photograph of a group of miners in a dark, narrow tunnel. They are standing in a line, looking down at their hard hats. The miners are wearing various colored shirts (red, blue, green) and some have headlamps. The tunnel walls are rough and rocky, with blue pipes and some hanging clothes visible in the background. The lighting is dim, with some light coming from the miners' headlamps.

MINERS

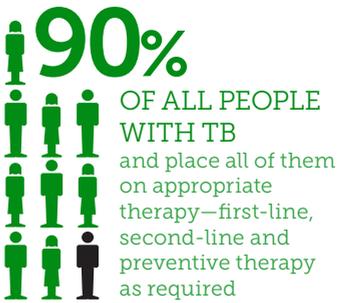


A confluence of biologic and social conditions creates the 'perfect storm' for the interaction of silicosis, HIV and TB in the mining industry. This phenomenon is best documented in the mining industry of South Africa, but evidence is emerging that similar patterns are developing elsewhere. However, research outside of sub-Saharan Africa is sparse, thus limiting the understanding of the need for interventions. Where evidence does exist, it has shown that mine workers, who are predominantly male, live in crowded quarters and informal settlements; they leave behind families and community support structures as they migrate from site to site, both within the borders of one country and across a continent in search of employment. The circular migratory nature of the mining industry means that hazards such as TB and HIV are spread to labour-sending communities. Circular migration and/or the location of mines in impoverished remote communities also allow mining companies to pass the burden of health care back onto these poor rural areas. Weak government regulations are poorly monitored and do little to hold mine owners to account. These factors, coupled with the mining industry's continued reliance on cheap labour, have served to create a culture of negligence and impunity, resulting in dramatic health disparities for miners. In southern Africa, however, there seems to be increased political will to finally tackle the TB epidemic. Given the mix of factors that contribute to the TB epidemic in the mining industry, multifaceted solutions involving multiple stakeholders are required.

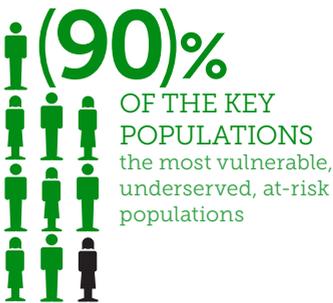
Global Plan to End TB and key populations

The Global Plan to End TB outlines the following targets to be achieved by 2020, or 2025 at the latest. The Plan refers to people who are vulnerable, underserved or at risk as TB “key populations” and provides models for investment packages that will allow different countries to achieve the 90-(90)-90 targets. The Plan also suggests that all countries:

