MANAGING TUBERCULOSIS AND OCCUPATIONAL HEALTH IN THE MINING SECTOR IN SOUTHERN AFRICA

DISCUSSION PAPER

June 2018

Patrick L. Osewe
Yvonne Nkrumah

WORLD BANK GROUP
Health, Nutrition & Population
MANAGING TUBERCULOSIS AND OCCUPATIONAL HEALTH IN THE MINING SECTOR IN SOUTHERN AFRICA

A Compendium of Knowledge

Patrick L. Osewe and Yvonne Nkrumah

June 2018
Health, Nutrition and Population (HNP) Discussion Paper

Managing Tuberculosis and Occupational Health in the Mining Sector in Southern Africa

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Abstract:
Given the magnitude and the complexity of factors associated with tuberculosis (TB) in the mining sector in southern Africa, no sector or actor is solely equipped to effectively tackle the issue. A cross-border response to TB involves a number of policy, programmatic, and service delivery considerations and the success of these efforts largely depends on establishing effective coordination and implementation mechanisms that bridge the mines, communities, and countries—including the housing, labor, health and mining sectors; development partners; civil society; labor unions; and mineworkers.

Through its South Africa Health Knowledge Hub (the Knowledge Hub), established in 2012, the World Bank Group (WBG) has worked extensively in the southern Africa region to support sustainable health reform and promote investments in all sectors that form the foundation of healthy societies. The WBG’s Health, Nutrition and Population (HNP) Global Practice has served as a vital source of financial and technical assistance in South Africa—facilitating high-level dialogue, multisectoral and public-private engagement, knowledge generation, and implementation support to tackle long-standing health sector challenges, including the persistent challenge of TB in the mining sector.

This compendium assembles a rich and diverse collection of papers, reports, and other material generated through technical assistance to tackle TB in the mining sector in southern Africa—spearheaded by the World Bank’s Southern Africa Knowledge Hub. The historical context details the significant progress and achievements made since the Hub was formally established in 2012. Particularly important is the documentation of work done on harmonization—often a challenge when working across sectors to develop a multisectoral approach. The information provides readers with the understanding necessary to examine the policy and practitioner approaches that have been used thus far and captures the successes, challenges, collaborations, and lessons learned in carrying out a range of comprehensive studies and innovative interventions.

Keywords: Tuberculosis, mineworkers, silicosis, occupational health, Southern Africa.
Disclaimer: The findings, interpretations and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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The editors are grateful to the World Bank for publishing this compendium as an HNP Discussion Paper.

¹ The PIC consists of all major stakeholders from government, civil society, private sector and different ministries across borders involved in addressing TB in the mining sector in southern Africa. It is a partnership forum for deepening ownership; facilitating knowledge sharing and cross-pollination of ideas among countries and stakeholders; and monitoring the progress of the sub-region towards meeting the targets for TB reduction in the mining sector. The PIC meets annually.
PREFACE

Despite progress in tuberculosis (TB) diagnosis and treatment over the last two decades, global TB statistics remain grim. TB is the ninth leading cause of death worldwide and the leading cause of death from a single infectious agent—surpassing HIV/AIDS. In 2016, there were an estimated 1.3 million TB deaths among HIV-negative people, down from 1.7 million in 2000, and an additional 374,000 deaths among HIV-positive people.

In southern Africa, TB is amplified within the mining industry and has been a growing crisis for decades. Working environments characterized by poor ventilation, high levels of exposure to silica dust, overcrowded housing, and lack of access to appropriate health services—along with high HIV prevalence in mining communities—have facilitated the spread of TB, especially among mineworkers. Furthermore, circular movement of mineworkers across provincial and national borders—and a poor cross border health referral system—fuel high infection rates, adversely affect adherence to TB treatment, and contribute to the incidence of drug resistant strains such as multidrug resistant (MDR) and extensively drug-resistant (XDR) TB in the sub-region. An estimated 70 per cent of cases go undetected, putting families and entire communities at risk. Consequently, in countries like South Africa (SA), approximately half a million mineworkers employed in 2,000 mines and quarries across the country—about 40 percent of whom originate from Mozambique, Swaziland and Lesotho—have the highest TB incidence in the world: an estimated 2,500-3,000 per 100,000 people are infected, 10 times higher than the rate that the World Health Organization classifies as an emergency.

Given the magnitude and the complexity of factors associated with TB in the mining sector in southern Africa, no sector or actor is solely equipped to effectively tackle the issue and previous efforts to address the disease from a health perspective have proven ineffective. A cross-border response to TB involves a number of policy, programmatic, and service delivery considerations and the success of these efforts largely depends on establishing effective coordination and implementation mechanisms that bridge the mines, communities, and countries—including the housing, labor, health and mining sectors; development partners; civil society; labor unions; and mineworkers.

Through its South Africa Health Knowledge Hub (the Knowledge Hub), established in 2012—and in line with its twin goals to end extreme poverty and promote shared growth—the World Bank Group (WBG) has worked extensively in the southern Africa region to support sustainable health reform and promote investments in all sectors that form the foundation of healthy societies. The WBG’s Health, Nutrition and Population (HNP) Global Practice has served as a vital source of financial and technical assistance in South Africa—facilitating high-level dialogue, multisectoral and public-private engagement, knowledge generation, and implementation support to tackle long-standing health sector challenges, including the persistent challenge of TB in the mining sector.

This compendium assembles a rich and diverse collection of papers, reports, and other material generated through technical assistance to tackle TB in the mining sector in southern Africa—spearheaded by the World Bank’s Southern Africa Knowledge Hub. The historical context details the significant progress and achievements made since the Hub was formally established in 2012. Particularly important is the documentation of work done on harmonization—often a challenge when working across sectors to develop a multisectoral approach. The information provides readers with the understanding necessary to examine the policy and practitioner approaches that have been used thus far and captures the successes, challenges, collaborations, and lessons learned in carrying out a range of comprehensive studies and innovative interventions.

Furthermore, the compendium contributes to the body of knowledge on the fight against TB in the mining sector by reflecting the growing understanding of the multifaceted factors that fuel, compound, and maintain the epidemic in the mining sector in southern Africa. In this way, the compendium serves as a robust and ready resource from which researchers, policy makers, and practitioners may draw on to guide similar programs in their countries and regions.
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ADL</td>
<td>Activities of Daily Living</td>
</tr>
<tr>
<td>AIDS</td>
<td>Acquired immunodeficiency syndrome</td>
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<td>AMIMO</td>
<td>Association of Mine Workers of Mozambique</td>
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<tr>
<td>ART</td>
<td>Antiretroviral therapy</td>
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<td>BME</td>
<td>Benefit Medical Examination</td>
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<td>BOHS</td>
<td>Basic Occupational Health Services</td>
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<tr>
<td>CBPR</td>
<td>Community-Based Participatory Research</td>
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<td>CCBRT</td>
<td>Comprehensive Community Based Rehabilitation in Tanzania</td>
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<td>CCOD</td>
<td>Compensation Commission of Occupational Diseases</td>
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<td>CD4</td>
<td>Cluster of Differentiation 4</td>
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<tr>
<td>CHW</td>
<td>Community Health Worker</td>
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<td>CMSA</td>
<td>Chamber of Mines South Africa</td>
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<td>COIDA</td>
<td>Compensation of Occupational Injuries and Diseases Act</td>
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<td>COM</td>
<td>South African Chamber of Mines</td>
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<td>CSO</td>
<td>Civil Society Organization</td>
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<td>CPT</td>
<td>Co-trimoxazole Preventive Therapy</td>
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<td>dBA</td>
<td>A-weighted decibels</td>
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<td>DHS</td>
<td>Demographic Health Survey</td>
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<td>DMR</td>
<td>Department of Mineral Resources</td>
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<td>DoH</td>
<td>Department of Health</td>
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<td>DoL</td>
<td>Department of Labour</td>
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<tr>
<td>DOT</td>
<td>Directly observed therapy</td>
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<td>DOTS</td>
<td>Directly observed therapy short-course</td>
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<td>DR-TB</td>
<td>Drug resistant tuberculosis</td>
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<td>DST</td>
<td>Drug susceptibility testing</td>
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<td>ECF</td>
<td>Enhancing Care Foundation</td>
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<td>EDRWeb</td>
<td>Electronic Drug Resistant Tuberculosis Register</td>
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<td>EIU</td>
<td>Economist Intelligence Unit</td>
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<td>EQA</td>
<td>External Quality Assurance</td>
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<td>FSB</td>
<td>Financial Services Board</td>
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<td>GDP</td>
<td>Gross domestic product</td>
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<td>GIS</td>
<td>Geospatial Information System</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>HATS</td>
<td>HIV/AIDS, Tuberculosis, and Silicosis</td>
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<td>HBR</td>
<td>Home-based rehabilitation</td>
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<tr>
<td>HCW</td>
<td>Health care worker</td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>HNP</td>
<td>Health Nutrition and Population Global Practice</td>
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<td>HRBA</td>
<td>Human-Rights-Based Approach</td>
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<td>HTC</td>
<td>HIV testing and counseling</td>
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<td>ICAP</td>
<td>International Center for AIDS Care and Treatment Programs</td>
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<td>ICF</td>
<td>International Classification of Functioning, Disability and Health</td>
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<td>IEC</td>
<td>Information, education and communication</td>
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<td>ILO</td>
<td>International Labor Organization</td>
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<td>IOM</td>
<td>International Organization for Migration</td>
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<td>IMB</td>
<td>Informational, motivational and behavioral</td>
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<td>IPT</td>
<td>Isoniazid Preventive Therapy</td>
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<td>IRS</td>
<td>Immune Reconstruction Syndrome</td>
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<td>LED</td>
<td>Light Emitting Diode</td>
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<tr>
<td>LGBTI</td>
<td>Lesbian, Gay, Bisexual, Transgender and Intersex</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<td>LPA</td>
<td>Line Probe Assay</td>
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<td>MBOD</td>
<td>Medical Bureau for Occupational Diseases</td>
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<td>MDA</td>
<td>Mineworkers Development Agency</td>
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<td>MDG</td>
<td>Millennium Development Goals</td>
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<td>MDR-TB</td>
<td>Multidrug-resistant tuberculosis</td>
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<td>MEMS</td>
<td>Medication Event Monitoring System</td>
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<td>M&amp;E</td>
<td>Monitoring and evaluation</td>
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<td>MGIT</td>
<td>Mycobacteria growth indicators tube</td>
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<td>MHS A</td>
<td>Mining Health and Safety Act</td>
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<td>MHSC</td>
<td>Mine Health and Safety Council</td>
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<td>MHSI</td>
<td>Mine Health and Safety Inspectorate</td>
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<td>MoH</td>
<td>Ministry of Health</td>
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<td>MSF</td>
<td>Médecins Sans Frontières</td>
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<tr>
<td>NDdH</td>
<td>National Department of Health</td>
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<tr>
<td>NDRP</td>
<td>National Disability and Rehabilitation Policy</td>
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<td>NCD</td>
<td>Non-Communicable Disease</td>
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<tr>
<td>NGO</td>
<td>Nongovernmental organization</td>
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<tr>
<td>NIHL</td>
<td>Noise-induced hearing loss</td>
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<td>NIOH</td>
<td>National Institute of Occupational Health</td>
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<td>NSSA</td>
<td>National Social Security Authority of Zimbabwe</td>
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<td>NTP</td>
<td>National Tuberculosis Program</td>
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<td>ODMWA</td>
<td>Occupational Diseases in Controlled Mines and Works Act</td>
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<td>OH</td>
<td>Occupational Health</td>
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<td>OHS</td>
<td>Occupational Health Services</td>
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<td>OHS C</td>
<td>Occupational Health Service Centers</td>
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<td>OHSI</td>
<td>Occupational Health and Safety Institute</td>
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<td>OREP</td>
<td>Occupational Risk Exposure Profile</td>
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<td>OSH</td>
<td>Occupational Safety and Health</td>
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<td>OSSC</td>
<td>Occupational health One-stop Service Center</td>
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<td>OT</td>
<td>Occupational Therapist</td>
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<td>PAS</td>
<td>Para-aminosalicylic Acid</td>
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<td>PATHA UT</td>
<td>Pathology Automation System</td>
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<td>PEPFAR</td>
<td>President’s Plan for AIDS Relief</td>
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<td>PGM</td>
<td>Platinum Group of Metals</td>
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<td>PHC</td>
<td>Primary Health Care</td>
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<td>PIC</td>
<td>Program Implementation Committee</td>
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<td>PFMA</td>
<td>Public Finance Management Act</td>
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<td>PLWD</td>
<td>People living with disability</td>
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<td>PLHIV</td>
<td>Persons living with HIV and AIDS</td>
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<td>PPE</td>
<td>Personal Protective Equipment</td>
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<td>PPM</td>
<td>Public-Private Mix</td>
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<td>RAF</td>
<td>Road Accident Fund</td>
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<td>RIF</td>
<td>Rifampicin</td>
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<td>RMA</td>
<td>Rand Mutual Assurance</td>
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<td>SA</td>
<td>South Africa</td>
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<td>SADC</td>
<td>Southern Africa Development Community</td>
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<td>SAMI</td>
<td>South African Mining Industry</td>
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<td>SARCM</td>
<td>Southern African Regional Coordinating Mechanism</td>
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<td>SARS</td>
<td>South African Revenue Services</td>
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<td>SDGs</td>
<td>Sustainable Development Goals</td>
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<tr>
<td>SI</td>
<td>Statutory Instrument</td>
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<tr>
<td>STI</td>
<td>Sexually transmitted infection</td>
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<td>TB</td>
<td>Tuberculosis</td>
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<td>TEBA</td>
<td>The Employment Bureau of Africa</td>
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<td>TWG</td>
<td>Technical Working Groups</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>UIF</td>
<td>Unemployment Insurance Fund</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>UNAIDS</td>
<td>United Nations Joint Program on HIV and AIDS</td>
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<td>UNCRDP</td>
<td>United Nations Convention on the Right of Disabled Persons</td>
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<tr>
<td>URC</td>
<td>University Research Corporation</td>
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<tr>
<td>URSA</td>
<td>University Research South Africa</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>VMMC</td>
<td>Voluntary Medical Male Circumcision</td>
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<td>WBG</td>
<td>World Bank Group</td>
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<tr>
<td>WBOT</td>
<td>Ward-Based Outreach Teams</td>
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<td>WCFS</td>
<td>Workers' Compensation Fund Board</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WHODAS</td>
<td>World Health Organization Model Disability Survey</td>
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<td>WRD</td>
<td>WHO-recommended Rapid Diagnostic</td>
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<tr>
<td>XDR-TB</td>
<td>Extensively drug-resistant tuberculosis</td>
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</table>
PART 1: OVERVIEW OF TUBERCULOSIS AND OCCUPATIONAL HEALTH IN SOUTHERN AFRICA
CHAPTER 1
TUBERCULOSIS IN THE MINING SECTOR IN SOUTHERN AFRICA

History of Mining
Mining has been defined as the ‘removal of minerals from their natural geological environment and their transport to the point of processing or use.’ As defined, mining has, in one form or another, been providing essential raw materials for tens of thousands of years. Although metal ores were first mined in southern Africa approximately 2,000 years ago, minerals such as ochreous haematite, specularite, and pyrolusite were sought for use in cosmetics millennia earlier. The history of gold mining and gold trade in southern Africa goes back nearly 1,000 years although there has been evidence of shallow pit mining in what is now Zimbabwe as early as 200-600 A.D. Given the number of early gold mines and the records of lively trade on the east coast, the scale of precolonial production was clearly extensive and of considerable importance in the economies of some of the region's Late Iron Age kingdoms.

J. H. Davis, an English miner, found gold in 1852 on Paaredeskraal Farm in South Africa (SA), initiating the post-colonial “gold rush.” The miner was a British colonial immigrant who was ordered to leave The Transvaal Republic immediately after he had sold his gold for £ 660 to the government Treasury. Forced removal of communities from their land, or forced sale of land, and forced repatriation were to have tragic consequences throughout the history of mining. An air of secrecy placed around commercial gold transactions hint at the alienation, exclusion of ownership and the veil of silence that shaped the industry to come.

The discovery of diamonds in the 1860s sparked the first great mineral rush to the Vaal River and then Kimberley in South Africa. Organized diamond mining capital supplied by European financiers, was used to fund the diamond mines, Cecil Rhodes and colonial consortiums such as the Consolidated Gold Fields of South Africa. The Witwatersrand Gold Rush resulted in Paul Kruger, the President of the South African Republic calling for measures to minimize the problem of Boer citizens being overrun by foreigners (uitlanders), mostly British, rushing to gain footholds in what promised to be great riches and the enhancement of personal status. The contesting of citizenship, immigrant rights and conquest colonial governance were growing issues in the mines. So great was the power of the British mining magnates, and so rich were the predictable pickings of mining abundance, they contributed to a series of military conflicts which culminated in the South African War (Boer War) of 1899-1902.

The industry created super-rich European mining entrepreneurs over time, often from very humble backgrounds, who gained social status that overturned class prejudice against them. Southern African mineworkers were also lauded as “rural aristocrats”, initially seen as masculine, brave, heroes and leaders in their communities, taking on some of the most dangerous mines in the world, and sending home wages to their families. When rejected through retrenchment, boarded by illness or injury, separated from health services, and unable to gain access to compensation for injury and sickness disabilities, they returned to physically and socially destroyed community environments, with no ability to support their families, stigmatized as carriers of disease, and by disability.

The potential of mining abundance was not limited to diamonds and gold. Vast resources of coal were discovered in the 1850s and used to power South African industry. The state-controlled iron and steel industry flourished on vast iron-ore resources in the North West and Northern Cape. Platinum was discovered in 1924, and uranium, chromium, vanadium and manganese allowed growth in the latter half of the twentieth century.

While most of the early mines were surface operators, rapidly developing technology, such as the MacArthur-Forrest cyanide process, improved the economic viability of gold recovery from ever deepening mines leading to South Africa’s super-mines. And super-mines and super-rich mine-owners required large numbers of mineworkers. In 1904, after the war, 10,000 contracted Chinese workers arrived to help rebuild
the industry and ensured low labor prices. Their repatriation due to ill health by 1910 heralded the start of southern African migrant—underpaid, unprotected, and uncared for mine labor and their mostly tragic history which is still unresolved. They were recruited from Mozambique, and later from British southern African colonies by agencies which concealed the risks they were to face.

In 2011, mining contributed 8.8 percent of gross domestic product (GDP) directly on nominal basis and 30 percent of merchandise exports in South Africa. If the indirect multiplier and induced effects of mining are included, the overall contribution of mining to GDP is about 18 percent. The mining sector accounted for 20 percent of private sector investment and 12.3 percent of the total investment in the economy in 2011. In the past decade, the sector contributed over 1.9 trillion South African Rand to both the country’s GDP and export earnings. The South African mining sector currently employs some 500,000 mineworkers with an estimated 2 million ex-mineworkers in Lesotho, Mozambique, South Africa and Swaziland. Total earning for all mineworkers in 2011 is estimated at about US$ 9 billion, with individual employee average annual earnings of approximately US$ 20,000. This underscores the significant contribution of the mining sector to employment and overall economic growth in South Africa.

History of Tuberculosis in Mines
Elaine Katz tells the story about the extent of silicosis, an incurable lung disease caused by inhalation of dust containing free crystalline silica due mainly to excavation activities, in early white mineworkers from Cornwall and Wales who returned home when they were ill. Ignored by most historians of the industry, she comments, “posterity has been extremely slow in acknowledging the devastation wrought by the ‘white death’ or censuring those who did nothing to stop it.” Were it not for the district of Redruth in Cornwall’s official silicosis records of returned Witwatersrand rock drillers, we would still be ignorant of their rapidly filling the graves of Cornwall. Almost an entire generation of professional mineworkers died between 1892 and 1910 from an “accelerated form of silicosis” contracted in South Africa’s dusty mines. Their consultative skills had pioneered the South African gold mining industry.

The connection between silicosis and TB emerged in these early mining years. It was soon realized that a complicating factor was that having silicosis rendered you much more likely to contract TB. Further, it seems that the root of TB in South Africa may be found in those early mines: the very population of mineworkers that came from Cornwall and South Wales “to teach us how to run our mines” were heavily infected with tuberculosis. Working in close contact with other mineworkers in humid, hot and dusty conditions in the presence of silicosis, the southern African scourge of TB was rooted. It was also in the communities around the mine sites, in labor-sending areas like the rural Eastern Cape, and in Lesotho, Swaziland and beyond, in ex-mineworkers’ families and communities when they “were sent home like parcels to die.” Thus, the cycle of infection, spread of infection, reinfection and death began, fanned by attitudes of those in power, financial and governmental, in early colonial and then apartheid ideologies, despite the medical knowledge that grew regarding the epidemiology of silicosis and tuberculosis. For now, it was becoming known that social and financial conditions, as much as physical conditions were the places to start bringing about change.

The Milner Commission Report of 1903, gave a warning about the looming epidemic: “The extent to which Miners’ Phthisis (TB) prevails at the present time is so great that preventive measures are at an urgent necessity, and that such a large number of sufferers in our midst is a matter of regret.” The early work of Anthony Lanza (1913), Frederick Hoffman (1920s) and C.E.A. Winsloz (1925) identified the toxic link between silicon and TB. The Conference on Silicosis in Geneva (1938) reported that “siliceous dust not only leads to fibrosis but facilitates the development of tuberculosis.” Arguably, during the whole period of the 1900s, those in power must have known about the physical, financial and social factors causing TB but denialism concealed it. There were many warnings. Certainly, statistics collected from the 1970s to the present by the surveillance via the automated pathology system (PATHAUT) at the National Institute of Occupational Health (NIOH) in Johannesburg revealed “a crisis out of control.”

Roberts argues that the Natives Land Act of 1913 and the subsequent Grand Apartheid from 1948, “physically removed illness from view and removed the recording of illness from official health issues.”
Packard describes the official attitude to tuberculosis between 1948 about 1980 as designed to achieve “the great disappearing act,” forcing the repatriation of the old or the sick to their “homelands” falling outside the official statistical records.

The management of the financial, social and health wellbeing of mineworkers and ex-mineworkers has and always will require political will, and political commitment as well as medical and organizational expertise, supportive ministers of labor, recruiting agencies and finance sectors, private and public sectors, mining companies including owners and directors; mineworker unions, ex-mineworker associations, development partners, nongovernmental organization (NGOs), academic institutions, advocacy groups and ex-mineworkers’ and their families and communities.

**Tuberculosis in Mines and Society in Southern Africa**

The size and labor intensity of the mining industry has created job opportunities for men in the southern Africa region, who have been, throughout the century, the major source of labor for the mining sector in South Africa. The countries providing most of the migrant mineworkers have been Lesotho, Swaziland, and Mozambique. The trend in employment of migrant workers since 1920 demonstrates the regional dimension of the mining sector in South Africa. However, those who are medically boarded (terminated from employment and sent back to their country of origin) carry TB and multidrug-resistant tuberculosis (MDR-TB) to the labor-sending areas, putting their families and surrounding communities at risk. For instance, a mapping of 251 ex-mineworkers in Swaziland conducted in 2013 found 38 ex-mineworkers with TB symptoms, and 12 with active TB.

Mineworkers in southern African countries — South Africa, Lesotho, Swaziland, and Mozambique — have the highest tuberculosis incidence of any working population in the world. Incidence rates of TB among mineworkers in the southern Africa region are the greatest reported in the world, at least three times higher than any country. The TB incidence rate in South Africa in the general population is estimated at 781/100,000 (WHO TB Global Report, 2017) while the rate among mineworkers is estimated at 3,000/100,000.² The TB burden is also high in all the other three countries sending mineworkers to South Africa—Lesotho at 724/100,000, 551/100,000 in Mozambique, and 398/100 000 in Swaziland.³ The TB incidence in all the four countries is higher than the 250/100,000 World Health Organization (WHO) threshold for a “health emergency.” In 2011, there were an estimated 760,000 new cases of TB in the global mining sector, one-third of all new cases being in Africa, and 9 percent of all worldwide TB. There are 9.6 million work days lost each year to TB. One mine worker with TB can spread the disease to between ten and fifteen other people. Mortality rates are probably underestimated since those who died after being repatriated were not included in statistics.

The problem has recently been amplified by concerns about the emergence of drug resistant TB in the region and the increasing frequency of travel between the mines and rural labor-sending communities. In South Africa, primary and acquired drug resistance is estimated at 7.3 percent and 14.3 percent, respectively for isoniazid resistance and 1.0 percent and 2.8 percent, respectively, for resistance to at least isoniazid and rifampicin. The main risk factors for MDR-TB and XDR-TB are delays in diagnosis and inappropriate therapy, which includes non-adherence to treatment. A survey carried out by the National Institute of Occupational Health in 2010 covering 68 mines in South Africa confirmed the elevated TB epidemic in the mines.

Combinations of environmental and occupational factors explain the elevated risk of high TB incidence among mineworkers. One of the key factors contributing to the high TB prevalence is the high level of silicosis resulting from prolonged exposure to silica dust in mine shafts affecting about 20 percent of long service gold mineworkers, 22 to 36 percent of living ex-mineworkers and 50 percent of the mineworkers followed to death. The proportion of black mineworkers with silicosis at autopsy has increased markedly.

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from 3 percent in 1975 to 32 percent in 2007. Exposure to silica dust increases the risk of pulmonary TB, particularly in the gold mines. Between 18 and 31 percent of the mineworkers in South Africa have scarring lesions characteristic of silicosis, which means that such mineworkers have a three-fold increased risk of pulmonary TB compared to those without silicosis. A recent study of about 700 South African gold mineworkers found that 24 percent had silicosis. Of those with silicosis, 44 percent had a history of TB compared to 26 percent among those without silicosis.

There is a potential positive correlation between labor migration in the mines and risk of HIV infection. First, mineworkers reside away from their families for prolonged periods of time, which makes them more likely to have multiple concurrent sexual partners. Secondly, mineworkers are targets of an active sex industry thriving in the mining areas. Sex workers are a key population at high risk of HIV infection and transmission. Therefore, long absences from home, dangerous work in the mines, and sex workers around the mining sites have created high-risk groups—mineworkers and their families—that are highly exposed to HIV infection. A high level of HIV prevalence in the four countries exacerbates the risk of TB infection. An HIV-infected individual is 20 to 30 times more likely to develop TB. Further, HIV increases the likelihood that a person infected with TB will progress to active disease, shortens survival time among co-infected individuals, and increases the likelihood of a typical TB manifestation that can be difficult to diagnose. HIV and silicosis multiplicatively increase the risk of TB, and TB incidence among HIV positive silicotic mineworkers is about 15 times higher than among HIV-negative mineworkers without silicosis. Migrants moving between their homes and the mines do not have continuous access to treatment, risking individual poor patient outcomes as well as development and subsequent transmission of drug resistant forms of TB.

Mineworkers work in crowded and poorly ventilated shafts and live in congested hostels with several men sharing one room. These conditions are highly conducive for TB infection as well as recurrent TB. A survey of a cohort of 600 mineworkers in South Africa found a rate of recurrent TB of about 8 per 100 person-years (as opposed to half of this rate or less in the general population) with 69 percent of the recurrent cases attributable to re-infection rather than relapse. The high TB incidence among mineworkers poses public health consequences in labor-sending areas. An estimated 230,000 men migrate each year from the labor-sending countries to South Africa for mining jobs. About 60 percent of the mineworkers travel to their homes (labor-sending areas) within and outside South Africa once per month. This circular migration pattern exposes people in low prevalence areas to migrants with high prevalence of HIV and TB and prevents continuity of care, adherence support, and consistent access to diagnostic facilities for migrating mineworkers.

Response to TB in the Mining Sector
Several policy and legal instruments regulate the mining sector in South Africa. These include:

- Constitution of South Africa Act no. 108 of 1996, which guarantees everyone a right to health care and security;
- National Health Act no. 61 of 2003, which provides for the establishment of a public and private health system;
- Labour Relations Act no. 66 of 1995, which affords protection of all employees against unfair dismissal (including dismissal based on HIV and TB status);
- Employment Equity Act, which protects any employee from unfair discrimination based on HIV/TB status.

In addition to these broad policy and legal instruments in South Africa, two legislations have direct impact on management of TB in the mining sector:

- The Mining Health and Safety Act no. 29 of 1996 (MHSA) regulates health and safety of employees in the mining industry. It also provides for the protection of the health and safety of employees and other persons affected by the South African mining industry. The act requires the mining companies to guarantee, as far as reasonably practicable, that the mine is designed, constructed, and equipped
to provide conditions for safe operation and a healthy working environment, which by interpretation includes control of the risk of “occupational TB”.

- The Occupational Diseases in Controlled Mines and Works Act (ODMWA) 78 of 1973 is administered by the Department of Health and provides the Workers’ Compensation framework for those occupational diseases attributable to “risk work” in a mine or works. It covers cardiorespiratory diseases such as pneumoconiosis, tuberculosis, chronic airways obstruction, occupational asthma, and progressive systemic sclerosis, which, “in the opinion of the Certification Committee of the Medical Bureau for Occupational Diseases, is attributable to the performance of risk work at a controlled mine or works.”

Despite the above legislations, which regulate health and safety in the mining sector, monitoring and compliance continues to be a major challenge. In the southern Africa region, TB services are provided through the public and private sector health systems with all countries having national TB programs leading efforts to combat the epidemic in the general population including mineworkers. Mining companies also have health facilities in the mining sites providing TB services among others. Although the countries have recognized the cross-border nature of TB in the mining sector, the national TB programs have not evolved a mechanism for coordinating their programs to address the cross-border dimension of the epidemic. The NIOH 2010 survey, which covered 68 selected mines in South Africa, found that 40 percent of the mines provided TB services on site. Of the 60 percent with no services on site, 16 percent outsourced services to private health care companies. Some 51 percent of the mines provide no service, implying total reliance on government health care facilities for TB services. On the other hand, 38 percent of the mining companies surveyed provided HIV services onsite, while 55 percent referred their employees to government facilities for HIV services, implying that these companies do not offer HIV services. Smaller mining companies (<200 employees) tend not to provide HIV and TB services onsite. In general, companies providing HIV services also provide TB services in line with the national policy on integrating HIV and TB services.

Lesotho has 33,000 current mineworkers in South Africa of whom 135 were medically boarded in 2012. Mineworkers account for about 10 percent of the 12,000 TB patients on treatment and between 30 and 40 percent of MDR-TB patients. A public-private partnership program has been initiated with funding from TB Reach. This program is a partnership between the National TB Program, International Centre for AIDS Care and Treatment Programs (ICAP), and the Employment Bureau of Africa (TEBA). Mineworkers with TB are provided with diagnostic and treatment services at TEBA regional offices. Community health workers provide home-based follow-up care.

High rates of HIV coinfection have contributed to a significant TB epidemic in Swaziland. About 10,000 TB patients are on treatment including 750 MDR-TB patients. Mineworkers are disproportionately affected by TB. A pilot mapping of current and ex-mineworkers in a village in Swaziland revealed a high incidence of TB. Of the 109 ex-mineworkers surveyed, 35 percent had a positive TB symptom screen, 26 percent had recurrent chest infection, and 9 percent had active TB. Nine cases of MDR-TB were also identified. However, there is no program specifically targeting current and ex-mineworkers. Mineworkers, ex-mineworkers, their families, and surrounding communities access TB services through the national TB program.

There is no specific TB program in Mozambique targeting current and ex-mineworkers, their families, and communities in the labor-sending areas. The Association of Mineworkers of Mozambique (AMIMO) has contact information for ex-mineworkers but faces the challenge of tracking them. At the national level, the national TB program is implementing the Directly Observed Treatment, Short Course (DOTS) strategy and providing treatment for MDR-TB, but there is relatively low use of GeneXpert compared to the other countries. Findings of a survey carried out in 2010 on TB services provided in the mining sector show that

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4 TB REACH is a multi-lateral funding mechanism that provides grants to partners for testing innovative approaches and technologies aimed at increasing the number of people diagnosed and treated for TB, decreasing the time to appropriate treatment and improving treatment success rates. It combines fast-track, results-based financing and rigorous, external monitoring and evaluation (M&E) to produce results, so other donor agencies and/or national governments can scale-up successful approaches and maximize their own investments. See http://stoptb.org/global/awards/tbreach.
there is poor follow-up of suspected and known TB cases; poor data collection and record keeping; the quality of inspection of mines is directly linked to the quality of services offered; detection of TB cases is mainly passive; there is heavy reliance on public health services by small, medium, and a few large mines; and occupational health workers do not view HIV and TB as their problem.

Formal recognition of mineworkers in Southern Africa as a group of particular vulnerability and disease risk came only recently when the Ministers of Health of Lesotho, South Africa and Swaziland issued a joint call for action on TB in the mines. This announcement followed an expert consensus meeting held in Johannesburg by the South African Department of Mineral Resources (DMR) and the NIOH with support from the World Bank, which sensitized the countries to the high burden of TB and TB/HIV among mineworkers and the paucity of services available. In follow-up to this meeting, the World Bank initiated a work program to address knowledge gaps about the exact numbers of migratory mineworkers at risk of TB and the extent of post-employment infections among ex-mineworkers.

Starting with a rapid data analysis of available information in May 2011, this ongoing work has stimulated larger economic studies to define the costs of intervention versus inaction, which have provided the financial rationale necessary to obtain Southern African Development Community (SADC) approval for regional intervention. Concurrently, the Department of Health of South Africa led an effort to establish a national multi-stakeholder committee on TB in the mining sector, involving representatives of the NIOH, the DMR, Chamber of Mines, development partners (World Bank Group, Stop TB Partnership, International Organization for Migration, UK Department for International Development), and The Employment Bureau of Africa (TEBA)—the regional recruitment agency for the industry, labor representatives, and academics. The aim of this group was to bridge gaps between opposing interest groups and tackle the fragmentation that had prevented an effective response to TB in the mining sector since its recognition as an issue of public health concern in 1914.

The South Africa Knowledge Hub Initiative, a collaboration between the South African government and the World Bank Group, was formally launched at the end of 2012. Its purpose is to facilitate the scaling up of development solutions and lessons learned, and to support knowledge-sharing within the southern Africa Region and beyond. As part of its focus on health reform, the South Africa Knowledge Hub is working to implement a regional strategy to reduce TB infection rates in southern Africa’s mines. With support from the World Bank Group, the Hub is part of a collaboration involving national governments, private sectors, civil society, research institutions and other development partners to lead the implementation of a four-pronged strategy that will help South Africa and its neighboring countries of Swaziland, Lesotho and Mozambique.

Recognizing the economic importance of the mining industry and the associated negative impact of TB on the health of mineworkers and their communities, SADC Heads of State signed The Declaration on Tuberculosis in the Mining Sector, in August 2012, in Maputo, Mozambique. This document provides a framework for understanding the strategy adopted by the World Bank in its chosen projects and programs in the southern Africa TB in the Mining Sector Initiative.

Framed by SADC’s rights-based development objectives, the commitment to the Millennium Development Goals (MDGs) then, and now to the Sustainable Development Goals (SDGs) relating to health and safety and to the eventual elimination of preventable diseases, the Declaration is prefaced by acknowledgement of contextual issues, detailed statements on factors driving the epidemic, mineworkers’ rights, and SADC protocols and commitments for improving practices and standards of occupational health and safety in the mining sector and of the region. The Declaration testifies not only to the shared commitment of the SADC countries and relevant stakeholders to action, but also to the intensity of their concern and their recognition of the depth of the response necessary to address the high levels of morbidity and mortality from preventable TB, HIV, silicosis and other occupational respiratory diseases in the region.

The collaborative development of the Declaration prompted the SADC member states to take the initiative to develop the Framework for the Harmonized Management of Tuberculosis in the Mining Sector, with the support of the World Bank and the World Health Organization. The Framework provides a platform for
coordinating multiple actors in addressing TB in the mining sector and seeks to facilitate a coordinated response to the TB epidemic that integrates a regional dimension into the national TB programs.

The Southern Africa TB in the Mining Sector Initiative promises to consolidate the work already done in an effort to, in an intersectoral and regional manner, finally address the issue of the TB epidemic in the mines and their communities of southern Africa.

**Declaration on TB in the Mining Sector**

In an attempt to tackle tuberculosis among current and former mineworkers, their families, and affected communities, 15 southern African leaders signed the *Declaration on TB in the Mining Sector*, a legal instrument, at a summit meeting of the SADC Heads of State and Government in Maputo, Mozambique on 18 August 2012. The declaration is to ensure commitment and accountability by member states to improve the lives of those affected by tuberculosis. At the signing, Aaron Motsoaledi, South Africa’s Minister of Health and member of the Stop TB Partnership Coordinating Board which spearheaded the initiative that led to the declaration, said that the problem of TB was regional and not just South Africa's alone: "The head of the TB snake is in South Africa, with its fangs in the country's mines and its tail reaching out to neighboring countries." He also said that while individual mining companies were responding to the tuberculosis crisis, a coordinated approach was needed for this multi-sectoral issue which acutely impacts southern Africa and for which African leadership is being mobilized. World Bank Group President, Jim Yong Kim, committed the Bank’s support to the initiative: “To effectively follow people with TB throughout the region, we will need to improve communications, laboratories, and other elements of infrastructure, an area where we have lots of expertise. We can convene all the relevant partners and help to build a truly regional response to an epidemic that does not respect borders.”

The declaration identifies and commits to addressing the following priorities relating to TB, HIV, silicosis and other occupational respiratory disease control in the mining sector:

- Strengthening, accountability, coordination and collaboration.
- Promoting a supportive policy and legislative environment.
- Supporting programmatic interventions.
- Enhancing disease surveillance system.
- Improving program monitoring and evaluation.
- Strengthening financing mechanisms.


**References**


CHAPTER 2

OCCUPATIONAL HEALTH IN SOUTHERN AFRICA

History of Occupational Health
In the wake of the Industrial Revolution and in response to worker concerns and, in particular, the health of children in the cotton mills of the United Kingdom (UK), research and regulation of occupational safety were placed on the agenda of Western countries. The Factory Act of 1833 in the UK began formal regulation by creating a dedicated Factory Inspectorate and as early as 1840 a Royal Commission published its findings on the dangerous state of conditions of workers in mines, prompting the Mines Act of 1842. Occupational Health regulation in Africa however, has consistently lagged the developed world and to the present time, compliance with International Labour Organization (ILO) recommendations and indeed any legislative or regulatory framework for occupational health and safety is absent or inadequate in many countries in Africa. While economies in many African countries have expanded, poor human resource capital, training and education in the field of occupational health services (OHS) have had a major negative impact on worker access to such services. However, progress has been made in many southern African countries towards the establishment of a legislative and regulatory framework although there continues to be, among other issues, lack of clarity and detail in certain areas, overlaps in some provisions and the question of whether or not TB is classified as an occupational disease in mining.

In most countries in southern Africa, mineworkers employed in large and the larger medium-scale mining operations are generally well protected in terms of occupational health and safety. This segment of the mining industry, mostly in the hands of transnational corporations, conducts regular risk assessments, establishes respective health and safety systems in line with national laws and regulations and supplies their workforce with adequate personal protective equipment (PPE). The mines are regularly inspected by the relevant authorities under the relevant Ministries. Large-scale mining houses provide excellent, mostly above country-standard primary health care, emergency and occupational health surveillance services combined with health promotion, prevention and well-being programs—known collectively as Basic Occupational Health Services (in this case BOHS III/IV). The most sophisticated systems are found in South Africa, with its long mining tradition and a Chamber of Mines (CMSA) that has provided effective leadership in setting standards and disseminating good practices within the industry.

More challenges are found in medium/small scale and informal mining in some countries. Depending on the size of the operation and the operator service, provision ranges from BOHS stages I/II to mines without any adequate health and safety systems in place. Clearly, limited implementation of regular health and safety inspections and limited enforcement of existing laws and regulations contribute to non-compliance in many workplaces in this mining sector. The most underserved mineworkers are those working in artisanal small-scale mines (ASSM). Although these owners often hold valid mining licenses, they often do not apply the relevant health and safety regulations and standards. The limited availability of OHS near ASSM areas, financial access barriers, and the low degree of risk awareness contribute to low uptake of services by this mining population. Furthermore, in ASSM, health and safety inspections are almost never conducted. Overall, the public OHS providers and inspectorates are often under-equipped, understaffed and are unable to effectively execute their mandates.

Legislative and regulatory frameworks
In 1950, the International Labour Organization and the World Health Organization (WHO) defined occupational health as “the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.” Occupational health (OH), as it is practiced in the mining industry, takes into account the impact of hazardous workplace exposures on workers’ health, working closely with the occupational hygiene discipline within a risk management framework. Together with the disciplines of occupational medicine and occupational epidemiology, OH provides risk based
medical surveillance programs directed to individual workers. Four ILO conventions define the fundamental principles of OH and safety for the mining sector: Convention Nos. 155, 161, 176, and 187.

ILO Convention No. 155, (1981) on Occupational Safety and Health (OSH) provides for the adoption of a coherent national occupational safety and health policy, as well as action to be taken by governments and within enterprises to promote occupational safety and health to improve working conditions. One of the key features of this regulatory framework is the introduction of a single overarching OSH law, replacing earlier laws, to cover all workers and all hazards at work. This is fundamental to the development of national OHS services and ties in closely with conventions 161 and 171. ILO Convention No. 161 (1983) on Occupational Health Services (OHS) and its accompanying recommendation No. 171 (1985) serve as models for establishing requirements for the organization and functioning of occupational health services. According to the convention, the term “occupational health services” means services entrusted with essentially preventive functions, responsible for advising the employer, the workers and their representatives in the workplace on:

- The requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work;
- The adaptation of work to the capabilities of workers in the light of their state of physical and mental health.

Good occupational health practice, according to Article 1(a) of this convention, involves health promotion and protection activities of workers’ health. This means that the improvement of working conditions and environment carried out by occupational safety and health professionals as well as other specialists, such as occupational hygienists, is vital.

The Occupational Health Services Recommendation No. 171 stipulates that the functions of OHS should comprise monitoring of workers’ exposure to health hazards, provide personal protective equipment for workers and to collaborate on job placement and better adaptation of work to the workers. OHS should also participate in the analysis of occupational accidents and occupational diseases and in accident prevention programs. The surveillance of the working environment should include the identification and evaluation of the environmental factors, which may affect the workers’ health. Occupational hygiene assessments and organizational and environmental risk factors should be documented and mitigated.

The most recent ILO Convention No. 187, Promotional Framework for Occupational Safety and Health (2006), aims to promote a preventive safety and health culture and to progressively achieve a safe and healthy working environment. It requires Member States that ratified the conventions to develop, in consultation with the most representative organizations of employers and workers, a national policy, a national system, and a national program on occupational safety and health. Under ILO Convention No. 176 on Safety and Health in Mines, the employer is mandated to assess and eliminate all risks, control the risk at its source and minimize the risk by means that include the design of safe work systems. If the risk were to remain, the employer is to provide personal protective equipment that is reasonable, practicable and feasible, and conforms to good practice and the exercise of due diligence.

The ILO Conventions C017 and C018 as well as C018’s revised version, C042, are concerned with the Compensation of Occupational Injuries (C017) and Diseases (C018/042). Convention C042 covers, among others, the compensation of silicosis, silico-tuberculosis and workplace related intoxications (e.g. mercury intoxications). Beside the above conventions, the ILO has adopted more than 40 standards specifically dealing with occupational safety and health, as well as over 40 Codes of Practice.

The above conventions and recommendations provide ratifying countries with clear and elaborate regulatory frameworks for introducing or improving existing occupational health and safety standards in general and in the mining sector in particular. The table below presents an overview on the ratification status of the relevant ILO conventions in some countries.
Table 1.1: Ratification status of ILO Conventions and Recommendations in selected southern African countries

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<th>South Africa</th>
<th>Tanzania</th>
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<td>Lesotho</td>
<td>20%</td>
</tr>
<tr>
<td>Swaziland</td>
<td>10%</td>
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</tbody>
</table>
As Table 1.1 shows, there is variation in the degrees to which a sample of southern African countries have ratified occupational health-specific ILO conventions, ranging from as low as 10 percent in Swaziland to a high of 70 percent in Zimbabwe. While all countries have put in place some legislative framework, these are inconsistently applied.

Although South Africa ratified the ILO Convention No. 155, it has not yet put in place a single overarching occupational health and safety law or statutory instruments. However, various laws do exist that have a direct bearing on the delivery of occupational health services by requiring medical surveillance and evaluation of the work environment. South Africa’s legislative framework is the most established in southern Africa and is worthy of mention. South Africa’s economy has been shaped by the mining industry which has relied heavily on labor from other southern African countries—40 percent of this sector’s human resources are drained from neighboring countries. The country’s mining sector is regulated by the Mine Health and Safety Act (MHSA), which was enacted in 1996 and heralded a new era of progressive and forward-looking legislation that would enable the protection of health and safety in the mines. The overall aim of the Act is to protect the health and safety of employees and it places firm accountability on the mine owner to do so. However, there is also firm obligation on both employers and employees to ensure health and safety, recognizing that contractors are included as employees of the mine. The MHSA is administered by the Department of Mineral Resources (DMR), which is responsible for overseeing the mining industry and the exploitation of the mineral resources in SA. The Mine Health and Safety Inspectorate (MHSI) situated within the DMR is the country’s largest specialist occupational health and safety inspectorate. In line with the MHSA, the DMR has developed Codes of Practice that the South African Mining Industry (SAMI) must adhere to. These are enforceable by law, and when audited by the inspector of mines, a mine is expected to produce codes of good practice applicable to their specific mining environment and context.