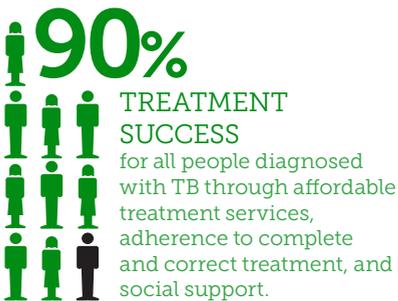
Reach at least



As a part of this approach, reach at least



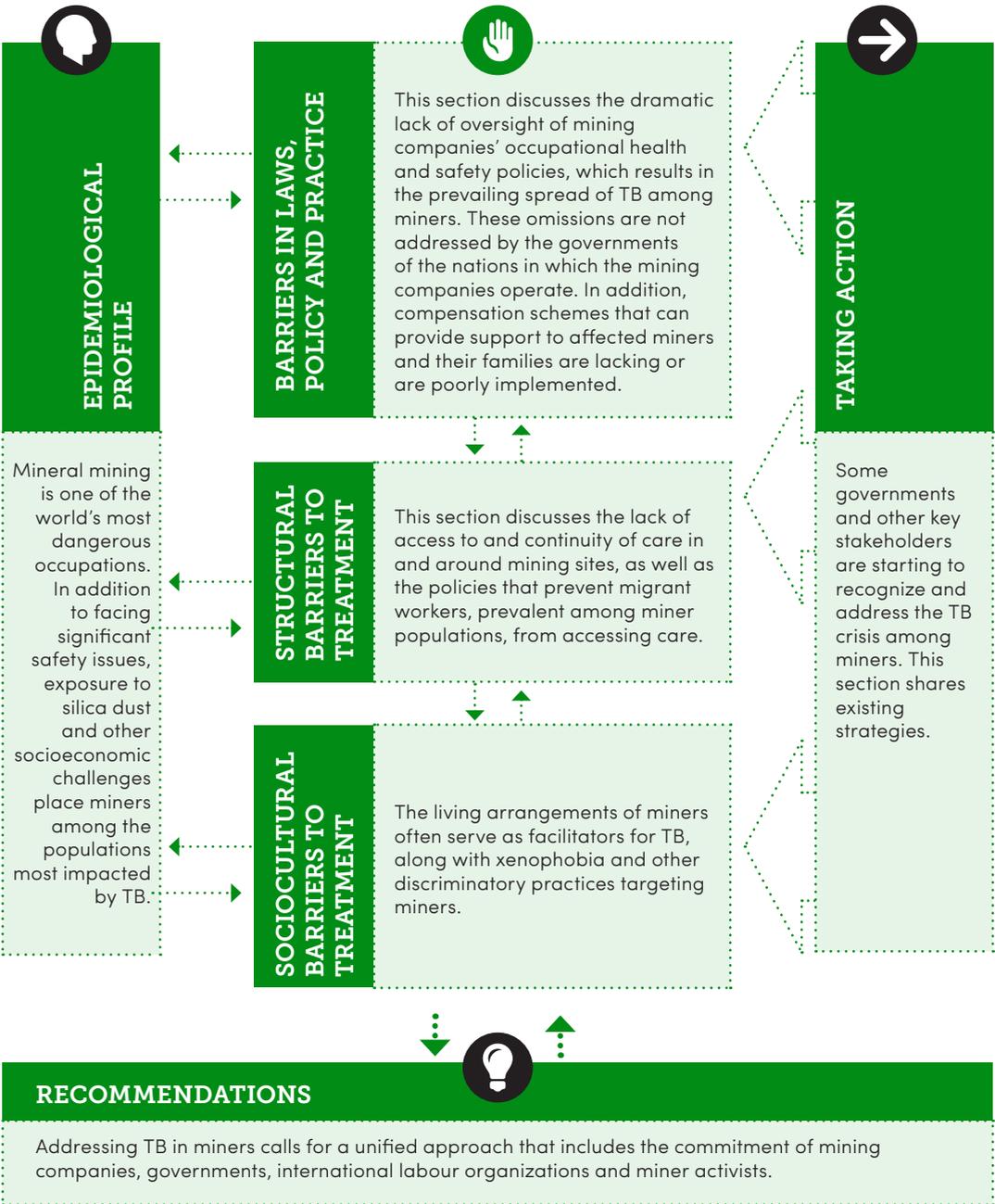
Achieve at least



- Identify their key populations at national and subnational levels according to estimates of the risks faced, population size, particular barriers to accessing TB care and gender-related challenges;
- Set an operational target of reaching at least 90% of people in key populations through improved access to services, systematic screening where required and new case-finding methods, and providing all people in need with effective and affordable treatment;
- Report on progress with respect to TB using data that are disaggregated by key population;
- Ensure the active participation of key populations in the delivery of services and the provision of TB care in safe environments.

This Guide calls on mining companies, governments and international labour advocacy organizations to prioritize addressing TB among miners, and on civil society to take immediate action to halt the spread of TB among miners.

What's in this guide?





Epidemiological profile

Mineral mining is one of the world's most hazardous occupations, not only because of the safety issues involved, but also because of the clear link between mining, lung disease and TB (1–3). A range of factors contribute to respiratory illness among miners, including the commodity being mined, the length of exposure to harmful airborne hazards, coexisting illnesses, environmental conditions (such as poor ventilation at work and where miners live), and the harsh lifestyles miners might lead that require hard labour,

mobility, and absence from their families and communities for long periods of time (1). Mineral mining exposes workers to high levels of silica dust (4), which carries with it an increased risk of lung disease (5,6), such as silicosis (7). Like HIV, silicosis has been demonstrated to greatly increase the risk of TB, including active TB (1). The impact of silicosis on health has been known since the late 19th century. Even without the presence of silicosis, silica exposure alone is associated with an increased lifelong risk of TB disease (1,4)





The link between TB risk and mining has been best documented in the countries of sub-Saharan Africa, where miners are reported to have a greater incidence of TB than any other working population in the world, and where TB incidence among migrant miners is 10 times higher than in the communities from which they originate (8).

The workers of South Africa's gold mines have the world's highest rates of TB disease and an estimated 90% rate of latent infection (9–11). Although research in sub-Saharan Africa has primarily focused on gold mining, coal mining has also been linked to a significant risk of lung disease (5,6) and TB (2,3) due to silicosis and coal dust exposure. Data from India (3), China (5,12) and Japan (13) have indicated that coal mining and residing in communities near coal mines might carry an increased risk of TB. Research in China has shown that metal mining also produces a significant risk of silica exposure and thus an increased risk of TB in the general population (14). Globally, mining remains an occupation that employs a predominately male workforce (15,16), but the impacts of poorly supported health service provision among male miners can be observed beyond the mines. Rural mining communities and miners' families are susceptible to TB because of the circular migration patterns of miners as they travel between mines and their home (2,7,12,17,18). Research on TB in mining communities outside of sub-Saharan Africa has been limited; thus, more research is needed to analyse the scope of the TB epidemics in mining communities globally, and to develop successful strategies for tackling these epidemics.

Where data are available, they indicate that miners often live in crowded single-sex hostels or in poorly maintained informal settlements where airborne diseases spread easily (8). Miners leave

their families behind for long periods of time when they travel in search of work, and this separation has been shown to increase the likelihood of risky sexual behaviour (2,7,17,19,20). The informal peri-mining communities that have grown up around the mines provide easy access to alcohol, drugs and the sex industry, contributing to the spread of sexually transmitted diseases, including HIV (2,7,17). A 2006 industry study in southern Africa found that almost one third of new HIV-negative mineworkers acquired HIV within the first year and a half of their employment (9). Miners living with HIV face a five-fold increase in the risk of developing TB disease, and the TB incidence rate for miners living with HIV and silicosis is 15 times higher than in HIV-negative miners without silicosis (21).