South Africa’s Department of Health (DoH) administers the Occupational Diseases in Mines and Works Act (ODMWA) of 1973, which provides for the medical surveillance and compensation of lung and heart diseases contracted in controlled mines and works. The regulator is the Compensation Commissioner for Occupational Diseases (CCOD). The Medical Bureau for Occupational Diseases (MBOD) of the DoH provides benefit medical examinations (BME) for workers and processes ex-mineworker claims at other sites such as at Occupational Health Service Centers (OHSC). The Department of Labour (DoL) administers the Compensation for Occupational Injuries and Diseases Act (COIDA) of 1993, which covers all sectors of the economy other than informal workers and those under ODMWA. The primary agency responsible for regulating work-related accidents and diseases for workers employed in the formal sector (except mining) is the Chief Directorate of Occupational Health and Safety in the DoL. It provides a no-fault compensation for employees who are injured in accidents or who sustain occupational diseases arising out of and in the course of their employment. All employers are obliged to register with a “carrier”, which is either the Compensation Commissioner of the Compensation Fund or an approved designated mutual. Employers are then required to provide their respective carrier with the particulars of their businesses and failure to register with a compensation fund constitutes an offence. There are also laws covering occupational safety and health in the aviation, maritime and transport sectors.

**Occupational Health Burden**

While many work-related illnesses are recognized as problems when they occur in industrialized countries, they are less well recognized in lower-income countries, such as those found in southern Africa. Many of the diseases are chronic, and with insecure employment, particularly in small enterprises, they are likely to go undetected. Many factors in the work environment that cause ill-health modify or are modifiers of wider causes of ill-health, such as the combined effects of workplace and environmental pollutants on asthmatic disorders. This may also make it difficult to establish the direct contribution of the workplace to ill-health, particularly for groups in which poverty has increased disease and mortality levels. Weak monitoring and regulatory systems imply that a significant share of occupational morbidity is not routinely reported, particularly chronic illnesses due to chemical, ergonomic and psychosocial factors. Health problems may also be underreported due to job insecurity and high labor turnover, factors exacerbated by employment patterns created by globalization.
Even though informal sector production is expanding more rapidly than production in the formal sector in several liberalized economies, in many Southern African countries, even the most comprehensive notification systems do not cover small-scale, informal-sector production. Informal-sector risks include poor work organization, poor access to clean water and sanitation, ergonomic hazards, hazardous hand-tools, and exposure to dusts and chemicals. Surveys of informal-sector workers have found occupational injury and mortality rates similar to those in the formal sector, but higher rates of occupational illness.

The mining sector is by nature a dangerous field; not only is the risk of injury high, there are various factors which predispose mineworkers to disease. The gold mining industry in particular, has high levels of exposure to silica dust due to underground mining resulting in chronic respiratory fibrosis and predilection to tuberculosis. Until the 1990s, there were very few studies on the extent of silicosis in South African gold mineworkers. The only long-term cohort study, conducted on white mineworkers, provides a clear illustration of the progression of silicosis long after retirement. Not surprisingly, the prevalence of disease in black mineworkers in earlier years, when exposure to dust was for relatively short periods, was much lower than in white mineworkers. Three subsequent studies of ex-mineworkers from Lesotho, Botswana, and the Eastern Cape province of South Africa reported proportions of silicosis of up to 36 percent. The high rates of silicosis are of major concern in the gold-mining industry largely because of the association of silicosis and tuberculosis—South African gold mineworkers have one of the highest incidence rates of pulmonary tuberculosis in the world.

Concomitant factors to silica exposure among mineworkers including poor ventilation, poor housing, migrant labor and high prevalence of HIV have created a situation where TB incidence in mineworkers is many times higher than in the general population. It is not surprising therefore that mineworkers in South Africa have the highest TB incidence of any working population in the world. The 15 SADC countries include five of the 22 TB high-burden countries identified by WHO; the SADC region is home to more than 37 percent of the world’s HIV population, and the region’s TB/HIV coinfection rate is the highest in the world—ranging from 50 to 77 percent.

**Occupational Health Services and Compensation systems**

Globally, access to OHS has been poor and occupational health as a discipline of medicine has only recently been recognized, despite the fact that some 2 million work-related deaths and 300 million non-fatal workplace accidents occur annually. Africa has lagged behind developed countries and expanding economies in recognizing workplace health as a priority – there are significant gaps in human resource capital, training and programmatic approaches to OHS in Southern Africa. In addition, the oversight and provision of OHS in this region is distributed between the Ministries of Labour and Health to differing extents. However, there has been some commitment by southern African countries to begin to comply with ILO conventions related to Occupational Health and Safety although these endorsements fall well short of the scheduled 177 technical conventions.

Mining plays a significant role in the development process of the Southern African Development Community by creating wealth and employment and a market for other industries such as manufacturing and services. Recognizing that a thriving mining sector can contribute to economic development, alleviation of poverty and an improved standard and quality of life throughout the region, Member States of SADC have signed a Protocol on Mining agreeing to adopt internationally accepted regional standards within the mining sector (enforced 10/02/2000). The Protocol outlines that signatories “agree to cooperate in improving the practices and standards of occupational health and safety in the region’s mining sector.” OSH and OHS are furthermore and explicitly mentioned in the SADC Protocol on Health, which was approved by the SADC Heads of State in August 1999 and implemented in August 2004: “States Parties shall assist each other in the development and delivery of integrated occupational health services and cooperate in reducing the prevalence of occupational injuries and diseases.” In this context, TB and Silicosis have been getting focused attention.

The compensation systems in most southern African countries cater theoretically for the compensation of incapacity related to occupational injuries or diseases. However, in each of the countries the systems face
constraints in implementing a proper compensation and claims management process. While the compensation of claims from work-related injuries is a relatively straightforward process launched by the employer, the assessment and compensation of occupational diseases with latency and usually after formal employment poses a great challenge. For example, the Division of Occupational Health and Safety of the National Social Security Authority of Zimbabwe (NSSA) in the Ministry of Labour is the custodian of Occupational Health and workers’ compensation. NSSA administers two schemes, namely the Pensions and Other Benefits scheme and the Accident Prevention and Workers’ Compensation scheme. The Accident and Prevention and Workers’ Compensation scheme, through statutory instrument, aims to create awareness and promote health and safety in the workplace, provide rehabilitation services, enforce health and safety legislation, and provide financial benefits to families of workers who have been injured or killed or who have acquired occupational diseases. However, only 30 percent of workers are covered by this scheme since the informal sector, civil service and domestic workers are excluded.

Zimbabwe has no system in place to follow up on ex-mineworkers’ health. Should a mineworker come forward with a potential claim, it will be processed and compensation is likely. Zimbabwe’s mineworkers rely on public health services across the country. The capacity of peripheral services to diagnose occupational diseases is limited. At the time being, no efforts are undertaken to overcome these structural barriers to compensation, although NSSA in Zimbabwe does provide accreditation training, which is unfortunately not mandatory by law.

The most fragmented system exists in South Africa, where the compensation of occupational lung and heart diseases in mineworkers in controlled mines is administered through the Compensation Commissioner for Occupational Lung diseases under the DoH, the compensation of occupational diseases in mineworkers in non-controlled mines is administered by the Compensation Commissioner under the MoL and the compensation of occupational injuries and related disabilities is managed by Rand Mutual Assurance (RMA). The Government of SA has however embarked on establishing a unified dispensation for an integrated compensation system that will be typified by equity in benefits and care for all mineworkers as well as a more effective administrative system.

Tanzania has just recently set up its Workmen’s Compensation Fund and the system is not yet operational. It will take several years until the compensation process, from medical benefit examinations, claims processing, and compensation is functional. A critical element will be the accessibility of sufficiently trained health personnel conducting occupational health examinations and certifying occupational diseases. Tanzania has committed to training at least three medical cadres from all districts on occupational health and on processing of compensation claims, to overcome the existing capacity constraints.

The Labour Law number 23/2007 in Mozambique is the main statute covering all aspects of employment relationships together with derivative legislation on various lateral aspects of employment. This legislation applies to all categories of work including employment relationships between national and foreign employers/employees but excludes public servants and workers in local government.

Although the Occupational Health and Safety Institute (OHSI) in Kitwe, Zambia has a wealth of information on ex-mineworkers in the country, it remains challenging to motivate ex-mineworkers to come forward for benefit medical examinations and to process a claim in case of eligibility. Many ex-mineworkers are lost to follow up in their distant rural homes. In Zambia, there is further a significant migrant labor force coming from neighboring countries, particularly DRC and Malawi. No efforts are currently undertaken to ensure that migrant laborers receive the requested routine health examinations or process any potential claims.

The compensation of ex-mineworkers poses one of the greatest challenges in African countries. Once mineworkers leave or are retrenched from their workplace in a mine and return to their rural homes they are lost to regular follow-ups of their health status. Moreover, ex-mineworkers are often unaware of their potential benefits and unfamiliar with application procedures.
References


CHAPTER 3
THE ECONOMICS OF TUBERCULOSIS IN THE MINING SECTOR

Tuberculosis Services for Mineworkers in Southern Africa
This economic analysis assesses the economic benefits and costs of comprehensive TB intervention, and considers its implications for the mining industry, as well as the labor-sending countries of South Africa, Lesotho, Mozambique, and Swaziland. The results are intended to contribute to the policy discourse on addressing TB in southern Africa. Following is a snapshot of the situation in each country.

South Africa
According to the South African Chamber of Mines (COM), 191,000 of 233,000 mineworkers (82 percent) included in its 2010 review of TB in the mines had access to health services (clinics or hospitals) in the workplace. Of the workers employed by reviewed mining companies, 18 percent (41,940) had no access to TB services of any kind. The COM also included 80,000 contractors in its review and found they did not have the same access as regular employees to the mines’ health services. For instance, 33 percent of the mining companies reviewed had no written policies regarding TB services for contractors, and those with written policies did not always allow contractors to access their TB services.

Approximately 82 percent of the reviewed mining companies provided their employees with access to either a mine clinic or a mine hospital. In general, these were well-equipped, with virtually no facilities reporting shortages in laboratory or pharmaceutical equipment, including TB medication. However, facilities were lacking in other areas, largely in the field of TB diagnosis. Only 67 percent of the mining companies with available TB services used the cough questionnaire that aims to identify workers with a persistent cough, one of the common symptoms of active TB or silicosis. Likewise, not all mining companies had access to sputum-testing or chest X-ray equipment.

In terms of the prescribed treatment protocols, more than 80 percent implemented the DOTS policy. Cure and completed treatment rates averaged 82 percent, with the outcome known in 89 percent of cases and a TB recurrence rate of 35 percent. These numbers do not include all companies reviewed because of a lack of data. Follow-up of patients being treated and those who have completed treatment needs to be improved to increase the cure rate, prevent TB reinfection, and rapidly diagnose re-infected workers.

Typically, only regular employees are given access to free care in mining companies’ health facilities. Employees’ family members are required to purchase insurance in order to be treated by the company’s health facility. There are exceptions; for example, AngloGold Ashanti conducts public screening programs, during which it conducts free HIV testing in its mineworkers’ communities.

Lesotho
Lesotho has 33,000 current mineworkers in South Africa, of whom 135 were medically boarded during 2012. Within Lesotho, 12,000 patients are undergoing TB treatment, of whom approximately 10 percent are mineworkers. Mineworkers account for 30-40 percent of MDR-TB patients. Under a contract between mining companies and TEBA, mineworkers with TB are given follow-up care. This support involves a community worker who ensures patients are connected to the public sector treatment program. The cost is about US$52 (R700) per month per worker or US$2,600 (R35,000) monthly to cover each of the 50 workers employed by TEBA—some US$31,000 (R420,000) per year. These workers take care of 250 patients in Lesotho at a cost per patient of US$124 (R1,680) annually. It has been independently verified that reimbursement to TEBA for providing home-based follow-up care is in this range. Based on this, the estimated personnel cost (i.e., not including treatment costs) of follow-up care for 1,200 current mineworkers in Lesotho is about US$152,000 (R2.06 million) a year.

5 This chapter is based on a report, “The Economics of Tuberculosis in the Mining Sector;”
Swaziland
In Swaziland, high rates of HIV coinfection have contributed to a significant TB epidemic, and mineworkers are disproportionately affected. Roughly 10,000 TB patients are in treatment, including roughly 750 cases of MDR-TB. The University Research Consortium, the Swaziland Department of Health, and the Mozambique Department of Health are working together on an initiative to map ex-mineworkers. This project has begun in one region of Swaziland, using home visits for communities where local chiefs have identified a high proportion of mineworkers. Of the 250 people traced, 55 had died and the rest were screened. Program workers found an abnormally high prevalence of TB. Thirty-eight screened positive for TB symptoms and of those, 12 had active pulmonary TB; no MDR-TB was present. High HIV coinfection rates were found—HIV was found in roughly three-quarters of those with active pulmonary TB. Eighteen GeneXpert\(^6\) machines are being deployed in the national program.

Mozambique
Health system resources to address TB in former mineworkers are probably weaker in Mozambique than in the other three countries in this study. The government provides DOTS and drugs for MDR-TB to all TB-infected patients in Mozambique. However, there is relatively low use of GeneXpert for rapid diagnosis. Unlike in South Africa, mines in Mozambique are not required to medically screen their employees once a year; the task of diagnosing and treating mineworker populations thus falls to others.

The Association of Mineworkers of Mozambique (AMIMO) has contact with former mineworkers. In 1999, a project to track ex-mineworkers was implemented by Rand Mutual. Although the project ended in the early 2000s, the database of 18,000 ex-mineworkers still exists. However, AMIMO currently does not help members apply for compensation, so there is little incentive for former mineworkers to self-identify. There are no MBOD-certified examiners in Mozambique, and the long distance to Johannesburg makes it extremely difficult for former mineworkers in Mozambique to apply for MBOD compensation.

Results
Figure 1.1 below shows the number of infections averted in the mining sector, in communities, and in labor-sending countries and provinces as a result of universal GeneXpert diagnosis in the mines and WHO standards for treatment of infected workers. Reductions in TB prevalence were measured against a baseline of interventions maintained at the current level. The greatest impact was seen on current mineworkers, with a smaller impact on South Africa and the smallest impact on labor-sending countries.

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\(^6\) The Genexpert test is a molecular test for TB which diagnoses TB by detecting the presence of TB bacteria, as well as testing for resistance to the drug Rifampicin. It uses a sputum sample and can give a result in less than two hours. (https://www.tbfacts.org/xpert-tb-test/)
Figure 1.1 Change in incidence (rates/100,000 person years) due to a comprehensive program of universal GeneXpert diagnosis and WHO standards for treatment in all gold (upper graph) and Platinum Group of Metals (lower graph) mines in South Africa

Figure 1.2 shows the total number of infections averted through universal testing and WHO standard of treatment in platinum group of metals (PGM) and gold mines. The number of infections declines with the reduction in the number of mineworkers over time, as does the number of secondary cases, due to the proposed comprehensive TB intervention. The number of prevented infections in labor-sending countries is minimal because of the large base of transmitted TB-infected patients already present in those countries. Our analysis indicates that the effect of these averted cases is much greater only if there is a significant decline in the baseload of TB cases in the labor-sending provinces and countries.
Figure 1.2. Total number of infections averted due to a program of universal GeneXpert diagnosis and WHO standards for treatment in PGM and gold mines in South Africa

Figure 1.3 shows the total number of deaths avertable over a 15-year time horizon in SA and each of the labor-sending countries because of a program of universal GeneXpert diagnosis and WHO standards for treatment in all PGM and gold mines in South Africa. Approximately 2,200 deaths due to TB are averted in South Africa. The analysis suggests that the intervention in South Africa will also result in averted deaths in the labor-sending countries. In Lesotho and Mozambique, approximately 250 and 200 deaths would be averted respectively. In Swaziland, however, fewer than 40 deaths would be averted over the 15-year horizon.

Figure 1.3. Deaths averted due to a program of universal GeneXpert diagnosis and WHO standards for treatment in all PGM and gold mines in South Africa

Source:
Figure 1.4 shows the cost per averted infection and benefit-cost ratios at the baseline of GeneXpert tests at R700 per test. The cost per averted TB infection in gold mines increases from R60,000 to R90,000 between 2015 and 2030. This is higher than the average R8,000-10,000 cost of DOTS in South Africa because it includes the cost of screening, setting up treatment facilities in new locations where there are no current facilities, GeneXpert testing, and treating a large number of MDR-TB cases. The benefit-cost ratio of the program in gold mines is calculated as the ratio of benefits of averted treatment costs and averted mortality to the incremental cost of the program. This value declines because of the declining numbers of infections, which is a result of fewer mineworkers in this sector. However, costs do not necessarily decline because the fixed costs of operating the program do not decline as rapidly and are spread over a smaller set of mineworkers.

**Figure 1.4. Projected benefit-cost ratio and cost per infection averted, in Rands, 2015-2030, at baseline of R700 per GeneXpert test**

Sensitivity of benefit-cost ratios to the proportion of mineworkers coming from gold mines is also indicated in Figure 1.4 above. In 2015, the benefit-cost ratio under the baseline of 20 percent of new workers coming from gold mines was 12, but this increases to 20 when a greater proportion (80 percent) of new hires in PGM mines are assumed to have come from the gold sector.

Figure 1.5 shows results when GeneXpert cartridges are provided in gold mines at the public sector price of US$ 7.38 (R100). Here it is seen that the intervention is actually cost-saving. In other words, the entire cost of the intervention is itself lowered because the increased testing leads to lower treatment costs. Benefit-cost ratios are also negative because there is no incremental cost of the intervention – again, the greater investment in testing is recouped in the form of lower treatment costs.

These results indicate that each Rand invested in an expanded testing program in South African gold mines will yield up to US$ 1.70 (R23) in economic returns in initial years, declining to roughly US$ 1.11 (R15) by 2030. Benefit-cost ratios for PGM mines went in the opposite direction, starting at roughly 12 (for the baseline where 20 percent of PGM workers come from the gold-mining sector) and moving upwards as employment in PGM mines increases. In comparison, the benefit-cost ratio of investing in the Global Plan to Stop TB (relative to continuing with existing levels of DOTS coverage) was estimated by Laxminarain, Klein et al. in an earlier study to be 14.
Conclusion
The study estimated that a program of testing and treating all current mineworkers will incrementally cost about US$ 24.4 million (R330 million) per year. Interventions considered in the study largely benefit the mining sector but have some impact on labor-sending countries as well. Benefits accrue in the form of reduced mortality and lower treatment and morbidity costs. Benefit-cost ratios of the interventions considered in this study are high, regardless of the type of mining operations. For gold mines, the estimated benefit-cost ratio attributable to the interventions is over 15 and decreases as employment in this sector declines. For platinum group metal mines, the ratio is over 12. Benefit-cost ratios for these interventions in platinum group metals (PGM) mines depend on the extent of movement of gold mineworkers to these mines; when the rate of intake from gold mines is high, there is significant benefit from TB control programs.

Recommendations
Two key recommendations emerged from the economic analysis:

1. Implement a universal program of testing and treating TB cases in the mines.
   Although this comes with significant additional costs, the benefits have been shown to be significantly greater than these costs. The impact of this intervention will mostly be in the mining sector within South Africa, but due to the nature of labor migration, will also have a positive, albeit limited, impact on neighboring countries.

2. Conduct further assessment of how to limit cross-border infections.
   Analysis results indicate that there is significant cross-border TB transmission between South Africa and labor-sending countries. Health systems and their programs usually have a national focus and often do not consider cross-boundary dynamics associated with regional health challenges. In addition to strengthening national TB programs in the four countries, it is necessary to assess the ability of the health systems in the four countries to manage the challenge associated with cross-border TB transmission arising from migrant mineworkers, and to identify strategies for managing any gaps. This may necessitate a regional approach that requires the collaboration of health systems of affected countries.
Although the study focused on testing and treatment, it is worth noting that prevention strategies could have a significant impact on reducing the overall challenge of TB in mines and labor-sending areas. Additional interventions could be employed such as reducing dust exposure, and ensuring adequate ventilation in living and working areas in the mining sector.

References


PART 2: A FRAMEWORK FOR THE HARMONIZED MANAGEMENT OF TUBERCULOSIS IN THE MINING SECTOR
Addressing TB in the mining sector necessitates a far-reaching, multidisciplinary, intersectoral approach that involves public and private sectors as well as civil society. Moreover, the unique context of TB in the mining sector requires both coordinated collaboration and innovation for such an approach to be effective. The Framework for the Harmonized Management of Tuberculosis in the Mining Sector is a comprehensive strategy for tackling the fragmentation that has prevented an effective response to TB in the mining sector since its recognition as an issue of public health concern in 1914.

Following a joint call for action by four National Ministers of Health, and in the context of a much larger process, the Framework was developed collaboratively by a core team comprising National TB program managers, the World Bank, and WHO, with support of the four Ministers of Health, and extensive consultations with national, regional and international role-players, stakeholders and development partners. The development of the Framework for the Harmonized Management of Tuberculosis in the Mining Sector, the first of its kind, reflects a remarkable process of technical cooperation between the National Tuberculosis Programs (NTPs) of Lesotho, Mozambique, South Africa, and Swaziland, and other national, regional, and international partners. Developed through extensive consultation and interagency review, the Harmonized Framework provided a rare opportunity to bring together a variety of stakeholders—Ministers of Health, Labor, and Mineral Resources; senior officials from development partners; chief executives of mining companies; and high-level representation from labor unions, mineworkers and ex-mineworkers’ associations, and key nongovernmental organizations—in order to implement the provisions of the SADC Declaration in priority countries.

The Framework, which is extremely detailed, is designed for TB programs, institutions and authorities involved in planning and delivering mineworker health care services for TB, HIV, silicosis and other occupational respiratory diseases.

Current approaches to managing TB in mines
A wide variation currently exists in the package of workplace health care services provided to employees in the mining sector in southern Africa. This relates to the size of mines (large, medium small scale), the location, and employment policies. While some mines provide health care services for both permanent and contract employees, others provide services to permanent employees only. Further, some small-scale mines do not provide health service at all, leaving their employees to rely on public health services.

A survey of TB and HIV health services conducted in 2010 by South Africa’s National Institute for Occupational Health identified inadequate TB care services in the mines. Of the 63 mines visited, only 40 percent provided TB services on site. Of the 60 percent with no on-site services, 16 percent outsourced services to private health care companies. Overall, 51 percent indicated ‘no service,’ implying total reliance on government health care facilities for TB services.

Specific Challenges to TB Prevention in the Mining Sector

Access to health services
Absence of basic health care facilities and TB-specific care services in mines are major barriers to accessing health care for some mineworkers. There is also a growing pool of undocumented migrant workers who are susceptible to exploitation and who, due to their undocumented status, may struggle to access public health care services. The vast majority of mineworkers in southern Africa are migrants and this could lead to TB treatment disruption, multiple treatment episodes, and loss of follow-up care. Access to TB services in

communities around mines has generally been limited, with few mobile healthcare services provided either by mining companies or by the public sector.

*Labor issues*

Employee conditions in the mining industry are often characterized by occupational exposure to silica dust and silicosis, a confined poorly ventilated working environment, cramped living quarters, and high HIV prevalence. Such conditions substantially increase the risk of TB in the mineworker population and their families. Contract employees, who are often migrants, are exposed to a heightened risk factor compromising their access to health services. Unlike permanent employees, they are generally not entitled to health benefits, which may also make them less likely to seek care and treatment for active TB, for fear of losing wages or losing their jobs.

Ex-mineworkers within South Africa and the labor-sending countries are an especially high-risk group due to the ineffective and slow process of compensation for occupationally-acquired TB. It is common for some ex-mineworkers to die while waiting for the process to be finalized several years after applying for compensation. This creates disincentives for ex-mineworkers to make the effort and investment to file claims.

*Cross-border migration and referral system*

The frequent movement of mineworkers across provincial and national borders extends the high TB disease risk to the communities surrounding the mines and those from which they originate. While undergoing care and treatment, migrant mineworkers can be highly mobile. Some may start treatment on the mines or in the public sector, return home to continue receiving care, and then return to work on the mines when they feel strong enough to do so. Ex-mineworkers frequently return to their home countries after a period of service in the mines. These groups are exposed to challenges including the difficulties of carrying quantities of necessary medication through border control, the lack of access to personal records of the most recent medical examination results in their home countries, difficulties of accessing health facilities, and limited education and specific knowledge concerning management strategies for TB and HIV and AIDS. These challenges further constrain ex-mineworkers from maintaining check-ups with the health system to ensure early detection of any emerging health issues, including TB. Additionally, the pattern of more regular, monthly circular movement that occurs in a large migrant population tends to be associated with the maintenance of relationships with multiple concurrent partners, which intensifies the risk of TB-HIV coinfection.

*Rationale for Engaging the Mining Sector in TB Care Activities*

TB and HIV undermine the healthy and productive workforce that businesses rely on, disrupting workflow, reducing productivity, and increasing accident rates and various direct and indirect costs to employers for health care, recruitment and training. The framework describes the workplace as a win-win setting for TB management and TB/HIV co-management strategies. A workplace program that comprehensively addresses TB and HIV prevention, diagnosis treatment, and care in high burden settings can effectively mitigate the impact of these diseases on the workforce and thus on productivity. National TB programs (NTPs) recognize the significance of workplaces in expanding access to TB prevention, treatment and care, and can provide businesses with strong management and technical skills, access to TB diagnostics and drugs, and broader health infrastructure. In addition, they can coordinate efforts to expand well-functioning TB and TB/HIV programs to increase access for small mining enterprises, the informal sector and the community.

Managing TB at the workplace in conjunction with HIV and other occupational health programs not only makes good business sense, but fulfils legal and moral obligations and responsibilities, testifying to social commitment and respect for the human capital of business, as part of corporate and social responsibility. These will impact and result in maintaining workforce morale by providing the convenience of increased access to TB and HIV prevention treatment and care service and saving related costs.
Every effort should be made to convince companies of the profitability of engaging in TB and HIV care and to gain their commitment to a comprehensive well-functioning workplace program. Management, employees and other key stakeholders should be provided with the necessary information and should be engaged from the start in planning and developing sound, rights-based policies and an effective, adequately-resourced workplace program with clearly-defined objectives, strategies, methods of delivery, monitoring, and specified roles and responsibilities.

**Purpose of the Framework for Harmonized Management of TB in the Mining Sector**

The Framework aims to enhance access to and improve delivery of essential services in mines within countries and across borders for the prevention, diagnosis, treatment and care of TB and related conditions in past and present mineworkers.

Designed as a resource for countries in southern Africa to facilitate increased collaboration that complies with WHO-recommended minimum standards for TB care, the Framework focuses primarily on national TB programs and the institutions and authorities involved in planning and delivering mineworker health care services for TB, HIV, silicosis and other occupational respiratory diseases. It is best used in a **complementary role** to national TB management guidelines and tools.

The Framework tackles policy issues and options that require further harmonization and collaboration within and across national borders. These two focal elements, harmonization and collaboration, are derived directly from the urgent need to develop an effective and efficient four-country cross-border mechanism for cross-border management, referral and monitoring systems. It is a daunting but necessary task which cannot be achieved in isolated or fragmented action—harmonization and collaboration are mandatory for achieving its purpose.

The Framework covers the following areas:

- **Approach to review and supplement national guidance for use in care of mineworkers and in mining communities.**
- **Harmonized protocols for TB diagnosis, treatment, and care among mining populations.**
- **Framework for implementation and coordination of TB care in the mining sector.**
- **Institutional linkages for regional coordination of TB control in the mining sector.**


**Approach to review and supplement national guidance for use in care of mineworkers and in mining communities**

The Framework calls for an initial and follow-up assessment of the nature and characteristics of mining companies and communities to help categorize the mining company profiles in terms of size and capacity to provide TB and HIV care, and to support and inform the design and implementation of relevant interventions. Critical areas to consider include: population of the country-mining community; numbers of mineworkers and ex-mineworkers in the country; the TB/HIV burden; availability of general health and TB services; community health workers, committees at community level, civil society, and NGOs active in the community. Mining companies should be engaged from the start to enlist their support for functional collaboration in assessment and in establishing a sound program to address TB in the mines. The two critical roles of management are to: provide sustainable resources for implementation of measures for TB and HIV prevention, treatment and care, and infection control that will minimize the risk of transmission of infection in the workplace; and to ensure that clear non-discriminatory workplace policies for confidentiality, time allowed for medical treatment, and job modification when necessary, are in place and implemented.

Management should recognize the importance of participatory policy and program development processes that engage employee representatives and other key stakeholders such as workers’ unions, ex-
mineworkers’ associations, and recruitment agencies from the planning stages and throughout the process of developing and implementing the program. This process will ensure trust, transparency, accountability, ownership, commitment and sustainability of the workplace program.

Management should also note that to enable mineworkers, ex-mineworkers, and other relevant stakeholders to participate effectively, it is essential to increase their awareness about TB prevention, diagnosis, management, and the related risk factors such as HIV and silicosis. Additionally, it is necessary to adequately inform prospective, current and ex-mineworkers about their rights and responsibilities regarding TB screening, compensation policies, and treatment adherence.

The design, service package, and implementation strategy for intervention should be developed based on the information generated from the mining community assessments. This service delivery strategy should be assessed regularly and updated in response to findings. The package of intervention designed should be implemented in line with national guidelines of respective countries, consistent with WHO recommendations. Key intervention packages include prevention, diagnosis, treatment, and care of TB, TB/HIV, and MDR-TB within mining communities.

Action plans with clear objectives, strategy, methods of delivery and monitoring, identified partners, specified roles and responsibilities and potential budgeting will ensure effective implementation of workplace programs. Mining companies should be provided with technical support in developing the plan in consultation internally with both senior management and workers’ representatives, and externally with NTPs and partners. Depending on their capacity, and in collaboration with the NTP and other partners, the businesses should identify which tasks they can undertake in the workplace or beyond. This should be clearly outlined in the implementation plan, with assigned responsibilities. Mining companies that have the capacity or have their own dedicated health services should establish their own workplace TB and TB/HIV programs or integrate these activities into existing Occupational Safety and Health or wellness programs.

Formulation of a workplace policy on TB and HIV or integrating one into existing occupational health and safety policies is vital to increasing awareness among workers and enhancing trust, accountability, ownership commitment and sustainability. TB and HIV workplace policies, which should be based on the principles of the International Labour Organization (ILO) Code of Practice and ILO recommendations on HIV and AIDS and the World of Work (2010), provide a framework for direct action in the workplace and demonstrate the commitment of management and workers.

Ideally, the workplace TB policy of a mining company should be integrated in a broader policy—for example, health, wellness or HIV workplace policy—and should include the following principles:

- Recognition of TB and HIV as workplace issues
- Bipartite approach (working with representatives)
- Gender equality
- Protection of rights of workers
- Non-discrimination
- Confidentiality
- Continuation of employment
- Prevention
- Treatment, care, and support

A clear return-to-work policy is needed for the worker with TB to address possible anxieties among other employees. Constantly reminding all staff that TB is a curable disease is necessary to dispel stigma and discrimination. Return to work should therefore be linked to medical certification that the employee is no longer infectious and is not otherwise ill or incapacitated for his or her usual work. If permanently incapacitated, the company’s normal permanent incapacity procedure should be applied.
Enhanced awareness and knowledge have a significant role in TB prevention, early diagnosis, better treatment adherence, and stigma and discrimination reduction. Awareness and education campaigns targeting employees and their families can help to address negative attitudes towards people with TB and HIV and increase awareness among employees about TB and TB/HIV coinfections. A focus on prevention and strengthening of advocacy efforts is necessary.

Development of a sound advocacy and education package that will address the information needs of employees and their families requires the collaborative efforts of the national HIV and TB program. At a minimum, all workers should at least be aware of the symptoms of TB and when, and how, to seek TB testing.

The plan for TB, HIV and MDR-TB services in a country should include:

- An active case-finding program of systematic active TB screening implemented in all mines.
- Ensuring access to good quality diagnostic services, particularly rapid molecular diagnostic test, sputum smear microscopy, culture and DST to ensure early detection of infectious and drug-resistant cases, thereby preventing the further spread of TB.
- Provision of an uninterrupted supply of good quality, free drugs accessed through the national TB program and the state health system.
- Direct observation of standardized short course chemotherapy by a health care worker or treatment supporter to ensure a cure and prevent the emergence of drug resistance.
- Psychosocial support for employees who have TB, such as ensuring free treatment and services, identical salary during treatment or compensation for loss of income, free transport to health facilities, food support or other motivations to continue treatment.

Ensuring continuity of TB treatment is an essential part of case management, considering the migratory nature of mineworkers. Appropriate measures to ensure continuity of treatment should be established for employees who are being treated for TB. Mineworkers on treatment who are not in a position to make use of workplace treatment services should be linked to appropriate health services in their area of residence or anywhere they go. Innovative collaborative mechanisms such as electronic registers for information exchange, should be established within and across the countries to ensure treatment adherence.

Intensified TB case-finding (TB screening), referral of people with TB symptoms, and treatment adherence support are activities that workplaces could contribute to with marginal investment or effort. Medical and paramedical staff, human resource personnel and workers (peer educators/counsellors) with appropriate training, can easily identify TB symptoms, refer people with symptoms for diagnosis, and provide treatment support and counselling. Reaching out beyond the workplace to the families, dependents, contracted companies and surrounding communities that ‘supply’ the workers is a key component of TB and TB/HIV workplace programs and, in some areas, it complements the otherwise inadequate public health service infrastructure.

For all employees, when medical records are kept in the company, provision needs to be made for adequate data-processing measures. These measures should be governed by rules of confidentiality consistent with the ILO Code of Practice on the Protection of Workers’ Personal Data (1997), and other relevant international data protection standards. The transfer of important medical information to the employee at exit (e.g. past TB/HIV treatment experience) should be consistent with these rules and national policies and should be done in a fully confidential manner.

**Harmonized Protocols for TB Diagnosis, Treatment and Care among Mining Populations**

The development of protocols for TB screening, TB and silicosis diagnosis, management of drug resistant TB, and management of HIV/TB coinfection is aimed at standardizing the approach to detection and treatment of the TB-infected patient across southern Africa in order to harmonize management, promote
adherence and improve cross border retention in care. Below is a selection of protocols agreed for use in the region.

Protocol for systematic TB screening
Systematic TB screening refers to a process that is usually provider-initiated, for the systematic identification of people with suspected active TB among at-risk individuals or communities, through rapid symptomatic assessments, laboratory and other tests. The most recent WHO global guidance on systematic TB screening classifies mineworkers and others who are exposed to silica as a TB high-risk group. The guidance recommends systematic screening of these groups to ensure that active TB is detected early and appropriate treatment is initiated promptly. Rapid access to TB/HIV screening, HIV testing and counselling services for mineworkers and/or their dependents either on-site or in collaboration with public and private institutions, and other community structures can greatly facilitate the identification of TB and HIV cases in mining workplaces. This will significantly reduce diagnostic delays and improve treatment outcomes.

Periodic TB screening should be regularly conducted throughout the course of mineworkers’ employment as part of occupational health activities and should continue post-retirement. Screening should be conducted using the nationally adopted algorithms that combine clinical, radiological, and bacteriological methods. A six-monthly radiological screening detects more patients with presumptive TB than a 12-monthly cycle and, when confirmed, patients have less extensive disease and lower mortality. TB screening should be combined with screening for other diseases, health-promotion activities, and with efforts to improve working and living conditions such as reducing silica exposure.

Completed documentation of mineworkers’ medical history, and screening results should be stored in appropriate systems that ensure that they are readily available. Continuity of care after screening should be ensured through referral of patients and transmission of their records to facilities providing either treatment of isoniazid preventive therapy (IPT) if this is not available within the screening structures.

Protocol for TB diagnosis
TB screening should be followed by the rapid establishment of a tentative TB diagnosis using reliable laboratory diagnostic tests. The diagnostic approach should be based on good medical history and laboratory investigation that includes assessment and accurate documentation of the past medical records of the mineworker, ex-mineworker and/or family members and close contacts, records of periodic exams; and the presence of any exposure to or emergence of any occupational lung disease. Given the high HIV prevalence among incident TB cases in the SADC region, a WHO-recommended Rapid Diagnostic Test, for example, GeneXpert should be performed as an initial diagnostic test for all mineworkers, ex-mineworkers, and their close contacts with presumptive TB or drug resistant TB.

Silicosis diagnosis
Countries should have appropriate policies, guidelines and tools for effective management of silicosis, an incurable lung disease caused by inhalation of dust containing free crystalline silica due mainly to excavation activities, and one of the major risk factors in the development of TB in mineworkers. Because the signs and symptoms of silicosis can be confused with those of TB, a complete work history and lung infection tests will help in its diagnosis. Health workers dealing with mineworkers or ex-mineworkers with respiratory symptoms or confirmed TB should endeavor to rule out or confirm the silicosis infection.

Protocols for TB treatment
Treatment of drug sensitive TB in mineworkers and their families should be based on nationally agreed treatment regimens developed in line with WHO recommendations. The recommended anti-TB drugs to be used in the treatment regimens should include Rifampicin, Isoniazid, Pyrazinamid, Ethambuto, and Streptomycin. The recommended regimens for treating drug-susceptible TB are as follows:

- Regimen for new patients: six months of Rifampicin.
- Regimen for previously treated cases: first line drugs.
Treatment of drug sensitive TB in children of mineworkers should be based on nationally agreed treatment regimens developed in line with WHO recommendations. The recommended regimen should include the dosage formulation and fixed combinations appropriate for children:

- Regimen for new patients: the regimen containing six months of Rifampicin.
- Regimen for previously treated cases: first line drugs.

**Protocol for management of drug-resistant TB (DR-TB)**

Intensive MDR-TB case finding should be implemented in patients such as mineworkers who are at high risk of harboring drug-resistant strains. All children who are close contacts of mineworkers or ex-mineworkers who are known MDR-TB patients should be evaluated for MDR-TB. Relevant samples should be collected for rapid TB diagnosis using available methods and culture.

As described above, all mineworkers with a presumptive diagnosis of TB should have their sputum examined with a WHO-recommended rapid molecular diagnostic (WRD) test capable of identifying at least Rifampicin resistance (GeneXpert, Line Probe Assay), and all respiratory specimens should be sent for smear, GeneXpert and culture.

A high index of suspicion is essential for rapidly identifying child cases with presumptive DR-TB, especially where the child is a close contact of mineworkers or ex-mineworkers. If the child is already diagnosed and receiving TB treatment, DR-TB should be suspected if there is poor clinical response—persistent TB symptoms i.e., cough, fever, night sweats, reduced playfulness, poor appetite; poor weight gain or failure to thrive after two or three months of treatment; and/or worsening of the chest X-ray. When a child who has been in contact with a confirmed MDB-TB patient is diagnosed with TB, she/he should be treated as a drug-resistant TB patient.

Rapid HIV testing should be performed according to national protocols if there is any doubt about the patient’s HIV status, or if the patient has not been tested recently. Results of HIV testing should be properly documented in the appropriate column of the TB register.

DR-TB in mineworkers, ex-mineworkers and their family members should be treated in the context of programmatic management of drug-resistant TB as recommended by WHO. Mineworkers and ex-mineworkers and family members diagnosed with MDR-TB should be treated mainly on an ambulatory basis not hospitalization. A decision to initiate a patient on MDR-TB treatment must be informed by the patient’s Drug Susceptibility Testing (DST) results; at a minimum, results of resistance to Rifampicin should be available with exceptions only considered in children. An MDR-TB regimen consists of two phases. The first is the intensive phase during which a combination of injectables, which should be continued at last four (4) months after the patient first becomes and remains culture-negative; and oral drugs. In the second phase, known as the continuation phase, only oral drugs are used. Patients should continue treatment for at least 18 months after culture conversion to result in at least 20 months of total treatment duration.

**Treatment of TB/HIV coinfection**

HIV testing and counselling should be offered to all patients of all ages who present with signs or symptoms suggestive of TB or have confirmed TB. The family-centered approach to HIV testing should be employed such that once a family member is identifies as having HIV, health workers should encourage and actively facilitate HIV testing for other family members. Appropriate post-test counselling should be ensured, with a strong focus on HIV prevention, as this will also help prevent the spread of TB. Results of HIV testing should be properly documented in the appropriate columns of the TB register. The existence of TB/HIV coinfection in mineworkers, ex-mineworkers or their family members have implications for the treatment, care and support for both conditions, including the timing and choice of antiretroviral therapy (ART) drugs. The following should be observed in the treatment of HIV/TB coinfection in mineworkers, ex-mineworkers or their family members:
• Anti-TB treatment should be initiated first, followed by ART as soon as possible within the first eight weeks of treatment.
• ART should be started in all TB patients including those with DR-TB, irrespective of the cluster of differentiation 4 (CD4) count.
• HIV-positive TB patients with profound immunosuppression (such as CD4 counts less than 50 cells/mm3) should receive ART immediately within the first two weeks of initiating TB treatment.
• ART should be started in any child with active TB as soon as possible and within eight weeks following the initiation of anti-TB treatment, irrespective of the CD4 count and clinical stage.
• Efavirenz should be used in patients starting ART while on anti-TB treatment.

HIV/drug-resistant TB coinfection is a significant challenge for the prevention, diagnosis and treatment of DR-TB, especially in the case of MDR-TB and XDR-TB. ART plays a crucial role, as mortality in MDR-TB/HIV patients without the use of ART is extremely high. The concurrent use of ART and DR-TB treatment has been reported to improve outcomes of DR-TB in the HIV-infected. The treatment of DR-TB in HIV positive patients is essentially the same as for patients without HIV coinfection. Therefore, HIV testing and counseling should be offered to all patients of all ages who present with signs or symptoms suggestive of TB or have confirmed TB. Appropriate post-test counseling should be ensured, with a strong focus on HIV prevention, as this will also help prevent the spread of MDR-TB.

Results of HIV testing should be properly documented in the appropriate column of the TB register. All mineworkers or ex-mineworkers diagnosed with HIV and DR-TB requiring second line anti-TB drugs should be started on ART irrespective of CD4 cell-count as early as possible—within the first eight weeks—following initiation of anti-TB treatment. The following should be considered in the management of HIV/DR-TB cases:

• The multiple medicines involved in DR-TB with recognized high toxicity risks, often combined with ART, result in a high incidence of adverse effects.
• Some toxic effects are common to both anti-TB treatment and ART and therefore tend to overlap, which may result in added rates of adverse events.
• Monitoring needs to be more intense for both response to therapy and adverse effects.
• Immune Reconstitution Syndrome (IRS) may complicate therapy.

Implementation and Coordination of TB Care in the Mining Sector
Establishment of a comprehensive and sustainable program to address TB, MDR-TB and TB-HIV in the mining workplace requires collaborative efforts of the government, companies, development partners, civil society, and the workers’ unions. Some countries in the region do not yet have a framework in place. The Framework recommends key steps to be taken by countries to address the issue of TB in the mining sector, as elaborated below.

In addition to the assessment of the scope and nature of mining communities, a stakeholder analysis of all key state and non-state actors in the mining sector should be conducted. This will enable the determination of the various roles, capacities and resources of the stakeholders. This analysis should identify current gaps, inform definition of roles and responsibilities, mechanisms for collaboration, and should inform future planning.

The NTP has the primary function of enlisting partnerships among both private and public sectors to support establishment and implementation of workplace programs in the mines. NTPs should take a stewardship role in creating a conducive and supportive environment for setting up workplace programs or partnering with existing workplace programs. The NTP’s role includes:

• Strategically identifying, linking with and facilitating partnerships and coordinating activities in collaboration with partners such as HIV programs, public and private sector employers, business
coalitions, employer federations, chambers of commerce, workers’ organizations, agencies, NGOs, and private health practitioners.

- Engaging relevant partners early in the planning process to strengthen implementation of workplace programs easier and to enhance sustainability.
- Identifying and documenting all organizations involved in TB and/or TB/HIV activities within the region/district/province/community of the workplace.
- Identifying the core competencies of potential partners and chart clear roles and responsibilities in consultation with partners.
- Setting TB control policy.
- Monitoring and evaluation of TB program activities—case finding and treatment outcomes.
- Reporting program results to the Ministry of Health and to the WHO.
- Training and supervising staff involved in TB control activities.
- Quality control of diagnostic laboratory activities.
- Procurement of drugs, diagnostic agents, and other supplies.
- Information, education, and communication activities.
- Advocacy.