Measures that have proven effective in controlling TB in other populations, such as isoniazid preventive therapy (IPT), have been unable to withstand the force of transmission among miners (21). A recent study found that a nine-month course of community-wide IPT for latent TB infection did not improve TB control in the mines in the long term (22). Although IPT did reduce TB incidence during intervention, at follow-up, there was no difference between those who had received IPT and those who had not in terms of the number of new TB cases (22). The study also found that only aggressive case finding and treatment of active cases, as well as increasing retention and adherence to IPT could potentially slow transmission in the mines (22).



Barriers in laws, policy and practice

Lack of regulations and oversight for the mining companies

The migration patterns entrenched in the mining sector operation in South Africa and elsewhere have served to weaken community and organized labour pressures on mine owners to improve safety, control dust exposure in the mines, and tackle the TB and HIV epidemics that are stubbornly prevalent in mining populations (23). The challenges in holding industry leaders responsible are more acutely felt in the artisanal and small-scale mining (ASM) and illegal mining sectors (21,24,25). While best documented in the mining industry of southern Africa, similar problems have been noted for both India's illegal mining sector (18) and China's state-run mining sector (5), where lack of interest in workers' safety sustains the high risk of TB. Furthermore, a recent media investigation reported on the treacherous and dangerous conditions for workers in Chinese-owned mines in southern Africa (26). In addition, in countries with high TB rates, such as China and Brazil, the overwhelming prevalence of silicosis and other lung disease among gold and coal miners results in the increased risk for TB disease (14,27,28). A reported 6 million Chinese have contracted lung disease from occupational exposure with little recourse, and with few managing to survive the illness. This incurs costs for managing both lung disease and TB (27,29). Some reports have also detailed the lack of engagement in mining regulation by local and national governments in China (30). In Brazil, over 3 million workers could be exposed to silica in the formal economy and many more in the informal sector (28).

Because of the abundant supply of labour, it is arguably cheaper for mining companies to replace sick, unproductive miners with new workers (2,7) than to keep workers healthy or provide appropriate services to those who are ill.

In the mining industries of the global north, stricter government regulations, stronger collective bargaining and smaller labour pools prevent and protect workers from occupational hazards. In these contexts, there is financial incentive for mining companies to invest in worker health and safety in order to retain their workforce (2,7). Worker safety and health care have slowly been improving at large-scale mining companies (LSM) in South Africa, but these efforts remain highly localized (21) and are often met with distrust on the part of the workforce (31). The fear of loss of employment due to TB illness serves as a deterrent for miners to seek care. Those who are identified as having active TB or who are unable to show up for work are "retrenched" or sent home, enabling mining companies to shift the costly burden of health care back onto the labour-sending communities (2,7,9).

The 2012 Declaration on Tuberculosis in the Mining Sector, signed by members of the Southern African Development Community (SADC), is perhaps the boldest attempt by the governments of Southern Africa and other labour-sending countries to get to grips with the TB epidemic in the region (32). A Code of Conduct to accompany the Declaration was agreed on in 2015 (33). This Code of Conduct is designed to strengthen accountability and collaboration at the national and regional levels, and to facilitate disease surveillance, programme monitoring and evaluation, and the financing of interventions (33). However, there has been a lack of commitment by the mining industry to engage with the governments (9). The success of any government or civil intervention is dependent on the cooperation of the mining industry. Therefore, all stakeholders need to put further pressure on the sector. In the international realm, the International Labour Organization/WHO Global Elimination of Silicosis Campaign has had some impact at the national level (for example, the commitment of



Brazil's government to ban sand blasting), but it is still unclear as to whether progress is being made towards the goal to eliminate silicosis by 2030 (34). More such industry-focused initiatives need to be launched in order to engage national and private-sector stakeholders.

Ineffective compensation system

Little is known about compensation schemes for miners outside of South Africa. Several reports have documented China's compensation system as being extremely inefficient, with the country's legal system failing workers (27,30). The South African government administers compensation for miners with TB through the Occupational Diseases in Mines and Work Act (ODMWA), which is funded by levies imposed on the owners of controlled mines (35,36). However, the system is thought to be vastly underfunded and very poorly administered; furthermore, it has done very little to alleviate the heavy economic burden of TB on miners, ex-miners and their families (36). Cumbersome and lengthy testing procedures, which in some cases require the family members of deceased miners to prove causality by sending the cardiorespiratory organs of the deceased for testing, mean that compensation is rarely paid out (2,36). Moreover, the autopsy requirements of the ODMWA serve to put compensation out of reach for already disadvantaged groups, such as black South Africans, migrants and women (36). It is estimated that almost US\$ 3 billion of occupational lung disease compensation remains unpaid (36). A 2004 study found that, out of 28 161 claims accepted by the Medical Bureau of Occupational Disease (MBOD) over a 21-month period, the Compensation Commissioner for Occupational Disease (CCOD) only approved 400 payouts (36). The ineffectiveness of current legislation and protections in South Africa has forced miners to bring

class action lawsuits against their Europe-listed employers in European courts (37,38). Financial penalties should serve as an incentive for mining companies to improve worker health and safety (2,36). However, penalties only have the desired effect if they are properly enforced. The systemic problems in the current compensation system reflects a failure to properly hold mining companies accountable in meeting their existing and future compensation obligations, and also a political failure by the government to make ODMWA fit for purpose (36).

Disregard for human rights

The right of any individual to safety and health at work is highlighted by multiple international instruments, including the International Covenant on Economic, Social, and Cultural Rights (CESCR) (39) and the Constitution of the International Labour Organization (ILO) (40). The CESCR also prohibits discrimination in employment based on health status (Article 2(2)), and the ILO supports the right to strike, which is often ignored in the mining industry (41,42). Laying off employees based on health status, providing inadequate health care and compensation for occupational disease, firing employees who strike to negotiate better working conditions all constitute violations of human rights that need to be immediately addressed. Because TB in the mines is not limited to miners and can be spread to communities where miners originate or live while at work, the failure to address TB among miners has serious implications for public health. Governments that either host mining companies or operate them are obligated to observe these international commitments and should be held responsible through the utilization of national or regional courts or international mechanisms such as the CESCR or the Universal Periodic Review (UPR) (43).



Structural barriers to treatment

Access to care and continuity of care

Some large-scale mining companies, particularly gold and newer platinum mining companies in South Africa, have invested in high-quality tertiary care for their workers. These companies provide TB diagnostic and treatment services, HIV testing and antiretroviral therapy (ART) (22). Most of these mining health facilities are capable of screening miners for drug-resistant strains of TB and can deliver preventative therapy (21). However, in the past, there have been concerns that extensive testing has been used instead to identify and dismiss workers with TB (2). Nevertheless, rapid and frequent testing, and targeted, aggressive case-finding with chest

radiography (44) have demonstrated positive results in curbing TB mortality among miners (45). Consequently, these methodologies should be actively promoted. Current studies have shown that only 56% of gold mines have TB and HIV testing and treatment facilities, which means that TB is not being diagnosed and treated in a large number of miners (46). Some miners with active TB do not seek care or treatment for fear of losing wages or their jobs (47). The situation is even more pronounced in the small-scale and illegal mining sectors, where health care provisions are nonexistent outside of the government health services that might be difficult to access (18,25).

Lack of health insurance for migrant workers and the impacts of migration for work on treatment completion

South African nationals are able to utilize the national health service, but migrant workers are often refused access (48). Similar issues might arise for Chinese mine workers who migrate to mining regions from their homes and cannot receive care in places other than where they live (49). Migrant workers who might be working illegally in a country face additional challenges in terms of fear of deportation and inability to access health services (42). Many sick migrant workers are thus forced to return home, which shifts the burden of care to families and to already stretched rural public health services (50). Women in these rural labour-sending communities lose their primary breadwinner in their partner and face the combined burden of having to look after the sick, care for children and look for a job (51). More recent news has reported that TB deaths among India's illegal sector miners have been creating villages of widows in the country (18).

TB detection and care is compromised by the miners' mobility (8). Miners often receive multiple treatment episodes with inappropriate therapy and high drop-out rates, which can sometimes result in higher rates of drug-resistant TB (8). Although miners may have access to health care at larger mines, continuity of care, adherence support and access to diagnostic facilities might not be available once they return home (8,17). The lack of an effective regional referral and monitoring system has resulted in a growing risk of drug resistance and continuous transmission of TB among miners, their families, peri-mining communities and labour-sending communities (47).



Sociocultural barriers to treatment

Housing

In South Africa, remnants of apartheid-era policies that prohibited labourers from settling in the country mean that some mobile workers continue to board in crowded, unsanitary and poorly ventilated single-sex hostels, where TB is easily spread (2,21). Some mining companies offer a living out allowance (LOA) for those workers who choose not to stay in company accommodations, but anecdotal evidence suggests that these stipends are often retained by miners who instead live in peri-mining communities in similar conditions to those they would have faced in the company accommodations (21). Indian coal miners encounter similar challenges, living in polluted unsanitary environments near the mines (52). These experiences are likely transferrable to workers in mining communities across the globe.

Xenophobia

A study of the experiences of Mozambican miners in South Africa noted the significant barriers they faced as they tried to access health care (53). Mozambican miners, like other migrant workers not from South Africa, do not have access to public health care and have to either rely on mining company clinics or pay out of pocket for expensive private health care if they get ill. Many of the miners taking part in the survey noted that they had been discriminated against by South African staff because of their nationality, and this had affected the level of care they received (53). Like so many other migrant workers, they were forced to return home, thereby shifting the burden of care away from the mines and the South African health care system (53).



Female miners

In developing economies, female miners are a relatively new phenomenon, and they face multiple challenges, including sexual and other forms of harassment and violence (54). Considering these issues, access to health care might be even more restricted for female miners. More research needs to be conducted on the state of health of female miners, and industry-specific organizations (such as South Africa Women in Mining) and others need to take a leadership role in ensuring equal and adequate access to health services for women.



Taking action

Improving access to health care and compensation

Some LSMs in South Africa do provide high-quality tertiary-level care and are employing multi-faceted approaches to tackling the biologic and social conditions that contribute to the spread of silicosis, HIV and TB among their employees (21). These measures include promoting active case-finding through biannual chest X-rays (CXR) for all miners working in “dust risk” work environments; case-finding whenever a worker accesses the company health system; building two-bedroom homes to allow miners to live with their families; reducing room density in company accommodations; improving ventilation and dust control in the mines; and implementing nutrition programmes (21). These measures should also of course involve contract and migrant miners, who might be unable to access care.