**Monitoring and evaluation**

Countries should develop appropriate monitoring and evaluation indicators and tools to assess progress in the implementation of this Framework. These indicators should include case notifications of treatment outcomes and referral rates for TB in the mining and labor-sending communities. Workplace programs should be consistently and rigorously monitored in line with the national standards. The effectiveness of TB prevention, diagnosis, treatment, and care activities should be measured against clear goals in terms of uptake and coverage indicators, successful treatment outcomes, and reduction in TB and HIV incidence, prevalence and mortality in line with national standards. Where successful, results and methods used to achieve them should be disseminated internally as well as to other businesses, to the public sector, and to nongovernmental agencies working in TB control. The standardized monitoring and evaluation tools in line with the national TB program-reporting system should be adapted and used by mine health services in TB notification and assessment of treatment outcomes.

**Institutional Linkages for Regional Coordination of TB Control in the Mining Sector**

There is an absence of a mechanism for cross-border management, referral, and monitoring systems. The extreme significance of this identified deficiency is its consequent impact in constraining proper assessment and management of TB and related risk factors, especially silicosis and HIV. In the context of the mining sector’s heavy reliance on migrant workers, the compound of the regular within-country and cross border circular movement; and the absence of an efficient cross-border referral system, exerts a profoundly negative impact on the continuum of care for TB and HIV and transmission continuity, with the resulting threat of the escalation of drug resistance in the labor-sending communities of the SADC region. This results in the urgent need for the development of an effective and efficient four-country cross-border mechanism for cross-border management, referral, and monitoring systems.

An effective and sustainable approach to coordinating interventions is needed to ensure quality TB prevention, care, and uninterrupted treatment activities together with patient support across the borders of Lesotho, Mozambique, South Africa, and Swaziland. The implications are that formal agreements need to be established among the governments of Lesotho, Mozambique, South Africa, and Swaziland. They should not only be restricted to the Ministries of Health but should be shared with other relevant government ministries and departments responsible for labor, immigration, and home affairs. These agreements should take the SADC Declaration on TB in the mining sector as a starting point, and the main areas should include:

- A harmonized framework for treatment for referral and transfer of patients.
- Establishment of legal frameworks to protect the rights of mineworkers and ex-mineworkers.
- Adequate recording, monitoring and evaluation of the initiative.
These formal policy agreements will also provide opportunities for technical collaborations across the region.

**Technical collaboration**

To ensure effective implementation and monitoring of this Framework, regional and country-level technical working groups (TWGs) should be established. The composition, secretariat and reporting responsibilities of the country TWGs should be determined based on local context. The WHO and the World Bank will remain principal partners to support both the regional- and country-level TWGs. The functions of the TWGs will focus mainly on promoting the adoption and implementation of the Framework, and facilitating and resolving intra- and inter-country technical issues related to TB management.

If providing services within the workplace is not feasible, the NTP should liaise with the nearest clinic to find alternative solutions to improve access to workers, for example by means of early morning, lunchtime or evening clinics, outreach visits to workplaces by clinic staff, or priority access at certain times.

**Referral and feedback mechanisms**

A robust tracking and referral mechanism within and between countries should be established. An electronic, interlinked online referral system would be ideal in achieving the objectives of this Framework. This would allow direct monitoring of referral processes and would ensure the trigger of a tracking mechanism in case of potential loss to follow-up. It would be appropriate for this electronic referral module to be able to have modules for other diseases to facilitate the delivery of a patient-centered “total package” of service. In the absence of an electronic system, a paper-based referral system should be used. This paper-based system should be supplemented using a telecommunication system such as cell phone technology to optimize efficiency.

**Mapping of current mineworkers and ex-mineworkers**

Countries need to initiate the mapping of current mineworkers and ex-mineworkers to know the number and location of current mineworkers and ex-mineworkers, and the location and quality of health services available to them. This will facilitate active case finding, contact tracing and referral. Ex-mineworkers’ associations can play a critical role in the mapping of ex-mineworkers, as this may reduce stigma associated with TB/HIV among the communities in which ex-mineworkers live.

**Database of mineworkers**

It is recommended that the countries work together with mining companies and other stakeholders to generate a database of mineworkers with a history of TB infection. This database should contain unique information on each mineworker, including basic demographics, relevant medical history, contact details, and addresses. It should be accessible to the health systems of each of the countries to facilitate and case finding and referral processes between and within the countries.

**Cross border tracking and tracing**

Patient tracking and contact tracing across borders often pose significant challenges related to immigration status which may compromise identification of patients and patient tracking. There is a need for coordinated stakeholders’ engagement in establishing an effective cross-border patient tracking and loss to follow up. The technical coordinating body should identify various stakeholders (e.g. multinational NGOs) and harmonize the referral, patient-tracking and contact-tracing mechanisms. Since almost half of the mines rely on government in the “mineworker-receiving country” (South Africa) and most of the mineworkers will be accessing the public facilities in the “mineworker-sending countries,” effective collaboration with government facilities is vital.

An efficient cross-border communication mechanism involving the national TB program for cross-referencing of patients and validation of referrals, tracking and contact-tracing information is crucial. This should be coordinated by the technical coordinating body and should involve all stakeholders.
PART 3: RESEARCH STUDIES FOR UNDERSTANDING TUBERCULOSIS IN THE MINING SECTOR
CHAPTER 1

MAPPING OF MINEWORKERS AND EX-MINEWORKERS IN LESOTHO, SOUTH AFRICA, AND SWAZILAND

South African mines draw their workforce not only from communities within South Africa; a sizeable number of mineworkers come from labor sending areas of other southern African countries. This cross-border migration is a major contributory factor to TB transmission. The service delivery framework is an integral component of a coordinated regional approach to addressing TB in the mining sector. Such a targeted framework requires information on the location of current mineworkers and ex-mineworkers, including information on the geographical location of health facilities. However, there is no single reliable source of readily available, consolidated and adequate information related to current and ex-mineworkers.

The objective of this study was to generate accurate, detailed, and up-to-date information on the demographic characteristics of current and ex-mineworkers from South African mines and the availability of TB screening and treatment facilities in three southern African countries—South Africa, Lesotho, Swaziland—in order to effectively coordinate and implement the regional TB response. The mapping provides valuable information on TB in the mining sector within the region and can be used to improve access to services for mineworkers, ex-mineworkers, mining communities, and labor-sending countries. The information can be further used to; improve targeting of current and ex-mineworkers for TB health services, define baseline data for the development of an evaluation framework for the impact of the regional response to TB as well as enhance country-level and regional decision-making around TB interventions.

This project provided the following deliverables:

- Database of mines, mineworkers and health facilities.
- Consolidated spatial database of Lesotho, South Africa and Swaziland.
- Density and geographical maps of mines, mineworkers, ex-mineworkers and families, and health facilities.

Methodology

The methodology for this project was to obtain and consolidate information, and to map the information into Geographic Information System (GIS) location-based maps. Useful “available” information was identified and requested from data sources. After cleaning up data records and comparing to other summary data sources, the data records for the mineworkers, ex-mineworkers, and their families were used to map density of mineworkers per sub-district; the health facility data was loaded in the spatial database and district maps were then generated.

The mapping exercise performed was based on existing data collected from data sources, with some verification and cross checking among data sources and generally available existing publications. Employment records obtained from Department of Minerals and Resources (DMR) were analyzed and mapped to health districts and sub districts, using the mine location as proxy for the mineworker living location. The records of mineworkers, ex-mineworkers, and beneficiaries obtained from the mining companies were analyzed and used to extrapolate and plot labor-sending areas for the mineworkers, and hence areas where they and their families mostly reside.

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8 This chapter is based on a report: “Mapping of Mineworkers and Ex-Mineworkers in Lesotho, South Africa and Swaziland.”
Results

A total employment register for 2013 was obtained from the South African Department of Mineral Resources (DMR) that, excluding mining agents, lists 498,384 mineworkers employed in South African mines as at end of December 2013. Approximately 30 percent of mineworkers are contract workers. Their distribution varies per region, mine, and commodity. However, they probably have different living and working conditions compared to permanent mineworkers and, therefore, different exposures. The basic map shown in Figure 1.1 forms the backdrop for all the mapping. This illustrates the district breakdown for each province and the region and provincial breakdown for the countries included in the study.

Figure 1.1: Map of South Africa, Lesotho and Swaziland with administrative districts

In Figure 1.2 below, the number of mineworkers per country in southern Africa is displayed over time. South Africa consistently has the highest population of mineworkers of the countries reported. Further, the figure shows that the total number of mineworkers in the region decreased from 1991 to 2000, but is since increasing in a positive trend.

Figure 1.2: Numbers of mineworkers per country in Southern Africa
Figures 1.3 and 1.4 display the total number of mineworkers reported at the provincial and district levels in South Africa. This information is necessary to understand the spatial variation in the number of mineworkers at varying administrative levels in South Africa, as most mineworkers are concentrated in northern provinces and within these provinces, some districts report higher concentrations of mineworkers than others.

**Figure 1.3: Mineworkers per province in South Africa**

![Mineworkers per province in South Africa](image1)

**Figure 1.4: Mineworkers per district in South Africa**

![Mineworkers per district in South Africa](image2)
Figure 1.5 shows the relative percentage of contractors per province versus the total mineworkers in that province. From this figure, it is clear that, compared to other provinces, Mpumalanga, Northern Cape and KwaZulu Natal use a large portion of contractors for their staff requirements—see also Figure 1.6. This trend was confirmed by looking at industries where the trends among the various commodity groups differ largely.

Figure 1.5: Mineworkers mapped per country in South African mines
The health districts used for the mapping have their own population densities. The density by itself drives infrastructure for an area, health facilities and demand for the services. The mineworkers to population density shows the relative load of mineworkers compared to the overall population of that area. It is also interesting to note that in some health districts the mining population is more than 20 percent of the total population of that area. This information is reflected in the map in Figure 1.7.

Figure 1.6: Contract mineworkers as a proportion of mineworkers per province in South Africa

Figure 1.7: Mineworkers in relation to general population per district in South Africa
Ex-mineworker data is not maintained in most cases, especially not beyond termination or separation from the mining company. Hence the data so obtained cannot be considered a database of ex-mineworkers. However, as a proxy for ex-mineworker statistics, this is quite a substantial dataset. For ex-mineworkers, Lonmin did not provide any data. The map in Figure 1.8 is thus focused on Harmony and Sibanye, which are major gold mining operations.
The distribution of families of mineworkers and ex-mineworkers, shown in Figure 1.9, demonstrates the complexity of migrant labor. This has significant impact on the spread of TB and the location of relevant health services for ex-mineworkers and the families of current mineworkers. Note that this information was only available for Sibanye Mining Company, but constitutes a large number of families.

The medical facilities lists were provided by the Departments of Health of Lesotho, Swaziland and South Africa. Not all provided facilities records had geographic coordinates, and subsequently not all could be mapped in Figure 1.10. It was assumed that data supplied was accurate, complete and represented the health facilities that would be considered in further planning the NTP programs. No data on the actual
capacity or capability of the health facilities to do TB screening, examination or treatment was performed or requested from the data sources.

**Figure 1.10: Health facilities**

Generally, this project experienced problems collecting data from various sources, even if it was reasonable to expect those sources to have the data readily available. The data was sometimes not forthcoming, but also of a rather poor quality in terms of accuracy.

The project demonstrated that data from TEBA is misleading since this data only represents a certain section, albeit large, of the total mineworker population. Even if it includes the high-risk gold and PGM mineworkers, it does not cover the contract workers and other potential mineworkers not from labor sending areas. It is recommended that primary data be collected from mineworkers and mines. The best way to collect such data is through ongoing interfaces to existing systems, and to have a process to augment the data with more complete data elements. In the absence of sufficient data elements within existing systems for interface, the only alternative is to have processes that collect such data at key points in an existing system. This is a lengthy approach, but it should be started.
CHAPTER 2

A 10-COUNTRY SURVEY OF HUMAN RIGHTS AND GENDER BARRIERS RELATED TO SERVICES FOR TB, TB/HIV, AND OCCUPATIONAL LUNG DISEASES IN THE MINING SECTOR

The mining industry is among southern Africa’s largest employers, particularly in South Africa. Yet, mining remains a male dominated sector. Recent data suggests that there is improvement of women’s representation in the mining sector. Employment of women in the sector has increased over threefold in South Africa between 2000 and 2015. Eighteen of the 100 women recognized in global mining in 2016 were from two southern African countries namely, South Africa (17) and Botswana (1). These were women who owned mines, were Chief Executive Officers, or served on management boards within the mining sector. The World Bank Gender Strategy 2016-2023 highlights the importance of identifying gaps between women and men in all sectors. Gap identifications enable the design of interventions to address the gaps between women and men.

This study was anchored on a human-rights-based approach (HRBA), which promotes the role of duty bearers, while at the same time empowering rights holders to demand and claim their rights. The study, therefore sought to identify the role of duty bearers and examine how rights holders collectively organize and bring the duty bearers to account. In applying the HRBA, the study identified key concepts inherent within each human right and instrument, and applied the issues contained in each concept to the areas under investigation.

The overall objective of this survey was to identify the human rights and gender barriers to accessing TB/HIV occupational health services and compensation services for those eligible mineworkers, ex-mineworkers, and their families and communities around the mines.

The survey’s specific objectives were:

- To identify gender issues that contribute to the spread of TB and HIV within communities around the mines, and human rights of these communities.
- To identify the human rights and gender barriers to accessing TB and HIV and occupational health services, including those that are common across the 10 countries in the SADC region and those that are specific to each of the 10 countries of interest.
- To determine the human rights and gender barriers to accessing compensation services in the mining sector in countries in southern Africa.
- To determine the health inequities in relation to the 3 diseases (TB, HIV and AIDS, and silicosis) among study participants.
- To identify the key civil society actors who undertake initiatives to address human rights and gender barriers to accessing TB and HIV and occupational health services in the mining sector in 10 countries.

The survey employed a mixed-methodology approach. Quantitative data focused on numerical data in relation to overall response, education attainment, non-satisfaction of services, availability of services, perceptions and attitudes, access to medical services, awareness of HIV, access to compensation services, and civil society actors. Qualitative data focused on generating experiences and descriptions of practices, norms, challenges, and recommendations.

The survey applied equality and non-discrimination principles as pillars underpinning the rights of all mine workers, ex-mineworkers and their families. The two principles were therefore used to examine the

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participation of men and women in decision making, employment, conditions of work, and access to services. Conditions of work referred to opportunities provided by mining companies in relation to issues such as recruitment practices, terms of employment, leave, career advancement, health and safety, housing, and working hours. Participation and representation mainly focused on the position and roles of women in the mining sector. Protection considered social protection, freedom from sexual harassment, violence against women, and respect for key populations. In the context of HIV and TB, the study sought to identify income or cash transfers to vulnerable groups within mineworkers and ex-mineworkers. According to the United Nations Joint Program on HIV and AIDS (UNAIDS 2015), social protection can significantly reduce HIV-related vulnerability. Sexuality examined the rights of lesbian, gay, bisexual, transgender and intersex (LGBTI) people in relation to attitudes towards these groups and their access to services.

As regards the mining sector, the study examined collective action. It specifically assessed the right of mineworkers and ex-mineworkers to organize and belong to a trade union, and sought to identify civil society actors who may promote the rights of mineworkers and ex-mineworkers to be heard within the mines and in policy processes. Empowerment analyzed career advancement for both men and women, examining gender differences in access to information, education, training, promotion, and compensation.

Results

Spread of TB and HIV within mining communities
The extent to which mineworkers are exposed to occupational lung diseases is partly determined by the type of mineral they mine and by the technology used. Underground mining exposes workers to high levels of dust and restricted air circulation compared to open pit mining.

The study found that half of the mineworkers in the Southern Africa region work underground; the other half works in open pit mining. However, South Africa, Swaziland and Zimbabwe have a significantly higher percentage of mineworkers working underground compared to other countries. Both categories of mineworkers are exposed to occupational lung diseases, with the risk higher in those associated with underground mining. Mineworkers who work underground have a higher risk of contracting silicosis compared to those who work above the surfaces. Interviews conducted attributed the higher risk to the length of time when mine workers are exposed to the silica dust. According to the Chamber of Mines South Africa (2017), silicosis, an occupational lung disease, is caused by the inhalation of silica dust, silicon dioxide, in crystalline forms such as quartz, cristobalite or tridymite.

Mine size was determined based on the number of employees. It was found that the size of the mine influences the risk of mineworkers to TB and silicosis. Mine size is a proxy indicator of the capacity of the mine to invest in better technology, provide personal protective equipment (PPE) as well as occupational health services. Thus, mineworkers in small and medium-sized mining companies are likely to have poor working conditions and limited access to occupational health services, compared to large mines.

The study found that the age of a mineworker and duration of employment determined exposure to occupational lung diseases. The period of exposure increased with the increased number of years worked in the mine as well as the age of the mineworkers. The long latency period of silicosis means that such diseases can manifest among ex-mineworkers for the first time long after leaving the mines. The study found that most mineworkers in the region are aged 30 to 39 years. Zimbabwe is the only country in the region where the majority of mineworkers are aged 40 to 49 years. On the other hand, Lesotho and Malawi have the highest proportion of mineworkers aged below 30 years.

The study suggests that 72 percent of the current mineworkers pointed out that wife inheritance is the main reason for the spread of TB and HIV infection, followed by sexual harassment (65%), sexual orientation discrimination (37%) and gender discrimination (36%). Among ex-mineworkers, the reasons provided for the spread of infections were similar to those pointed out by the current mineworkers. Seventy percent reported wife inheritance as the main reason for the spread of TB and HIV infection in the mining
communities, followed by sexual harassment (68%), sexual orientation discrimination (37%) and gender discrimination (34%) respectively. These results may not reflect the complete picture since the study was not able to sufficiently explore these issues by, for instance, studying mine records on reports on sexual harassment of women. Rather, it could show the lack of awareness of human rights and gender issues among current and ex-mineworkers. Other reasons for the spread of TB and HIV infection cited by current mineworkers were multiple concurrent partnerships, lack of knowledge on the mode of transmission (75%), lengthy periods of spouse separation (69%), unemployment (52%), service providers’ attitude (51%) and discrimination among health service providers (33%). Among ex-mineworkers, other reasons cited were multiple concurrent partnerships (86%), lack of knowledge about mode of transmission (71%), lengthy periods of spouse separation (67%) and unemployment (54%). These were viewed similarly by male and female respondents.

Unequal power relations between men and women was perceived to make women more vulnerable to HIV and TB infections. The unequal power relations affected women both in the home setting and in the workplace. Women reported to be unable to negotiate for safer sex options. In focus group discussions, multiple sexual relationships were mentioned for both men and women. Mines are usually closed communities and engaging in multiple, concurrent sexual relations fuels the spread of HIV infection within mining communities.

Mining companies are expected to provide good quality accommodation for their employees, as a way of keeping their employees healthy. The study sought to identify mineworkers’ perceptions related to housing per country. Poor housing was mentioned as a contributory factor to the spread of HIV and lung diseases. It found that Botswana had the highest percentage of mineworkers (97.2%) who perceived poor housing as one of the main causes of TB and HIV infection. Poor housing is an underlying determinant of health, because it is related to poor sanitation, unsafe drinking water and inadequate ventilation, which could fuel the spread of lung infections. In terms of HIV, it could put women and girls at higher risk to rape. Houses without proper security or houses located in higher density areas were perceived to put more women at risk of rape. There were no significant sex differences between women and men in terms of perception about the effect of poor housing conditions.

*Human rights and gender barriers*

This subsection discusses human rights and gender issues by focusing on several aspects concerned with working conditions. These include decision making, employment, education, training and housing. It synthesizes access of services to TB, HIV, and occupational lung diseases. The study recognizes context specific variations within each country and common trends of human rights and gender barriers to TB, HIV, and other occupational lung diseases across the region. Figure 2.1 summarizes key findings.

**Figure 2.1: Gender-related barriers**

- Women constitute 12 percent of workers in the mining sector.
- Women-centered health services and commodities were fewer compared to those for men.
- Negative societal norms were barriers for women to access condoms.
- The study found that there are very few women who are ex-mineworkers (6.6%).
- Women were often more unable to afford transport to health services than men. Moreover, women’s reproductive roles affected their access to HIV and TB services.
There is disproportionate employment of women in the mining industry. Mining is a male-dominated sector—overall, only 12 percent of current mineworkers were female. There is, however, a statistically significant difference of proportion of sex by country among current mineworkers, $p<0.001$. Lesotho had the highest proportion of females in mining (18.3%); Swaziland had the lowest (2.5%). Furthermore, the study identified the role and position of women in mining, as illustrated in Table 2.1 below.

Table 2.1: Role and position of women among current mineworkers by percentage

<table>
<thead>
<tr>
<th>Position of current job in mine (Grouped)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>50.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Artisan</td>
<td>90.6%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Cleaner</td>
<td>43.8%</td>
<td>56.3%</td>
</tr>
<tr>
<td>Clerical</td>
<td>50.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Driver</td>
<td>91.4%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Engineer/Analyst</td>
<td>42.9%</td>
<td>57.1%</td>
</tr>
<tr>
<td>Geologist</td>
<td>60.0%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Health and Safety</td>
<td>60.0%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Human Resource</td>
<td>83.3%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Laboratory Technician</td>
<td>77.8%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Manual Laborers</td>
<td>90.7%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Producer/Production Assistant</td>
<td>91.7%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Security</td>
<td>69.2%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Supervisor/Foreman/Leader</td>
<td>94.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Supplies</td>
<td>100.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Technician/Electrician</td>
<td>94.1%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Other</td>
<td>94.1%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Missing</td>
<td>80.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Total</td>
<td>88.0%</td>
<td>12.0%</td>
</tr>
</tbody>
</table>

Table 2.1 shows that the participation of women within mining was predominantly located in support services jobs such as cleaners, administrators and clerical officers. For technical positions, it was only within engineering that women out-numbered men. However, it was not clear from the research, what women’s roles were in engineering. It should also be noted that a significantly high percentage of human resource positions (83.3%) were occupied by males. It is instructive that for women, some of the most harmful gender inequities are often enacted within human resource practices. This is because human resource practices such as policies and decisions affect the hiring, training, pay and promotion of women. This study revealed the need for a gender-balanced human resources workforce within the mining sector. The study found that there are very few women who are ex-mineworkers (6.6%). The highest proportion of female ex-mineworkers was in Zambia (26.2%), followed by South Africa (9.6%) and Zimbabwe (8.5%).

The study also found that female workers faced more challenges in the mining sector than male workers. For example, more women (38.7%) than men (36.3%) were working through contracts. This could be attributed to women having to juggle home-care work and formal employment. Female workers expressed several problems facing them not just as mineworkers, but more so as women mineworkers. An example was given in Mine B about the experience of a female worker who resumed work from maternity leave. Under normal circumstances, she was supposed to be assigned light duties to regain her body strength.
Unfortunately, the management assigned her to drive a dumper, which involved loading and off-loading materials. Following the exertions, she started bleeding continuously. She went to the hospital, where the doctor treated her and recommended exemption from heavy duties. Management followed the doctor’s instructions, but after three months her contract was terminated on grounds that she had caused a loss to the company. The above findings are congruent with an earlier study (Botha, et.al, 2012) that found that lack of recognition of women’s maternity leave frustrated women in the employment sector; women who got pregnant were either forced to forego part of their maternity leave or had to leave employment.

In terms of citizenship, the research found that of the total number of mineworkers, more non-citizen males were employed (11.3%), compared to females (5.4%). Unlike males, females may be restricted through marital or cultural norms in their ability to move far from their country of origin for job opportunities.

Regarding decision making, the representation of women is marginal, comprising only 5.8 percent within mining companies. These statistics do not include the labor unions. It appears from the findings that the roles of men and women are distributed according to the gender division of labor. Women’s roles are predominantly associated with reproductive roles as compared to men’s productive roles. Women’s reproductive roles are predominantly unrecognized and unrewarded, whereas men were in positions that attracted more income.

The study indicates that more males go for night shifts than females. This could be attributed to the fact that more men are employed in the mines and therefore can go in for night shifts. It could also be due to the burden of care assigned to women, as they are responsible for most of the reproductive roles in the home. It could also be that there is a tendency for mines to allocate women ‘light’ roles in the mines compared to men. ‘Light roles’ also mean less compensation for women.

Accessibility of health services
Neither male nor female mineworkers consider distance a barrier to accessing TB and HIV services. The difference between men and women is not significant, $p=0.202$. This could be attributed to the location of these services within the mining companies and therefore their ease of accessibility for current mineworkers. However, distance to TB facilities as a barrier to accessing TB and HIV services was raised in the focus group discussion where participants were largely comprised of family members and relatives of mineworkers and ex-mineworkers, and further emphasized by community leaders and women around mining communities. It can also be deduced that mineworkers of both genders will be better off financially, compared to those in the communities around their mines, because they can perhaps afford to pay for long-distance transport. The study revealed a degree of desperation when it comes to ex-mineworkers and their ability to access health services, as well as their dire physical and financial state.

The main factors that affected quality of services are shown in Table 2. Although the majority of respondents perceived services as convenient, qualitative study noted that barriers still exist in terms of direct and indirect costs of seeking services. Women appeared to be more adversely affected in terms of cost of services relative to their male counterparts.

Culture and norms prescribe distinct gender specific roles and status in the family. Men are perceived as providers, resulting in stigma and suspicion if a man is known to be infected by TB and HIV and therefore, may not be able to work to support his family. Such perceptions prevent men from seeking services at an early stage of their symptoms.
Mineworkers who accessed TB services indicated that they were not satisfied with the services, mainly because of unavailability of a comprehensive package of services, the service provider’s attitude, long waiting times, and overcrowding. Like the current mineworkers, the ex-mineworkers cited long waiting periods for services and unavailability of a comprehensive package of services as the main reasons they were not satisfied with TB Health services.

Women tend to take on more roles in the home, yet when they are employed, sometimes employers are not mindful of women’s responsibilities and needs. Time is an important factor in trying to balance both, as mine work and domestic responsibilities each have distinct time demands on women workers. The research confirmed that women have to balance domestic responsibilities and working in the mines.

The research team was unable to assess company policies to ascertain their stance on sexual harassment and support mechanisms in place for victims and survivors. It was not possible to access many mines to study their policies and their records. Neither did the research identify specific issues affecting LGBTIs. The results showed that ex-mineworkers across the board expressed no opinion on all the services provided for LGBTI. However, these findings could be associated with the stigma and discrimination towards LGBTI within the mines and the mining communities in general. This should also be understood in the context of criminalization of same-sex relations by some countries within the southern Africa region. In such a context, LGBTIs may fear to disclose their sexual orientation.

Several mineworkers exercised their right to collective action through participation in unions. Women’s participation (59.2%) in unions is not significantly different than that of men (54.6%). However, the position of women could not be ascertained in the unions. Unions generally present a platform for addressing and lobbying for gender interests.

**Health Inequities**

Some respondents reported corruption among health care workers. There was a perception that that the rich were favored over the poor. Most males and females had no opinion about whether health facilities provide adequate privacy for LGBTIs. This could be due to the conservative nature of most communities in the region; there is stigma associated with being LGBTI. Where LGBTIs exist, stigma and discrimination appear to be a major barrier to their rights to access health services.

In all the countries, there were variations regarding how company clinics deal with the mineworkers’ families. Health services available seem to be geared towards the mine’s benefit, while the mineworkers and their families are not priorities. The common trend was for company clinics to provide medical attention specifically to the mineworkers. The families were expected to get treatment from the government hospitals.

**Compensation services**

The ability for mineworkers and ex-mineworkers to access compensation, pension, and provident funds and obtain workers’ compensation for death, injury or illness contracted because of working conditions—particularly tuberculosis and silicosis—has been a notable challenge. Compensation for mineworkers who contracted lung diseases and had to be laid off or who had to take time off to receive treatment, has been minimal to non-existent until recently.

The study found that compensation services were more available in South Africa (55% of respondents) compared to other countries. Access to compensation services in Lesotho, Malawi, Tanzania and Swaziland

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### Table 2.2: Mineworkers’ reasons for non-satisfaction with TB and HIV services

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unavailability of services</td>
<td>68/161 (42%)</td>
<td>9/16 (56%)</td>
<td>77/177 (44%)</td>
</tr>
<tr>
<td>Service provider attitude</td>
<td>68/175 (39%)</td>
<td>2/9 (22%)</td>
<td>70/184 (38%)</td>
</tr>
<tr>
<td>Long waiting time</td>
<td>67/174 (39%)</td>
<td>3/9 (33%)</td>
<td>70/183 (38%)</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>55/170 (32%)</td>
<td>2/9 (22%)</td>
<td>57/179 (32%)</td>
</tr>
</tbody>
</table>
was below 10 percent for both TB and occupational lung diseases. The study found that more males than females, 49.5 percent and 30.9 percent respectively, believe that occupational lung disease compensation services are available. The study found that the perception on availability of TB compensation services differs significantly by sex. More males (50.1%) disagree that compensation services are available, compared to females (37.8%). These differences in perception show the need to consult and inform both women and men on interventions aimed at increasing access to compensation services.

The lack of clear information on existence of compensation legislation and policy by the institutions in charge of workers’ compensation affects access to compensation services. Therefore, it is even more difficult for dependents or families of these mineworkers to access the compensation services in cases where the mineworker dies in service. In key informant interviews, policy makers stated that there were no obligations for mine owners to provide health education or treatment for ex-mineworkers. Interviews with community leaders showed that it was difficult at times to hold the companies responsible as company owners were regularly changing.

Lack of awareness of the existence of compensation services contributed to lack of access for such services among current mineworkers. Thirty-two percent of respondents stated that mineworkers were unaware that they could claim compensation, while 28 percent said family members were unaware that they could claim compensation. This could be a clear demonstration of mining communities being deprived information. Unavailability of services and long waiting periods were cited as major issues for dissatisfaction with compensation services among mineworkers. These point to breaches in the quality of these services as well as, to some extent, breaches in the accountability of the right to health by the duty bearers.

**Civil society mapping**

The mapping exercise sought to establish the nature of interventions as well as challenges they were facing. This information would be utilized to provide feedback and a basis for understanding the various actors involved and the roles, capacities, and resources available to them. The exercise provided an opportunity to indicate existing gaps regarding human rights, gender, compensation, and TB Health services in the mines as provided by civil society organizations, and to identify potential partnerships. The exercise identified the different initiatives and their capacity to deliver on their mandate, including their existing human and financial resources. From this study, it can be inferred that Civil Society Organizations (CSOs) that work directly with mines outside of mineworkers’ unions largely do not exist. Rather, few CSOs have had occasional engagement with mining communities based on available funding from donors. They often engage on a one-off basis rather than on an on-going basis, as they engage in other activities to sustain their organizations.

Figure 2.2 shows that South Africa had the least number of CSOs. The highest number of CSOs mapped were in Zambia (22), closely followed by Tanzania (21), and Botswana (15). It must be noted that despite South Africa’s fewer CSOs, most of them are big and cover not only the country but the SADC region as well.
Conclusion
Research suggests that though women account for over 51 percent of the populations of the SADC region, their numerical advantage has done very little to strengthen their influence in national economies. The mining sector is a major engine for the development of national economies, yet women’s participation and representation remains marginal.

Due to lack of access to information from the management of mining companies, the research could not ascertain if there were any incentives for night shifts. The study found that the participation of civil society organizations that focus on human rights and gender in the mining sector is weak. Where civil society exists, their capacity is constrained due to lack of funding. Very few of the 106 civil society organizations documented focused on women’s human rights.

Recommendations

Women’s participation and representation
There is a need for development partners to support civil society actors to engage with mining companies and the Chamber of Mines to address gender gaps within decision-making in the mining sector. Civil society actors could assist with enhancing awareness of women’s rights and building evidence for why promoting women in leadership is good business for the mining sector.

There is a need for gender training and awareness within the mining sector. This study found a lack of sensitivity to women who were pregnant, to nursing mothers and to women’s domestic roles in general. Civil society actors addressing gender and human rights could be important actors to promote such awareness.

Gender-mainstreaming policies within mining companies should be developed and their implementation monitored by Gender Ministries in various countries. Whereas all countries that had participated in the study have some gender policy framework, Act/and or National Gender Plan of Action, the study did not identify any mining company that had a gender policy or plan of action. It would therefore appear that gender considerations within the mining companies are ad-hoc and difficult-to-measure.

Right to collective action
The World Bank needs to support more detailed gender analysis on the participation of women within the mining sector and trade unions. This study met challenges trying to access some mining companies, and
some labor unions were not supportive of the study. The detailed gender analysis could build on this work by focusing on issues of sexual harassment, affirmative action measures taken to promote women and institutional readiness (within labor unions) to promote the empowerment of women.

The capacity of CSOs working in mining needs to be assessed. The study found that insufficient funding for human rights and gender-focused CSOs constrained their participation to promote human rights and gender issues. Whereas international NGOs and regional CSOs had resources, this was not the case with national and community-based organizations. Moreover, the study found weak institutional systems, for example in finance and monitoring and evaluation, within national and community-based organizations. Development partners should support appropriate capacity building and system strengthening.

**Right to non-discrimination and equality**
Mining companies should promote women-friendly work environments that promote women’s rights to maternity and decent working conditions. Development partners should lobby the management of mining communities to strengthen awareness of human rights and gender issues among mine workers. Mining companies should promote gender awareness to eliminate stereotypes held by men in relation to access to health care. The study found that in all nine countries, early health-seeking behavior for men was frowned upon within mining communities. This prevented some men from seeking preventive care, early diagnosis and early treatment for HIV, TB and occupational lung infections.

**Right to protection and empowerment**
Further research is needed to investigate how mining companies and labor unions promote the protection of women's human rights. The research could be done by development partners. In the nine countries surveyed, wife inheritance was mentioned as a contributing factor to the spread of TB and HIV in current mineworkers and ex-mineworkers. It would therefore appear that the awareness of negative cultural norms and practices will assist in protecting women's human rights.

**Sexuality**
More research should be conducted on LGBTIs in the mining sector. The study found there was lack of awareness or denial of the existence of LGBTIs within the mining community. Development partners could support civil society actors to facilitate community dialogues on LGBTIs in the different countries. This is because community dialogues could break silence on the issues of LGBTIs.

**Promoting a culture of human rights in the mines**
SADC should be lobbied to ensure that member states adhere to human rights, rule of law, peace, protection, stability and improved conditions for mineworkers. Countries that have not ratified relevant ILO instruments and domesticated their laws accordingly should be encouraged to do so and to implement the instruments. Country-specific human rights commissions or similar institutions should play a role in monitoring human rights frameworks. A robust human rights education and awareness program for mineworkers and ex-mineworkers should be implemented.

**References**


CHAPTER 3

ETHNOGRAPHIC RESEARCH DESIGNED TO ENGAGE SOUTHERN AFRICAN MINEWORKERS, EX-MINEWORKERS, MANAGERS, POLICY MAKERS, CLINICIANS, AND COMMUNITIES ON TUBERCULOSIS TO IMPROVE HEALTH CARE DELIVERY

Ethnography is the study of social interactions, behaviors, and perceptions that occur within groups, teams, organizations, and communities. The central aim of ethnography is to provide rich, holistic insights into people’s views and actions, as well as the nature of the location they inhabit, through the collection of detailed observations and interviews. The purpose of this research was to illuminate, through the stories of a range of stakeholders, the socio-cultural factors that inform health care delivery models among mineworkers.

Methodology

The study applied a community-based participatory research (CBPR) approach to guide the facilitation of equitable partnerships across all aspects of research—including analysis—and emphasize the strengths of resources within the community. Clinicians, care providers, policy makers and managers were engaged to understand their experiences in TB service delivery systems, to jointly identify challenges in current practices, and to better understand the many assets they can contribute or deploy. In so doing, the study provided a more inclusive approach, allowed for a collaborative process of eliciting what matters most to those receiving care, and disseminated those preferences to a wider audience.

Ethnography was conducted to deepen an understanding of the unique social and behavioral health determinants associated with living near and working in gold mines in South Africa. The term “applied ethnography” was used to explain how this method would be used to be a practical integration of cultural exploration with service delivery evaluation. The intention was to explore the social and cultural impact of tuberculosis and associated illness seeking behaviors from a rigorous examination of the lived experiences of individuals across a wide range of stakeholder groups.

Results

Qualitative analysis of field notes, interviews, and observations characterized the lived experience of those interviewed under the following themes:

- Ecologies of Fragmentation—disjuncture within and across care settings. The study examined how many mineworkers and ex-mineworkers defined themselves by their ability to be productive, and yet, through this felt need to produce, families have been broken up. Fragmentation also manifests because clinicians were disconnected from patients and confused by current bureaucracies, practices, and systems of care.
- Culture of Invisibility—routine experiences of disempowerment. This theme is characterized by mineworkers and ex-mineworkers feeling forgotten and families being unable to break cycles of poverty, conflated with TB illness. Further, this culture of invisibility evokes clinicians’ feelings of helplessness to meet the needs of their patients; the realities of the citizens and care providers, that policy aims to serve and support, remain immense, obscuring immediate needs or rendering them invisible.
- Suffocated by Production—the irony of mining as both a place of wealth and risk. This theme explored how the economic needs of families drive mineworkers to return again and again to the mines, even as mineworkers and their kin are aware that such work could likely lead to their deaths. This theme also speaks to how the mines affect the spirit, morale, and prospects of communities.

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11 Reeves, S. et al. Qualitative research methodologies; BMJ 2008;337:a1020: https://doi.org/10.1136/bmj.a1020
• Masking of TB—limited system of accountability and uncertain responsibility. This operates among mineworkers and ex-mineworkers as a denial of symptoms, and among families as misinformation and understanding of TB health risks and prevention. Among clinicians, this masking occurs when an emphasis on biomedical models for understanding or treating TB obscures the socioeconomic and cultural determinants of health and where TB fits within a landscape of other illnesses and competing concerns. Among policy makers, this masking can be understood as weak communication and integration channels for TB, which have resulted in implementation challenges for TB treatment and management.

Ecologies of Fragmentation
The concept of fragmentation was one of the most prevalent themes to emerge from the extensive data. Fragmentation was referenced in diverse ways, from describing communication gaps between government organizations to defining how value was applied to the bodies of ex-mineworkers. The researchers adopted the term “ecologies of fragmentation” to frame the nature of health and social systems in South Africa. They anchored this framing on previous work that described social ecologies as multi-dimensional, systems-based, and included both academic and non-academic perspectives. Specifically, they used the term to describe how smaller social, economic, and health systems work simultaneously in ways that speak past each other. Although many of these systems are interdependent, misaligned communication strategies and priorities lead to further fragmentation across systems. These are discussed below in more depth from the perspective of each participating group in our study.

Mineworkers and Ex-mineworkers
The men who had given their lives to the mines routinely described how their bodies are both literally and figuratively broken as well as divided between two worlds—that of the mine and that of the home community. One example is how the compensation system designed to support ex-mineworkers contributes to fragmentation by basing payment on the part of the body that is affected—the lungs, for example. The DoH regulates compensation for ex-mineworkers’ hearts and lungs based on ODMWA while the DoL handles compensation for ex-mineworkers’ hands and heads based on COIDA. The findings showed how such fragmented payment schemes cause deep confusion and frustration for ex-mineworkers and create barriers to receiving available compensation and care.

Family Members
The importance of family lies at the heart of the data. Fathers, mothers, sisters, and brothers would express how important family and being a member of a family was to the foundation of their collective lives. Fragmentation of families occurs because of migration to work in the mines with the demands and stressors of that work. It affects opportunity, relationships, and social cohesion. Families felt disempowered, without opportunity, and left out of the economic and health systems. The nature of mine work and oscillating migration forced families apart, which affected health and happiness of family members. In addition to migration, TB and other illnesses among mineworkers contributed to the fragmentation of the family as a unit.

Clinicians and Care Providers
There is consensus across all stakeholder groups that the health system that provides various services to the mineworkers, ex-mineworkers, and peri-mining communities is highly fragmented. Inadequate, unpredictable resource allocation leads to inefficiencies. Several clinicians and providers noted duplication of services, waste, and pointed to a lack of coordination and standardization of services. Clinicians recognized the challenges of receiving mixed messages and that because of their own uncertainties, their messaging to others was inconsistent. Patient records and health information systems were often discussed as fragmentation in health care delivery experienced by clinicians, nurses, and community health workers. Lack of consistent communication about the current health status of patients and poor follow up are major barriers to achieving individual and population health outcomes.

Fragmentation also emerged in the disconnect between patients and health providers. Patients and physicians had differing perspectives about how health care should be delivered, including whether patients
should be touched or not, what type of contact patients should have with their doctors, and what treatment meant. This was exacerbated by the fact that few health care providers, especially doctors, were from the communities they served or lived in the area. Thus, they often did not understand the structural forces and local contexts that impacted their patients’ lives and could adversely affect treatment outcomes. But the study did find some clinicians who worked hard to connect with their patients and understand the difficulties they faced.

Health Care Policymakers and Managers
Interviews with policymakers explored how new policies were designed to improve identified service gaps, with a focus on ex-mineworkers. In an informal group interview with regional district managers, researchers discovered a lack of awareness about the presence of a one-stop service center, a critical new and innovative resource, at a large regional teaching hospital. While in agreement about the need to improve local occupational health programs and offer service delivery solutions, district TB managers encountered challenges in making necessary improvements a reality due to miscommunication, blame, and diffused accountability across national, provincial, and district levels of the care system. Provincial TB managers stressed that their biggest problem was weak communication between provinces, especially related to patient referrals, follow-ups, and contact tracing. In addition, they worried about the fact that there was “no referral system between mine hospitals and hospitals here.” District TB managers worried about how working in South Africa’s gold mines impacted the health of the people in their district. They did not know the current and former mineworkers and had no systematic way to take occupational histories to learn about TB infection and risk factors.

As the mining houses sometimes send patients home for sick leave, and because mineworkers who come home over the holidays may be sick, the fragmented communication system between the mines and labor-sending regions was perceived as contributing to a higher disease burden. The mining houses found management of the unknown disease burden especially challenging because of the size and landscape of the district—many hard-to-reach, small, rural villages—and the problems they faced with low adherence as people would go back to work when they felt a little better. The companies knew death rates remained high, especially among those who were co-infected with TB and HIV. Conversations with mine health managers also illustrated another side of this fragmented system. They spoke about their struggles to manage TB, because they rarely received information on follow-up for contacts of their mineworkers with TB from NGOs or the DoH.

Culture of Invisibility
Researchers noted that their work and observations in South Africa were analogous to Joao Biehl’s presentation of invisibility characterizing the hidden AIDS epidemic in Brazil. According to Biehl’s ethnography, epidemiology and surveillance data failed to accurately capture how AIDS was devastating the lives of Brazilians. By adopting a similar characterization, the researchers provide context to the many stories heard from black South Africans recounting their own experiences of feeling ignored and powerless. It also acknowledges the unique loss of personal agency when individuals are made to feel invisible and unimportant.

Current and Ex-mineworkers
The invisibility that mineworkers face begins with their impoverished lives before finding work in the mines and extends to their experiences as ex-mineworkers. Mineworkers generally come from regions that are historically disempowered and resource-poor for reasons including apartheid and economic and social isolation. Migrating to the mines is often seen as the only way for people to break the cycle of generational poverty so prevalent in these areas. Many of the men interviewed had internalized their poverty and mine work as their lot in life and believed it was all that they could expect. This could lead them to blame themselves for their lack of understanding or ability to further their lives.

Many ex-mineworkers felt lost in the medical system. They often laughed or expressed disbelief when asked in interviews if clinicians ever took the time to speak with them about their health issues in any depth, answer
their questions, or show how they cared. Confusion and death are the results of patients being passed
between different health systems.

Family Members
Family members felt invisible and disempowered in the employment and health systems for mineworkers
and ex-mineworkers. Family members also told stories of how they felt invisible in their communities when
they tried to care for a husband with TB. In addition, family members talked about their disempowerment
within their poor communities, even as they tried to get ahead and find ways to move out of poverty.

Clinicians and Care Providers
Learning and collaboration across providers and practices could help elevate quality of care at individual
and population levels. The survey found that many health care workers showed outstanding dedication and
service to their patients. However, they were the outliers in a fragmented delivery system with diffused
accountability. They were neither recognized for their efforts nor for their potential to be of even greater
service as positive examples for others within the health system.

In many cases, the people interviewed were more interested in seeing someone who could offer help. Many
ex-mineworkers were most interested in seeing a doctor for serious problems. When asked if they preferred
a nurse or community health care worker to a doctor, the general sentiment was negative. According to
many interviewed, it was believed that nurses provide care at the clinics. Doctors were only selectively
available, and everyone seemed to know that. For these reasons, many men refused to go to a clinic, stating
they lacked trust in community health workers. Observations in clinics and from speaking to patients suggest
that health care workers can contribute to this invisibility, even unwittingly, through the language they use
among themselves to speak about patients or to address patients during consultation visits.

Health Care Policymakers and Managers
In a conversation, a high-level policy maker expressed concern for the divide between what happens in
policy making and what happens for the people because of it. It was believed that official policy documents
that detail programs and interventions are highly regarded in international arenas as comprehensive and
accurate. Yet, middle managers were unclear about the origins of data that informed these reports. Their
resulting skepticism contributed to half-hearted implementation efforts. In interviews with district level health
authorities, academics, and nongovernmental organizations, data quality was expressed as a fundamental
problem with far-reaching implications. It was suggested by clinician managers and administrators that
current data and information systems hide the realities of average South Africans.