The government of South Africa has recently launched two One-Stop Service Centres in mining areas and labour-sending areas. The service centres provide miners and ex-miners with advice about pensions, benefits and compensation. They are also equipped to detect various illnesses that are common among miners and can provide help with therapy and rehabilitation. These centres are actively involved in tracing ex-miners and helping them to access care near their homes (55). In 2015, the Department of Health, in conjunction with the Medical Bureau of Occupational Disease (MBOD), the Compensation Commissioner for Occupational Disease (CCOD), and eight LSM operations, also launched project Ku-Riha with the aim of eliminating the backlog of claims filed through ODMWA (55). The project also aims to identify ex-miners who may be in line for compensation (35). There is a big regional push for the establishment of a common database of all mine workers with TB in the SADC, a common treatment protocol for all mine workers, and a referral system between the mining companies, health care systems within the SADC and the South African public health system (56).

In and outside of South Africa much remains to be done. There are basic structural issues that need to be addressed, such as improving dust control in the mines and ensuring that active TB case-finding is promoted throughout the mining industry. Continuity and integration of care also need to be addressed through the more effective treatment support of mine workers with TB and TB/HIV coinfection. Integrated and “one-stop shop” approaches have to be implemented where miners work and live. However, there need to be effective incentives for companies to implement these programmes and strictly enforced penalties to ensure uptake and compliance on the part of the mining sector. Miners and their families need to be aware of the services, benefits and compensation that are available to them and able to obtain support in the case that those services are denied or limited. More needs to be done by governments, mining companies and unions to inform miners of services and compensation, and to find ex-miners who might be due compensation. The current system for awarding compensation is not fit for purpose and should be drastically simplified. Governments also need to re-examine the levies that mining companies pay, since the current system is thought to be dangerously underfunded.



Holding the mining industry and governments to account through union organizing and community activism

Although governments in southern Africa are finally showing willingness to take on the mining industry, progress has been slow. In other countries, governments are only now waking up to the realities and the scope of the crises created by poorly managed mining industries.

One of the traditional mechanisms of holding the mining industry accountable, unions, have shown themselves to be somewhat ineffective on the issue of TB and general occupational health and safety in South Africa's gold mines. The various gold miners unions have been forced to use their finite collective capital to focus on pay demands at the expense of health issues (57). In fact, labour objections by several unions have actually served to weaken HIV monitoring in some mines (57). The South African National Union of Miners (NUM) and unions in sectors of the mining industry that are characterized by low migrancy, such as coal, have been more successful in putting pressure on mining companies to introduce health and safety measures (57). The NUM has been particularly influential in forcing improvements in housing and living conditions for miners (47).

Mining unions in other countries have been successful in improving occupational health and safety and securing compensation through effective legislation. In some countries, the battles in the mines are only just beginning, with workers proving their ability to shut down industries. However, the migrant nature of workers in the mining industry makes it difficult for them to organize effectively. In recognition of this, governments should pick up more of the slack in pressuring mining companies to adopt changes that will really tackle the TB epidemic.

The TB epidemic in the mining sector does not solely affect miners, but impacts communities where workers with TB live and to which they return. Thus, civil society partners can display leadership in helping to document and disseminate evidence of abuses in the mining industry and bring cases to courts at the national, regional, and international level. In cases where mines are run by governments or where governments are hesitant to challenge mining companies for fear of damaging the economy, civil society involvement is key to bringing violations to light. At the same time, international health and labour stakeholders can help to drive campaigns and initiatives targeted at increasing the occupational health and safety standards focused on lung disease and TB.

Research and documentation

While the challenges in access to TB programming for southern and specifically South African miners have been widely documented, the lack of studies in other countries is pervasive. Research investigations and documentation by civil society are essential in order to develop a better understanding of how the mining industry is impacting TB epidemiology in countries outside of Africa and to formulate a global response.



Recommendations

While these recommendations provide an outline for action for a range of key stakeholders, others, including UN Agencies and local and global health worker collectives, should take note and assess their potential for use in improving TB prevention, treatment and care in miners.

Civil Society	Collectives of Miners with TB/Unions	National/Regional Governments	Donors	Mining Companies
Help build the capacity of mining worker unions and collectives;	Utilize opportunities for capacity building in order to promote occupational health and safety in the mines that includes access to TB prevention and treatment services;	Support and ensure legislative protections for unions and collectives of miners;	Support capacity building among mining unions and collectives;	Adhere to international best practice and national laws that respect the right of workers to unionize and form collectives;
Support mining unions and organizations of miners with/affected by TB in documenting cases of TB and violations related to worker safety and human rights;	Conduct research and document cases of violations related to TB, worker safety and prevention in mining communities globally;	Support research in mining communities to identify risks for TB;	Fund research in mining communities outside of sub-Saharan Africa;	Adopt best practice occupational health and safety policies that lead to better protection of workers;
Advocate for international- and national-level campaigns to lower lung disease and other TB risks among miners;	Advocate with national-level labour protection agencies to launch awareness campaigns on addressing occupational hazards and eliminating TB among miners;	Engage in global initiatives to eliminate lung disease and TB risks among workers;	Fund and provide leadership to international- and national-level campaigns to eliminate lung disease and other TB risks among workers;	Collaborate with national governments and international stakeholders to eliminate lung disease that leads to heightened risk for TB;
Advocate for and support data sharing on employee health between mining companies and national governments;	Engage with mining companies to advocate for uniform records of employee health; raise awareness among miners about their health and the need to maintain uniform records when they are moving from employer to employer;	Create a unified database of miners to allow for cross-border referrals;	Encourage data sharing between mining companies and national governments;	Share medical information with regional governments to create a unified system of surveillance and treatment;



Civil Society	Collectives of Miners with TB/Unions	National/Regional Governments	Donors	Mining Companies
Promote better materials on TB and HIV for miners; advocate for better compensation schemes for miners and their families;	Organize to educate new recruits about HIV and TB in the mines; educate about compensation that might be available to miners, ex-miners and families of deceased miners;	Drastically improve compensation systems and also promote awareness of the system to miners, ex-miners and their families;	Work with miners in helping them to access compensation; put pressure on governments to reform compensation systems and on mining companies to properly fund them;	Promote educational campaigns in collaboration with trade unions, and instruct recruiters to inform potential miners about HIV and TB risks;
Put pressure on governments where mining companies are headquartered to force companies to adopt safer mining practices;	Engage with local and national governments to advocate for better labour policies;	Work with mining companies to agree on a set of guidelines that can be implemented to tackle diseases that weaken the immune system, such as silicosis and HIV; develop incentives for mining companies to meet these guidelines and a strictly enforced penalty system for those companies that fail to comply;	Support and help facilitate government work with mining companies, and help governments to adopt better occupational health and safety standards;	Implement safer working conditions and social conditions for miners in order to tackle TB, silicosis and HIV;
Document inadequacies in the mining sector, and work with human rights and lawyers' collectives to file cases against mining companies.	Document and report abuses.	Devise a system to respond to complaints from miners and a system for tracking oversight in the mines that might lead to the spread of TB and other illnesses.	Support documentation and legal programmes for miners with TB.	Respond to worker complaints and adopt health supportive programming.

References

- Ross MH, Murray J. Occupational respiratory disease in mining. *Occup Med Oxf Engl*. 2004;54(5):304–10.
- Stuckler D, Steele S, Lurie M, Basu S. "Dying for gold": the effects of mineral mining on HIV, tuberculosis, silicosis and occupational diseases in southern Africa. *Int J Health Serv Plan Adm Eval*. 2013;43(4):639–49.
- Mohapatra H, Goswami S, Dey D. Coalmine dust concentration and rate of tuberculosis infection around Ib Valley Coalfield, Orissa, India. *J Environ Biol*. 2010 Nov;31(6):953–6.
- Murray J, Davies T, Rees D. Occupational lung disease in the South African mining industry: research and policy implementation. *J Public Health Policy*. 2011;32 Suppl 1:S65–79.
- Han L, Han R, Ji X, Wang T, Yang J, Yuan J, et al. Prevalence characteristics of coal workers' pneumoconiosis (CWP) in a state-owned mine in Eastern China. *Int J Environ Res Public Health*. 2015;12(7):7856–67.
- Dweik R, Mazzone P. Occupational lung disease. Lyndhurst, OH: The Cleveland Clinic Foundation; 2010 (<http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/pulmonary/occupational-lung-disease/>, accessed 26 October 2015)
- Stuckler D, Basu S, McKee M. Governance of mining, HIV and tuberculosis in southern Africa. *Glob Health Gov*. 2010;4(1) (<http://researchonline.lshtm.ac.uk/1376/>, accessed 30 October 2015).
- Stuckler D, Basu S, McKee M, Lurie M. Mining and risk of tuberculosis in sub-Saharan Africa. *Am J Public Health*. 2011 Mar;101(3):524–30.
- Tuberculosis in South Africa's gold mines: a united call to action. London: Results; 2013 (<http://results.org.uk/tuberculosis-south-africas-gold-mines-united-call-action>, accessed 14 October 2015).
- Hanifa Y, Grant AD, Lewis J, Corbett EL, Fielding K, Churchyard G. Prevalence of latent tuberculosis infection among gold miners in South Africa. *Int J Tuberc Lung Dis*. 2009 Jan;13(1):39–46.
- TB and mining. Rockville, MD: Aeras (<http://www.aeras.org/pages/tb-and-mining>, accessed 30 October 2015).
- Innes A. Zhao Tong, Yunnan: fighting TB in its mountain stronghold. Washington, DC: U.S. Agency for International Development (<https://www.cap-tb.org/blog/zhao-tong-yunnan-fighting-tb-its-mountain-stronghold>, accessed 26 October 2015).
- Onozuka D, Hagihara A. Geographic prediction of tuberculosis clusters in Fukuoka, Japan, using the space-time scan statistic. *BMC Infect Dis*. 2007;7:26.
- Chen W, Liu Y, Wang H, Hnizdo E, Sun Y, Su L, et al. Long-term exposure to silica dust and risk of total and cause-specific mortality in Chinese workers: a cohort study. *PLoS Med*. 2012;9(4):e1001206.
- Jansen McWilliams L, Lenart P, Lancaster J, Zeiner J. National survey of the mining population part I: employees. Pittsburgh: Department of Health and Human Services, Centers for Disease Control and Prevention National Institute for Occupational Safety and Health; 2012 (<http://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/2012-152.pdf>, accessed 3 March 2016).
- Gender statistics South Africa 2011. Pretoria: Statistics South Africa; 2013 (<http://www.statssa.gov.za/publications/Report-03-10-05/Report-03-10-052011.pdf>, accessed 3 March 2016).
- Basu S, Stuckler D, Gonsalves G, Lurie M. The production of consumption: addressing the impact of mineral mining on tuberculosis in southern Africa. *Glob Health*. 2009;5(1):11.
- Niazi S. Miner tuberculosis creates village of widows in rural India. *Women News Network*. 13 January 2011 (<http://womennewsnetwork.net/2011/01/13/india-miners-tb-widows/>, accessed 30 October 2015).
- Sonnenberg P, Glynn JR, Fielding K, Murray J, Godfrey-Faussett P, Shearer S. How soon after infection with HIV does the risk of tuberculosis start to increase? A retrospective cohort study in South African gold miners. *J Infect Dis*. 2005;191(2):150–8.
- Teicher JG. The human cost of South Africa's mining industry. *Slate*. 9 September 2014 (http://www.slate.com/blogs/behold/2014/09/09/ilan_godfrey_documents_the_impact_of_south_africa_s_mining_industry_in_his.html, accessed 30 October 2015).
- Dharmadhikari A, Smith J, Nardell E, Churchyard G, Keshavjee S. Aspiring to zero tuberculosis deaths among southern Africa's miners: is there a way forward? *Int J Health Serv Plan Adm Eval*. 2013;43(4):651–64.
- Churchyard GJ, Fielding KL, Lewis JJ, Coetzee L, Corbett EL, Godfrey-Faussett P, et al. A trial of mass isoniazid preventive therapy for tuberculosis control. *N Engl J Med*. 2014;370(4):301–10.
- Nelson G. Occupational respiratory diseases in the South African mining industry. *Glob Health Action*. 2013;6 (<http://www.globalhealthaction.net/index.php/gha/article/view/19520>, accessed 30 October 2015).