Suffocated by Production
To be suffocated means to die from lack of air or an inability to breathe. Researchers chose this word
because it relates directly to stories told by ex-mineworkers and their experiences underground—the heat,
the dust, the moisture, and the brutal working conditions. The report uses the word production to help paint
a picture of the “everyday violence” experienced by current mineworkers and ex-mineworkers and their
families and communities related to their need to produce as a way out. There was a clear connection
between mines and production as well as the understanding or myth that working in the mines was
analogous to salvation. Many people explained how the risks of dying were not enough to keep them from
applying for work underground. The lure of opportunity—producing for the family and supporting children—
was more important than the risk of dying. The dangers of working and living around mines reflect the power
of the economic system to penetrate every aspect of a mineworker’s life.

Current and Ex-mineworkers
In many cases, mineworkers are viewed by their family members and employers as producers—making a
profit to support family being understood as the priority. Mineworkers are treated like commodities when
they produce, and costs when they cannot. The study heard stories of men working in poor health, their
lungs severely damaged by TB or silicosis, to earn more money to send home. The forces that drive men
to work in these difficult conditions vary; most boil down to “hunger.” Instead of function or quality of life,
mineworkers fear how sickness will impact their ability to provide for their families. Many interviewees admired this resilience and strength of character.

**Family Members**

Family members stated that they were driven to create a better future for their children; the success of a female child could earn her graduation photo a place of pride in the combined kitchen and living room of a two-room home in the rural Eastern Cape. Limited finances, however, make it much more likely that a mother’s children will look for work in the mines rather than pursue other careers as she hopes.

**Clinicians and Care Providers**

Researchers repeatedly heard about how doctors and nurses “push the queue” or “push the pill,” referring to their rush to see as many patients as possible within a short period. This focus on total patient volume rather than quality of the clinical interaction disadvantages the patient and, based on interviews, creates mistrust of the health system. In a district meeting, doctors expressed how pressure on the primary health care system, coupled with provider frustration and limited recognition of effort, leads to burnout. In a system already burdened, depressed physicians will negatively impact both patients and providers.

As learned in a meeting with provincial TB officials, the referral process itself also encourages health care providers to focus more on producing health care data demanded by the system than on the actual outcomes experienced by patients. When a health care facility refers a patient, whether within districts, across districts, or across provinces, the patient’s TB outcomes—sputum negative, died, defaulted, etc.—belong to the referring facility. For these facilities, a good outcome means that the patient is not lost to follow-up when transferred or moved, but this does not necessarily address questions of whether the patient is taking treatment or understands the treatment’s purpose and use.

**Health Care Policymakers and Managers**

Through conversations and observations, it became clear that there is no shortage of data about TB, HIV, and other illnesses in South Africa. What was unclear, however, was the origin of the data, what was motivating its collection, and whether the data truly reflected the realities on the ground. Many district and provincial TB managers said that they were pressured to gather more data, particularly to help measure progress towards different national and international targets such as 90-90-90. While targets are useful for achieving urgent health goals, a narrow focus on treatment targets and data collected can have a negative impact on actual outcomes and patient experiences.

Several district health officials lamented that the pressure to achieve better HIV results meant that there was often less funding for TB, and a more limited focus on individual diseases rather than the comprehensive health needs of patients and the realities that TB and HIV are closely tied to one another. The study’s ethnography highlighted ways in which the demand by health systems for data did not incorporate the lived experiences of the mineworkers or effect better outcomes, contributing instead to the general goal of data production and leaving out the voices of the mineworkers.

**Masking of TB**

Across stakeholder groups, TB was perceived as ubiquitous yet hidden from public consciousness. Despite its prevalence and the public health risks associated with it, people generally were unlikely to know much about its clinical features, how it is spread, or how to treat it. The researchers chose to describe a large segment of their data as the masking of TB to refer to the widespread confusion and lack of knowledge about characteristics of TB. Many South African organizations support health information and promotion activities in the mines and clinics, so the prevalence of confusion and a lack of knowledge among people at risk of TB infection is especially surprising.

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**Current and Ex-mineworkers**

The mineworkers and ex-mineworkers interviewed often spoke of TB as a strange illness that was somehow connected to the dust underground and potentially to trash in the community or dust from the mine dumps. This lack of knowledge and understanding about TB leads to stigma and makes people wary of disclosing the disease to family members or seeking care at a local clinic. Many of the ex-mineworkers interviewed in Khutsong township had negative feelings about their interactions with the health care system and clinician and care providers. Negative experiences with health facilities make people even less willing to go to doctors because they may fear that the hospitals are only places where they go to die. Therefore, many of the men would wait, from fear, misunderstanding, and lack of support, until they were very sick before they would go see a clinician. Some were diagnosed after they had repeated incidences of flu or weakness, while others had to be dragged to a clinic by their wives or because their illnesses had progressed so far that they collapsed.

The lack of understanding is compounded by how TB is talked about in the mining houses. Topics in occupational health and disease are not discussed in a clear and comprehensive way, even with mineworkers who are sick. Many of the ex-mineworkers stated that they never received education or awareness about TB during their time in the mines, or that it only occurred during the induction trainings with few opportunities to clarify the nature of a TB infection. Instead, TB was often understood as directly and only related to the dust. Few of the ex-mineworkers interviewed received accurate, relevant information about their illness when they sought treatment at the mining house’s clinics.

**Family Members**

Family members interviewed, all of whom had experienced TB in their families, also had limited knowledge and inaccurate beliefs about TB. Researchers heard that health education for families was even more limited than health education for mineworkers. Stigma and misunderstandings were exacerbated by the fact that, even though wives served as caregivers, neither the mining houses nor the local health facilities gave family members TB information. Further, they did not provide follow-ups to monitor whether informal caregiving that occurred within families was safe and effective. Family and community caregiving is a valuable service to the public health system and the mines where the diseases were contracted, but quality and effective outcomes will not be achieved without adequate health information, integration, and local support systems.

**Clinicians and Care Providers**

Clinicians and other health care workers contribute to the masking of TB and the disease’s negative impacts when they blame patients for difficulties in treatment adherence. Blaming patients fails to account for social, cultural, economic, historical, community, and political factors that influence people’s health, behaviors, needs for care, and ability to get the support they need to adhere to treatment.

**Health Care Policymakers and Managers**

On many occasions, the researchers experienced the deliberate evasion of uncomfortable stories by administrators and high-level managers. Individual circumstances varied, but generally administrators admitted that they preferred having others to collect this kind of data. In an informal interview, a high-level policy administrator said that interested parties discussed issues and developed solutions, but accountability was diffused and implementation challenges remained unsolved. Some policy makers suggested that the survey should ask “why had the conversation around institutional failure to solve TB gone underground?” This could help to reveal the origins of the misunderstandings and misinformation that masked TB and contributed to poor outcomes.

**Conclusions**

The findings provide convincing evidence that previously held suppositions about the sense of disempowerment and hopelessness or the role of stigma, for example, were true and pernicious. They confirm and add to current social science literature detailing how TB continues to disproportionately affect the underserved in peri-mining and labor-sending communities. The ethnography brings to the foreground many of the socio-cultural dynamics and perceptions of TB care that substantively impact mining communities and TB control. Previous assumptions regarding access to care, fragmentation, and under-
resourced communities were confirmed. However, nuances of the findings elucidate just how impactful TB in the mines has been and remains in the lives of individuals, families, and their communities. The four main thematic findings reflect participant language, feedback, and reactions.

The study found that the health system is a collection of fragmented ecologies and interdependent groups working in parallel. Further, the research team witnessed a system where individual perceptions of isolation, fear, and abandonment hang over people like a shroud, keeping their stories hidden from those with the power to effect change. In many ways, the ubiquity of the mines, their massive presence across all aspects of life in South Africa, creates difficult-to-escape pressures on communities, both in death and life - giving many few options for health and livelihood. Ultimately, the effects of TB and the risks for mine workers and their families are often not shared or well understood. Efforts to mitigate TB, therefore, often receive attention at the policy level, but rarely extend to gain needed community-based support.

**Recommendations**
Based on the findings, the study made the following recommendations:

- Co-develop new delivery models through stakeholder engagement, learning what matters most to communities, and integrating preferences into care delivery processes.
- Invest in current health care delivery systems to deliver integrated care in communities.
- Measure and support provider and patient engagement to improve prevention and treatment adherence.
- Identify and support low-cost social interventions for preventing and managing illness.
- Empower and train clinicians and providers to deliver care that responds to patient needs and wants to reduce care fragmentation and lack of agency.
- Engage with mineworkers, health care providers, and communities to confer agency and combat stigma.
- Empower ex-mineworkers as community health workers through Ward-Based Outreach Teams (WBOTs).
- Engage with current and ex-mineworkers using patient-to-patient TB support groups to confer agency to others to ensure visibility in communities.
- Co-develop incentives for clinicians, managers, and policy makers to learn about context and the realities of illness to integrate this understanding into TB policies and practice.
- Apply delivery science to support implementation

**References**


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PART 4: STRATEGIES AND INTERVENTIONS
CHAPTER 1

OPERATION MOLESWASA 1 AND 2: IMPROVING CARE FOR MINEWORKERS ON TUBERCULOSIS TREATMENT LIVING ACROSS BORDER\(^\text{13}\)

South Africa’s mining industry attracts mineworkers from across the Southern African Development Community (SADC) as well as from all provinces throughout the country. More than 100,000 workers in the mining industry come from Lesotho, Swaziland, Mozambique, or Botswana, and approximately 80 percent are concentrated in the gold mining industry. Despite the longstanding history of cross-border migration for the purposes of labor-sending, few regional policies and systems have been implemented to limit the spread of communicable diseases such as TB and HIV or to provide continuity of care and support for mineworkers, ex-mineworkers, and their families upon return home. The financial cost and health system burden to labor-sending countries is substantial. Migrant laborers can often face treatment interruptions, inadequate referral systems, and inadequately resourced care facilities on returning home, which can lead to treatment failure, TB relapse, and poorer health outcomes.

During their time in the mines, mineworkers on treatment are regularly observed by occupational health staff prior to commencing the day’s shift and face severe penalties if they miss any of their doses. For multiple widespread complicated reasons, such as non-disclosure of TB and HIV status to families, mineworkers on TB treatment often interrupt their treatment when they are away from work. This happens especially during the longer holiday breaks such as the Easter holidays in April, and the annual two-week shutdown over the Christmas-New Year period.

The Framework for the Harmonization of Tuberculosis in the Mining Sector identified the various patterns of cross-border movement as the most significant challenge in planning effective health service provision and ensuring treatment adherence. This challenge was attributed to the absence of a mechanism for cross-border management, referral, and monitoring systems. The extreme significance of this identified deficiency is its consequent impact in constraining proper assessment and management of TB and related risk factors, especially silicosis and HIV.

In the context of the mining sector’s heavy reliance on migrant workers, the compound effect of this holiday-focused treatment interruption, the regular within-country and cross-border circular movement, and the absence of an efficient cross-border referral system, exerts a profoundly negative impact on TB and HIV transmission continuity, with the concomitant threat of the escalation of drug resistance in the labor-sending countries of the SADC region. In 2014, Operation MoLeSwaSa was conceived as an approach to promote and support the continuum of care for mineworkers on TB and HIV treatment during the Christmas season. Its name, MoLeSwaSa was coined from the names of the four participating SADC countries: Mo(zambique)-Le(sotho)-Swa(ziland)-S(outh)A(frica). In 2016, a further study was undertaken, MoLeSwaSA 2, which aimed to build on the findings of the first study and was conducted during the Easter holiday.

**MoLeSwaSA 1**
The specific objectives of the study were:
1. To provide support to mineworkers on TB treatment while on Christmas holiday through:
   - Provision of education and information materials on TB adherence and HIV prevention.
   - Strengthening linkages to care through existing country health systems.

\(^{13}\)This chapter is based on two reports: (i) “Operation MoLeSwaSA: Improving the Continuum of Care for Miners on TB and HIV treatment during 2014 year-end holidays,” Aquity Innovations, September 2015; and (ii) “MoLeSwaSA 2: Assessing the Effectiveness of an intervention to Improve Adherence to TB Treatment (and Select Predictors of Adherence) among Mineworkers in Southern Africa,” Enhancing Care Foundation (ECF); September 2016.
• Use of SMS campaign to promote patient support and continuum of care for mineworkers on TB treatment.

2. To ascertain potential barriers to treatment adherence during the Christmas holidays among mineworkers:

• Undertake a post assessment to ascertain the barriers to treatment adherence among mineworkers during the Christmas holidays.
• Solicit TB clinical outcomes of the mineworkers who participated in the project.

The target population for the project was some 400 mineworkers with TB employed on South African gold mines (Sibanye and Harmony) and residing in the four countries of Mozambique, Lesotho, Swaziland, and South Africa.

Results
Sixty-four forms were obtained from the two mines in the ratio 23:41, for Harmony and Sibanye respectively. In both mines, most of the mineworkers were over 40 years of age. None of the mineworkers were female, although the mapping study suggested that females account for about 10 percent of the mining employees in South Africa. There were very few mineworkers between the ages of 18 and 29 years.

The following were provided to mineworkers who were returning home for the December holiday:

Survival Kits: The kits were intended to assist the mineworkers with useful resources to ensure continued care and adherence to medication while at home on holiday. All the mineworkers responded positively about the usefulness of the survival kit and reported that they had taken their medication without fail.

Dual sim card cell phones: The mineworkers found it easy to operate the cell phones, and message reminders were reported to have been useful.

SMS campaign: A total of 540 responses were received from mineworkers during the 10-day period. There were instances of mineworkers responding to each of the three reminders sent—the possibility of receiving more airtime might explain this positive response. Only one response per miner per day was counted. Responses peaked at 20 percent during the first four days of the campaign, and then slowed to a median rate of 15 percent in the remaining six days of the campaign. Overall, a median response rate of 15.8 percent was recorded for the 10-day campaign. Responses dropped to their lowest on 31 December. Whether this was due to the day being New Year’s Eve can only be confirmed by a repeated pattern in future.

Nurses’ call: The nurses’ call strategy seemed to have worked, as all the 21 mineworkers from Sibanye were followed up over the 10-day period. Every mineworker called confirmed that they had taken their medication and would continue to take it daily. Sixteen (16) mineworkers received both the nurses’ calls and SMSs to remind them to take their medication; 10 (63 percent) responded. In the 10-day period of the campaign, the two Harmony nurses each made a single set of phone calls on December 26, 27 and 29 only. For Sibanye, more than 76 percent of the mineworkers responded to the nurses’ calls. In every instance, the nurse was able to confirm that the client had taken his medication or was about to. A sample of the report messages filed by the nurses via SMS confirms this. Cross-referencing the clients’ responses to the nurses’ calls with their SMS responses, found that nearly 48 percent of the Sibanye cohort (10 of the 21 in the cohort) had responded to the SMS campaign as well.

The post-intervention assessment was conducted on a sample of the participating mineworkers. All the mineworkers (n=24) who were contacted were very receptive of the intervention, and willing to share their experiences of how the project benefited them and their families. They all expressed satisfaction with having been part of the project and knew where to get medical assistance when they needed it. They were especially grateful for the cell phones and the survival kits, as these items benefited entire households. The
regular contact by the mining company through the nurses’ calls was particularly commended as compassionate. The mineworkers, however, expressed dissatisfaction that the TB treatment was limited to themselves, with their spouses and families excluded.

While the intervention was well-received, the clinical outcomes could only be collected from 24 of the returning mineworkers, as recorded in Table 1.1.

Table 1.1: Clinical TB outcomes

<table>
<thead>
<tr>
<th>Type of TB</th>
<th>Number on Intensive Phase</th>
<th>Number on Continuation Phase</th>
<th>Completed Treatment</th>
<th>Still on Treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTB</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>EPTB</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>MDR</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>5</td>
<td>19</td>
<td>15</td>
<td>24</td>
</tr>
</tbody>
</table>

A little over 62 percent (15/24) of the mineworkers successfully completed their treatment by the end of the study. Sixty percent of those who completed treatment (n = 15) had TB while 13 percent were found to have MDR-TB, eight percent had Extrapulmonary-TB (EPTB), and more than 37 percent (9) were still on treatment during the project timeline.

Observations from Project MoLeSwaSA 1 included:

- The amount of work required to coordinate multiple stakeholders should not be underestimated.
- Extensive consultation is required when bringing various groups such as mines, unions, clinicians, and communities to the table.
- Incentives appear to work, as evidenced by the positive participation of nurses throughout the campaign period; providing mineworkers with airtime was another instance. However, the details of the mineworkers’ mobile phone service providers were not captured during enrolment, resulting in delays in rewarding those who did respond to the message reminders.
- Airtime for an immediate response apart, consideration should also be given to rewarding mineworkers at the conclusion of their treatment when they have been declared as “cured from TB.”
- Interventions such as nurses’ calls, SMS reminders, and one-on-one training produced desired outcomes. With a little more time invested and minor refinements such as translation into local languages, an improvement is possible.
- Current mine health infrastructure is sufficient to provide remote treatment adherence support with the help of nurses and cell phones.

Based on the experiences of this project, the Enhancing Care Foundation was tasked with developing a research study to design, implement, and evaluate a strategy for promoting adherence and retention among TB-infected mineworkers returning home during the 2016 Easter holiday – MoLeSwaSA 2.

MoLeSwaSA 2
The MoLeSwaSa 1 project was undertaken in 2015 to address challenges in adherence to TB treatment of mineworkers who return home to neighboring countries from South African mines. As a follow-up, MoLeSwaSa 2 sought to develop and evaluate an evidence-based intervention to promote adherence to TB treatment and retention in care for mineworkers with TB, particularly when they return to labor-sending areas on leave during the Easter holiday.

Phase 1 of this study identified key individual informational, motivational and behavioral (IMB) deficits as well as structural barriers to adherence to TB treatment and care for mineworkers with TB in two gold mines in South Africa. The activities to achieve this included a desktop review, elicitation research with relevant stakeholders, and a quantitative evaluation of the experiences of mineworkers with TB who had participated
in previous interventions or had recently returned from a SADC country after holiday leave 2015. Methodology included online and paper-based surveys, structured interviews, and focus group discussions.

The following deliverables were to be achieved in Phase 1:

- Scoping study – desktop review
- Stakeholder forum set up and facilitation
- Post-hoc Operation MoLeSwaSa Analysis
- Elicitation Research with mineworkers with TB, post-holiday leave – 2015

Based on the findings from Phase 1, the package of systems interventions included:

(i) A backpack that contained
(ii) Survival kit (for trip home) with water, water bottle, health bar, torch
(iii) T-shirt (branded)
(iv) Locally available Information, Education, and Communication (IEC) material (DOH pamphlets, etc.)
(v) Health Passport with IEC Material relevant to intervention content from workshop, including information for families (available in local languages – Zulu, Sotho, English)
(vi) Location of nearest clinic through smartphone or SMS (in Passport)
(vii) Referral letters: to local TB program, TEBA
(viii) Letter to border control
(ix) Weekly SMS with reminder messages regarding TB treatment adherence (also available in predominant local languages)

It should be noted that all participants received the backpack, with the intervention participants receiving additional components 2-6, and participating in a workshop.

The primary outcomes in this study were time to non-adherence to TB treatment and improved overall adherence to TB treatment among study participants. For the purpose of this study, adherence was measured using the Medication Event Monitoring System (MEMS), which has been used and validated in similar studies. MEMS medication bottles contain a microelectronic chip that registers the date, time, and frequency of every bottle opening. Assuming bottle openings represent medication intake, MEMS provided a detailed profile of the patient’s adherence behavior. This method is currently regarded as the gold standard to measure adherence to medication.

As part of secondary outcomes in this study, improved overall adherence as a primary outcome was further broken down into three main secondary outcomes: improved adherence during the week, improved adherence during the weekend, and improved adherence during the holiday break. “Self-report” adherence to TB medication, and self-report retention in care were also considered as secondary outcomes. Other secondary outcomes included improved psychosocial support; improved TB stigma, and improved TB knowledge scores.

Phase 3 of the project consisted of a Cost-Consequence analysis. This exercise sought to generate information that can assist future implementers of the interventions similar to the one implemented in Phase 2, to understand the cost of the intervention and the consequences thereof in terms of outcomes.

An economic cost-analysis was conducted from the health care perspective. This involved the comparison of two alternatives in terms of their costs and consequences, measured as retention to care and adherence to the treatment. In this case, the results of the suggested randomized controlled trial for the control and intervention groups were analyzed. Economic cost data was collected retrospectively, at the Enhancing Care Foundation (ECF) offices using electronic records and billings from the accounts department. The data manager provided the data that included salaries and resources used.
Results

Phase 1
Desk review
According to the World Health Organization (2015), South Africa has the one of the highest rates of new tuberculosis cases in the world, with roughly one in 100 people experiencing active TB annually. South Africa also has the highest adult prevalence of HIV/AIDS (UNAIDS 2015) and the largest global burden of disease with over 6 million people living with HIV. In 2012, 61 percent of active TB cases were coinfected with HIV and 6.7 percent were re-treatment cases—those with drug resistant bacteria (WHO 2015). TB is considered a serious public health threat as well as a grave concern for people living with HIV (PLWH).

This threat is amplified in mineworkers, who have been historically susceptible to TB infection due to the nature of their physical work environment, their close living quarters while on duty, and the social context within which they live (Rees et al, 2010; Dharmadhikari et al., 2013). Gold mineworkers in South Africa have one of the highest TB incidence rates in the world, currently estimated at 3,000 per 100,000 population (Churchyard et al, 2014). HIV prevalence in the miner community is also high, with migrant laborers being especially vulnerable.

Estimates suggest that mineworkers have poorer health outcomes related to these conditions compared to the general population. HIV infection and advanced immune suppression contribute significantly to TB re-infection among mineworkers (Charalambous et al, 2008). Mortality rates among mineworkers with TB are elevated in the presence of HIV and silicosis (Churchyard et al., 2000). These mortality rates remain high among mineworkers, despite the rollout of anti-retroviral therapy and wellness programs (Lim et al., 2012). Low uptake of such programs seems to have hindered their success, with 50 percent of those who died from HIV and TB having never been enrolled (Lim et al., 2012).