24. Steele S. Human trafficking, labor brokering, and mining in southern Africa: responding to a decentralized and hidden public health disaster. *Int J Health Serv Plan Adm Eval.* 2013;43(4):665–80.
25. Artisanal and small scale mining: challenges and opportunities. *CommDev* (<http://commdev.org/artisanal-and-small-scale-mining-challenges-and-opportunities/>, accessed 30 October 2015).
26. Okeowo A. China, Zambia, and a clash in a coal mine. *The New Yorker.* 9 October 2013 (<http://www.newyorker.com/business/currency/china-zambia-and-a-clash-in-a-coal-mine>, accessed 30 October 2015).
27. Yin SC. Dying to breathe: a short film shows China's true cost of gold. *Proof.* 15 May 2015 (<http://proof.nationalgeographic.com/2015/05/15/dying-to-breathe-a-short-film-shows-chinas-true-cost-of-gold/>, accessed 7 January 2016).
28. Gottesfeld P, Murray J, Chadha SS, Rees D. Preventing tuberculosis with silica dust controls. *Int J Tuberc Lung Dis.* 2011;15(6):713–4.
29. Helping them breathing. *China Daily.* 12 September 2014 (http://www.chinadaily.com.cn/2014-09/12/content_18585768.htm, accessed 30 October 2015).
30. Fifteen minutes of fame. Three years of waiting. *China Labour Bulletin.* 15 March 2014 (<http://www.clb.org.hk/en/content/fifteen-minutes-fame-three-years-waiting>, accessed 10 January 2016).
31. McCracken P. Mine strikes worsen TB infections. *Financial Mail.* 29 October 2012 (<http://www.financialmail.co.za/economy/local/2012/10/29/mine-strikes-worsen-tb-infections>, accessed 17 February 2016).
32. Southern African heads of state join forces to end tuberculosis in the mining sector. Geneva: Stop TB Partnership; 2012 (http://www.stoptb.org/news/stories/2012/ns12_053.asp, accessed 30 October 2015).
33. BLC. Fact sheet: BLC's support to the SADC Secretariat to implement a coordinated regional response to TB in the mining sector. Southern Africa HIV and AIDS Regional Exchange (SHARE); 2015 (<http://www.hivsharespace.net/resource/fact-sheet-blc-s-support-sadc-secretariat-implement-coordinated-regional-response-tb-mining>, accessed 30 October 2015).
34. Occupational health: silicosis. Geneva: International Labour Organization; 2009 (http://www.ilo.org/safework/areasofwork/occupational-health/WCMS_108566/lang--en/index.htm, accessed 10 January 2016).
35. Lewis P. South Africa: the scandal of South Africa's sick miners. *GroundUp.* 11 June 2015. (<http://allafrica.com/stories/201506111365.html>, accessed 30 October 2015).
36. Fulfilling broken promises: Reforming the century-old compensation system for occupational lung disease in the South African mining sector. Policy Paper (no. 2/2013). Yale Global Health Justice Partnership; 2013 (http://www.law.yale.edu/documents/pdf/News_&_Events/GHJP_Report_on_Compensation_for_Miners_in_Southern_Africa.pdf, accessed 17 October 2015).
37. McVeigh T. South African miners take lung disease fight to London. *The Guardian.* 26 April 2014 (<http://www.theguardian.com/world/2014/apr/27/south-african-miners-lung-disease-fight-london>, accessed 30 October 2015).
38. Khumalo T. South Africa's sick miners take gold mines to court. *DW.* 10 December 2015. (<http://www.dw.com/en/south-africas-sick-miners-take-gold-mines-to-court/a-18777363>, accessed 7 January 2016).
39. International Covenant on Economic, Social, and Cultural Rights. Office of the High Commissioner for Human Rights; 1966 (<http://www.ohchr.org/EN/ProfessionalInterest/Pages/CESCR.aspx>, accessed 18 February 2016).
40. ILO constitution. Geneva: International Labour Organization; 1976 (http://www.ilo.org/dyn/normlex/en/f?p=1000:62:0::NO:62:P62_LIST_ENTRIE_ID:2453907:NO, accessed 18 February 2016).
41. Gernigon B, Odero A, Guido H. ILO principles concerning the right to strike. Geneva: International Labour Organization; 2000 (http://www.ilo.org/global/standards/information-resources-and-publications/publications/WCMS_087987/lang--en/index.htm, accessed 19 February 2016).
42. Human rights and business country guide: South Africa. South African Human Rights Commission, The Danish Institute for Human Rights; 2015 (<http://www.sahrc.org.za/home/21/files/Guide%20Final%20final.pdf%20March%2019.pdf>, accessed 18 February 2016).
43. Guiding principles on business and human rights. Office of the High Commissioner for Human Rights; 2011 (http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf, accessed 30 October 2015).
44. Corbett EL, MacPherson P. Tuberculosis screening in high human immunodeficiency virus prevalence settings: turning promise into reality. *Int J Tuberc Lung Dis.* 2013;17(9):1125–38.

45. Churchyard GJ, Fielding K, Roux S, Corbett EL, Chaisson RE, De Cock KM, et al. Twelve-monthly versus six-monthly radiological screening for active case-finding of tuberculosis: a randomised controlled trial. *Thorax*. 2011;66(2):134–9.
46. TB in the Southern African mining sector and across the sub-region. Geneva: Stop TB Partnership; 2012 (<http://www.stoptb.org/assets/documents/about/cb/meetings/21/1.12-0%20Presentations/1-12-03%20TB%20and%20the%20mining%20industry%20in%20SADC.pdf>, accessed 17 October 2015).
47. Providing continuum of care for miners on TB treatment during "Christmas Season": MoLeSwaSa activity report. Aquty Innovations; 2015 (<http://aquty.org/wp-content/uploads/2015/08/FINAL-Moleswasa-Report.docx.pdf>, accessed 17 October 2015).
48. Duponchel M. Vulnerability, mobility and place: Alexandra and Central Johannesburg pilot study. Johannesburg: African Centre for Migration & Society, University of the Witwatersrand; 2010.
49. Liu X, Thomson R, Gong Y, Zhao F, Squire SB, Tolhurst R, et al. How affordable are tuberculosis diagnosis and treatment in rural China? an analysis from community and tuberculosis patient perspectives. *Trop Med Int Health*. 2007;12(12):1464–71.
50. Clark SJ, Collinson MA, Kahn K, Drullinger K, Tollman SM. Returning home to die: circular labour migration and mortality in South Africa. *Scand J Public Health Suppl*. 2007;69:35–44.
51. Charles T. Black rural women: carrying the burden of the gold mining industry's neglect. *NGO Pulse*. 23 September 2015 (<http://www.ngopulse.org/article/2015/09/23/black-rural-women-carrying-burden-gold-mining-industry%E2%80%99s-neglect>, accessed 30 October 2015).
52. Schneider K. India's treacherous coal mines in Meghalaya. *Circle of Blue WaterNews*. 15 March 2014 (<http://www.circleofblue.org/waternews/2014/world/meghalayas-treacherous-coal-mines/>, accessed 30 October 2015).
53. Barwise K, Lind A, Bennett R, Martins E. Intensifying action to address HIV and tuberculosis in Mozambique's cross-border mining sector. *Int J Health Serv Plan Adm Eval*. 2013;43(4):699–719.
54. Benya AP. Women in mining: a challenge to occupational culture in mines [dissertation]. Johannesburg: University of Witwatersrand; 2009.
55. Occupational lung disease compensation project launched. *Mining Review Africa*. 1 June 2015. (<http://www.miningreview.com/occupational-lung-disease-compensation-project-launched/>, accessed 30 October 2015).
56. Khumalo G. Africa must work together to combat TB. *SNews.gov.za*. 25 March 2014 (<http://allafrica.com/stories/201403260288.html>, accessed 30 October 2015).
57. Bateman C. Annually, 1% of gold miners die: 4% sent home sick. *South Afr Med J*. 2014;104(3):160–2.

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