As stated already, the mining sector offers a unique and complex setting to promote TB treatment adherence and support. In a review, Munro et al. (2007) synthesized a number of qualitative studies to reveal overarching themes that influence adherence to TB treatment and care. The review proposed the model below which suggests four categories of factors that influence TB care and treatment adherence:

As Figure 1.1 below shows, structural factors such as poverty, access to care, and discrimination influenced patient’s agency to adhere to their medications. Despite a willingness to adhere and an understanding of its importance, these factors limited how patients access medications on a routine basis. For pill collection, for example, when TB care had consequences for work or family duties, financial needs would take precedence.
The social context—family and community—where treatment is accessed and taken is critically important. A supportive social context can motivate a person to adhere to treatment and remain in care. Such findings are corroborated by quantitative research. In a population-based study in South Africa where 1,020 households were surveyed, Cramm et al. (2010) found that 95 percent of participants believed that people tend to hide their TB status for fear of what others might say, and half-believed that if you had TB, people would not respect you. Such stigmatizing social contexts may hinder treatment adherence efforts among those with TB, particularly when they are expected to be observed taking treatment.

Health service factors also matter. Healthcare settings where health care providers are unsupportive and limit patients’ autonomy in accessing care and treatment are a barrier to TB treatment adherence. Other negative experiences with the health care system include long queues, limited transport options, and unsupportive staff. Conversely, positive experiences with the health care system and providers contributed to adherence benefits (see also Naidoo et al., 2009). Personal agency was considered an important aspect of adherence; self-administering patients and those who developed their own reminders adhered readily.

Finally, personal factors such as a person’s knowledge, attitudes, beliefs, and experiences of treatment could influence treatment adherence. Side effects and beliefs in traditional cures could limit adherence. Alcohol and tobacco use have also been linked to non-adherence to TB medications (Naidoo et al, 2013). These findings were corroborated in a recent review of 30 qualitative studies with migrant workers by Tomas et al. (2013). Considerable confusion around TB disease and its origins, particularly latent TB, is common. Delays in seeking care for TB stemmed from not wanting to miss work, stigma, fear of deportation, concerns about contact tracing and possible HIV (Tomas et al., 2013; Cramm et al., 2010). TB itself also seems to have specific consequences for work viability among mineworkers which also may hinder engagement in TB care and health screenings.

Review of interventions for TB adherence with specific relevance to mineworkers in South Africa
There have been numerous international studies that have focused on interventions for TB adherence, and Cochrane has conducted a series of reviews to offer a concise base of evidence for effective TB treatment
adherence and support. For purposes of this analysis, these reviews are summarized here based on the following interventions:

- **Directly observed therapy (DOT):** an appointed agent—health worker, community volunteer, family member—directly monitors people swallowing their anti-TB drugs
- **Education and counselling for promoting adherence to the treatment of active tuberculosis:** provision of information or one-to-one or group counselling about tuberculosis and the need to attend treatment
- **Material incentives and enablers in the management of tuberculosis:** money or cash in kind to reimburse expenses of attending services, or to promote attendance
- **Reminder systems and late patient tracers in the diagnosis and management of tuberculosis:** routinely reminding patients to keep an appointment

Studies which assess relative impact for different intervention components and modalities in terms of TB treatment adherence are scarce, except for DOT vs. self-administered treatment programs as described below.

**Directly Observed Therapy, Short Course (DOTS)** seeks to improve the adherence of people to tuberculosis treatment through health workers, family members or community members directly observing them taking their anti-tuberculous drugs. DOTS remains at the heart of the Stop TB Strategy recommended by the World Health Organization (WHO, 2010) and forms the foundation for standard-of-care TB treatment delivered in the mining sector. In Karumi and Gardner’s Cochrane Review (2015), the authors summarize trials comparing DOTS through different providers and settings with self-administration of TB treatment. Treatment outcomes (cure/treatment completion) were similar among participants in the DOTS and self-administration of treatment arms in comparison trials. Effect sizes between home-based and clinic-based DOTS were also similar. Notably, daily DOTS was only shown to improve TB cure in comparison to self-administered treatment when patients in the self-administered group visited the clinic monthly, but this effect diminishes when patients return to the clinic more often—one a weekly to bi-weekly basis.

**Education and counselling interventions** seek to ensure that people have sufficient knowledge and understanding to make informed choices about their own health. In this Cochrane review (M’Imunya et al, 2012), both patient education and counselling interventions, one-on-one or group were considered, and the impact of these interventions on adherence to treatment for active and latent tuberculosis was evaluated. While educational or counselling interventions may improve completion of treatment for latent tuberculosis, more definitive research for active TB, particularly from low-middle income countries is needed. Data were insufficient, as many studies were excluded from this review due to the inclusion of other interventions, which made it impossible to tease out the main effect or relative impact of the education/counselling component.

**Incentives and enablers** are material interventions which seek to improve adherence to care or treatment, through either direct provision of cash or vouchers, or indirectly via the provision of a service (e.g., transport). Material incentives have been found to improve adherence and outcomes for many health problems, and also increase the utilization of health services for screening programs. In this Cochrane review, Lutge et al. (2015) evaluated randomized controlled trials of material incentives in patients being investigated for TB, or on treatment for latent or active disease. When given as cash, incentives likely improve clinic re-attendance for TB prophylaxis. They may also be more effective than non-cash incentives, and higher amounts of cash may be more effective than lower. The authors also found that once-off incentives in specific populations did improve clinic attendance, which may assist with attendance to important visits, like sputum conversion. Accrued incentives showed mixed results.

**Reminder systems** and late patient tracers are strategies used to improve patients’ adherence to tuberculosis screening, diagnosis, and treatment—for example, phone calls, home visits, and letters. In this Cochrane review, Liu et al. (2014) assessed the effects of reminder systems and late patient tracers on
completion of diagnostics, initiation and completion of treatment for TB, and cure in people with active tuberculosis. Results showed that reminders by home visit and letter were beneficial and clinically significant in increasing adherence to TB treatment and attendance to appointments, compared with none. Reminders via text messaging on a weekly basis have been found to promote ART adherence in less resourced settings, and may be useful for this purpose (see WelTel trial results, Lester et al, 2010 and Cochrane Review by Horvath et al., 2012).

**Stakeholder engagement**
A total of 50 stakeholders participated in the on-line survey and the results are presented here. Stakeholders were asked about their opinions regarding the factors that may affect adherence to TB treatment within the study setting. The main barrier to TB treatment adherence per stakeholders was the health- and help-seeking behavior of mineworkers while at the mines. It appeared that some mineworkers were afraid to seek help from their local clinic because they feared being declared unfit to work in the mines. This may delay TB diagnosis and treatment initiation for TB and other comorbidities, as well as increase risk of transmission to other mineworkers. The second biggest challenge around TB treatment adherence was the fact that some mineworkers who are not South African residents do not always trust the system. Their belief is that the disclosure of their health status may cause them legal problems, including the possibility of facing deportation if staying illegally in the country.

Other barriers that were regarded by more than 60 percent of the stakeholders as being important or very important barriers to TB medication adherence included, in ascending order: work schedule that conflicts with normal operational hours for the health care facilities; lack of understanding of the treatment regimen; preference for alternative medication; fear of job loss; superiority of medications from home country; feeling better whilst on treatment; socio-cultural beliefs on how TB should be treated; and importantly, health-seeking behavior whilst at home. Transportation of medication across borders was only regarded as an important barrier by 42 percent of the stakeholders.

Stakeholders were also asked to give their opinion about the usefulness of different components of the MoLeSwaSa 1 intervention. The results showed that providing returning mineworkers with the location of the health facilities in the home country, having access to a treatment nurse supporter, receiving SMS reminders with airtime incentive, the provision of incentives, and issuing of health passports, were rated as the most useful components of the MoLeSwaSa 1 intervention. Relatively fewer stakeholders felt that radio announcement and issuing of mobile phones were as useful.

**Elicitation Research with Mineworkers with TB, post-holiday leave**
A total of 47 mineworkers participated in this elicitation research. The results showed that only one mineworker had a prior history of TB infection and none had a history of DR-TB. The majority (78%) were South African citizens, 63 percent were married and 66 percent had an education level lower than high school. While at the mines, 70 percent lived with 3-4 people and when at home half of the respondents live with 7-9 individuals in one household. Almost all of the sample was male (91%) and 61 percent had dependents that they supported on a regular basis.

**Access to psychosocial support**
About 70 percent of the study sample indicated that they were in touch with their family members almost every week/every day. However, not everyone had disclosed their TB status with all the family members. Roughly two-thirds had informed most of them/all of them. The majority of those who disclosed to family reported being very happy with the overall support they get from their family (73%). However, only 58 percent reported that their friends and family members help them a lot to remember taking their TB medication.

**Motivation for and attitudes towards use of TB medication**
According to these results, most respondents were very/extremely sure of their ability to take medication as directed (87%), that the TB medication they were given would be efficacious (83%), and that if they did not take their medication exactly as instructed, their TB would become drug resistant (84%). However, 30
percent were a little sure/not at all sure that the TB medication they received from the mine would work as well as the TB medication they would receive back at home, which may signal that mineworkers could switch regimens or stop taking the TB treatment dispensed by the mines when they return home.

**Medication adherence measured by the Morisky Scale**

The Morisky scale is a generic self-report, medication-taking behavior scale. The scale consists of four items with a scoring scheme of Yes = 0 and No = 1. The four items are summed to give a range of scores from 0 to 4 from which an individual can be classified as low-adherence if their score=0, medium-adherence if their score is 1 or 2, and high-adherence if their score is 3 or 4. The study participants answered the four questions based on their recollection of taking medication as instructed. The scale revealed that 94 percent had high adherence to TB medication and only 4 percent had low adherence as shown in Figure 1.2.

**Figure 1.2: Four-item Morisky medication-taking adherence scale**

- **Self-report adherence to TB medication**

  The adherence findings using this measure were not necessarily in agreement with those by self-report. Close to 5 percent of the respondents surveyed reported not closely following their schedule for TB medication all the time during the month before they were surveyed. Furthermore, only 64 percent reported following special instructions for taking TB medication all the time during the same month. It is also seen that about 26 percent skipped medication at some point during their treatment, and 6.4 percent missed taking their TB medication on a weekend during the last month before the interview. Although respondents reported generally high adherence (per the Morisky scale), there are clearly some mineworkers who struggled to adhere to the medications exactly as prescribed and on weekends.

- **Self-report barriers to treatment adherence**

  The proportion of mineworkers who reported ever missing their TB medication was approximately one out of four. The results showed that the most frequently mentioned barriers to TB treatment adherence were: feeling too ill to attend clinic for the collection of medication; travelling; belief that the pills given are too many; not fully understanding TB medication and their requirements; as well as religious/traditional beliefs.

- **TB-related Stigma and knowledge**
The composite TB stigma index score was computed based on 20 diverse stigma questions. The analysis of this variable indicated that stigma was relatively high in this study sample, with a median of 3.2 on a 1-5 scale. With regard to knowledge, even though the respondents were not completely knowledgeable about TB as a disease and the appropriate treatment for it, a large proportion of them scored between 60 percent and 80 percent on the 43 questions related to TB knowledge. The median score was 70 percent. In particular, knowledge was remarkably low with respect to TB prevention, understanding of TB as an illness, as well as the treatment of TB with concurrent HIV infection.

Focus Group Discussion Results
Five focus groups were held with 23 Sibanye Gold mineworkers carrying TB who had returned to the mines after the 2015-2016 festive season. Similar to the exit focus groups noted above, these mineworkers felt that they were not given extensive knowledge on TB and silicosis by nurses, and that differentiating between the two diseases was difficult. This lack of information was also seen to contribute to mineworkers seeking consultation from traditional healers. Mineworkers also noted challenges with the PPE\(^\text{14}\) masks that the mine provides alleging that it has disadvantages, explaining that working underground is very hot and they use hydraulic pumps to pump water, which wets the masks and causes them to stick to their faces, suffocating them. They believe that the water mixes with the dust to create a chemical mixture which they may inhale. Motivation factors that inhibited TB treatment adherence included the lack of sympathetic supervisors; lack of available nurses; shift schedules, and difficulty accessing the clinic daily for DOTs, including transport challenges. Most would prefer to receive a weekly supply of TB treatment. Alcohol use also featured as a barrier.

Many participants felt that one should be motivated to look after their own health as it was their responsibility. Mineworkers felt they lacked the skills and information to prevent their families from getting TB back home, and some felt that it was difficult to tell their friends, partners and families about their TB status. Mineworkers who had told their families about their TB, received good support. Mineworkers also did not know how to access treatment if they ran out whilst on leave or how to take their medications according to instructions. Although they considered TEBA a resource, they were unsure how to access their services. No mineworkers had experienced challenges with border control, and all felt that Operation MoLeSwaSa would be of great benefit to them and their colleagues.

Phase 2
The total baseline sample included in the descriptive analysis was 153, which surpasses the estimated sample size of 148.

Descriptive results
These results illustrate that the sample consisted of middle-aged participants who, on average, had been employed at the mines for between 16 and 21 years. Most participants were recruited from Sibanye Gold mine (63%) and were South African (60.1%). The sample was predominantly male (95.97%), very few (4.7%), were living with someone with TB 18.1 percent were using alcohol and 22.7 percent of those with a history of tobacco use were smoking at the time of the study. Only 17.6 percent had a history of TB, 8.5 percent had drug-resistant TB and 18 percent had noncommunicable disease (NCD) comorbidity. A high number (72.3%) had HIV coinfection, but very few (2.05%) had silicosis comorbidity.

Self-report findings indicate high adherence to TB treatment. For example, few study participants (8.72%) reported ever forgetting to take their TB medication, or ever having problems remembering to take their medication (6.04%). Similarly, a very small proportion (7.38%) reported ever stopping taking TB medication when they felt better but slightly more because they felt worse (16.11%). The majority indicated following the medication schedule (63.5%) and medication instructions (72.7%) as instructed all the time, and very

\(^\text{14}\) Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.
few reported ever missing TB medication on a weekend. A small proportion of study participants (10.1%) indicated ever seeing a traditional healer for TB care, although 13.7 percent preferred not to answer the question.

As stated earlier, very few participants reported missing their TB treatment. The study assessed the perceptions of this group regarding their individual barriers to TB treatment adherence using a 23-item questionnaire. Participants were asked to indicate whether they ever missed taking their TB medication because of any of the 23 barriers listed under the question. This analysis showed that the top four barriers listed by the participants were avoiding side-effects, forgetting to take medication, competing tasks (doing other things), and having other medical conditions for which additional medication is required (such as HIV and NCDs). On the other hand, sharing TB medication with other family members, fear of stigma or being discriminated against were rarely reported as barriers to TB treatment adherence.

Inferential results
The goal of this analysis was to evaluate time until defaulting TB treatment for mineworkers with TB in the control group and the intervention group. The results showed that the risk of defaulting treatment was significantly delayed among participants who were part of the intervention, compared to those who were in the control group. The same was also true when the results were stratified by mining company, indicating that the intervention had a positive impact in delaying the time to defaulting treatment.

A number of factors were also evaluated to see if they were associated with TB treatment non-adherence. The analysis showed that only a history of TB was significantly associated with TB treatment non-adherence. Participants who had a history of TB had a significantly higher risk of defaulting treatment compared to those who did not.

Four metrics of adherence to TB treatment were used to assess the impact of the study intervention: (i) adherence during the week (Mondays to Fridays), (ii) adherence during the weekend, (iii) adherence during the holiday break, and (iv) overall adherence during the study period. These metrics were expressed as percentages and used as such during data analysis.

The analysis revealed that most participants in both the control group and the intervention group had high adherence. However, it should be noted that overall, the intervention participants attained better overall adherence, weekend adherence, and week-day adherence compared to control participants.

A regression analysis was carried out to estimate the effects of factors other than the exposure or non-exposure to the intervention on the levels of adherence. For this analysis, only total adherence was considered as the outcome variable. The results indicated that not having DR-TB comorbidity significantly increased the intervention’s effect, whereas having extra-pulmonary TB significantly decreased the impact of the intervention. Although not statistically significant, being HIV positive, living with someone with TB, and having no education seemed to not favor the effect of the intervention on overall adherence. On the other hand, not having NCD and silicosis comorbidity and previous TB infection favored the effect of the intervention. The intervention’s effect was also found to be more pronounced for those with lower adherence, suggesting that the intervention worked best for those who needed it most.

Further assessment considered whether the changes from baseline to end-point in perceived psychosocial support, composite TB stigma index score, composite TB knowledge score and patient weight for the intervention group were significantly different, compared to changes in the same metrics for the control group. The results suggested that participants in the intervention group trended toward higher gains in perceived psychosocial support and TB-related knowledge as well as TB-related stigma. These findings indicate that the intervention had a positive effect on these metrics.

The key finding from Phase 2 of the project is that the study intervention had a statistically significant positive impact not only on overall adherence to TB medication, but also on adherence during the week, and adherence during the weekend. This finding is very encouraging, particularly against the backdrop of the
different barriers identified in Phase 1, for which various intervention packages were developed and implemented. The finding suggests that the IMB-based face-to-face workshops held with the mineworkers in the intervention group worked, either independently or as part of the overall intervention. This view is supported by the literature, including a systematic review of 12 health behavior studies which concluded that the IMB model is a strong and effective interventional framework that can be used to promote health behavioral change (Chang et al, 2014). Unfortunately, our elicitation work revealed that while TB patients in the two mining companies receive some form of health education and promotion services, these are delivered on an ad hoc basis, and are rather unstandardized with some patients receiving less of what could potentially improve their medication-taking behavior.

Phase 3

The cost-analysis of implementing one month of intervention was calculated, with two workshops being conducted per month based on the following assumptions:

- Each workshop would target 20 mineworkers.
- Mineworkers would need to be given shift leave to attend, with a cost-to-company of one day of work (this does not factor in production losses since it can be implemented while mineworkers are still on sick leave/intensive phase, before returning to work)
- Staff would need to spend approximately 1-2 days/week to schedule mineworkers to attend, confirm venue, arrange catering, print materials, package kits, and assist with facilitation.
- A workshop facilitator consultant and an onsite translator are required to facilitate the half-day session.
- All mineworkers who participate in the workshop also receive the survival kit; IEC materials; health passport; and weekly SMS reminders.

This translated to a cost of US$ 224/mineworker reached with the intervention as shown in Table 1.2.

Table 1.2: Summary of Intervention Costs by expense category

<table>
<thead>
<tr>
<th>SUMMARY: TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Analysis</td>
</tr>
<tr>
<td>Cost Data Categories</td>
</tr>
<tr>
<td>Start-up</td>
</tr>
<tr>
<td>Total start-up costs</td>
</tr>
<tr>
<td>Recurrent</td>
</tr>
<tr>
<td>Staff</td>
</tr>
<tr>
<td>Material</td>
</tr>
<tr>
<td>Building utility and maintenance</td>
</tr>
<tr>
<td>Total recurrent</td>
</tr>
<tr>
<td>Capital</td>
</tr>
<tr>
<td>Building</td>
</tr>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>Total capital costs</td>
</tr>
<tr>
<td>Startup + Intervention</td>
</tr>
<tr>
<td>One month intervention</td>
</tr>
<tr>
<td>Unit cost (mineworker)</td>
</tr>
</tbody>
</table>
As Figure 1.3 below illustrates, the cost analysis showed that the cost driver was staff salary, followed by materials. Equipment, building, utility and maintenance costs were minimal.

**Figure 1.3: Cost analysis of intervention, based on category**

Economies of scale could be reached by training onsite staff, such as health educators or nurses, to facilitate the workshops. Since the intervention had limited impact on those who were already adherent, consideration may be given to targeting mineworkers with adherence issues or those with HIV or DR-TB, which seems to complicate TB treatment adherence. The cost analysis demonstrated that desired outcomes can be achieved with a unit cost that is reasonable, considering the cost consequence of treatment failure which may lead to production losses, and increased medication cost for DR-TB as part of ongoing care.

**Conclusions**

**Phase 1**

This review highlighted the complex factors that contribute to the high TB and HIV disease burden among mineworkers. Strategies to promote adherence need to be multifaceted and address the individual, contextual, and systems-level barriers to TB treatment adherence to not only tackle the biological need for TB control and its public health consequences, but also to mitigate the underlying circumstances of poverty, migration, occupational hazard, and lack of social support which pre-dispose mineworkers to a dual burden of HIV and TB risk. The different components of the systems intervention package were informed by the findings from Phase 1 and constitute a set of recommendations for future interventions. The package included health passports and goodie bags with IEC materials designed to inform mineworkers and their families and friends about TB and its treatment, with a goal of fostering psychosocial support.

In summary, there are four primary categories of factors—structural, personal, health service, and social context—considered in the literature to have an impact on adherence to TB care and treatment. Factors facilitating adherence to TB treatment include family support, receiving personal attention from healthcare providers, and receiving care provided by staff specially trained in TB with cultural sensitivity. Having positive relationships with health professionals was perceived to be a crucial element to TB treatment adherence and reinforced through home visits and/or phone discussions. Finally, navigating the social context and community for support in TB care engagement and adherence is of critical significance, and is likely undermining efforts to address TB and HIV in this sector. This is not only important for the health of mineworkers themselves, but also for the health of their colleagues, families, partners, and respective communities.
Based on this review, the following intervention components would seem necessary to assist mineworkers in protecting their own health, and limiting contagion to others:

- A caring, accessible, confidential health service that routinizes TB, HIV, and STI screenings, as well as patient-centered adherence support and appropriate treatment.
- A relevant, evidence-based package of interventions for mineworkers to assist with personal factors that is, information-motivation-behavioral skills (IMB) barriers to individual adherence behavior, which may include health education, reminders, incentives and peer support.
- An informed, engaged and supportive social context (i.e., family and community) that supports timely TB diagnosis, treatment, and adherence to care which de-stigmatizes health-seeking behavior and normalizes healthy practices within the community.

Intervention development should consider the “state of the science” and propose a mix of effective interventions to maximize impact, as seen in Thiam et al. (2007) and emphasized in the Cochrane Reviews. As noted, evaluations of the relative impact of various intervention modalities are scarce but it is well-recognized that combination interventions—the use of both biomedical and behavioral intervention components and strategies—will maximize the potency and impact of such interventions. Health education, the use of weekly SMS reminders, social support and incentives seem to indicate benefits for TB treatment adherence in addition to the proven efficacy of directly observed anti-TB treatment (DOTS). Given this evidence, the project sought to propose an intervention package delivered and reinforced in multiple modalities—workshop, print material and SMS reminders—that offered not only information, but the social support and critical skills to adhere to TB treatment and remain in care.

The stakeholders confirmed that barriers of priority included the mineworkers’ reluctance to engage in care and remain on TB treatment due to employment status and immigration concerns. Concerns about the use of traditional medications and the perceived superiority of home regimens among mineworkers were commonly reported. Family support and navigating the continuum of care for mineworkers across borders was also seen as important. Less important was the threat of border security confiscating medications, competing priorities, language barriers between providers and patients, and lack of skills. Based on the past project, stakeholders agreed that the health passport, SMS reminders, and the provision of incentives or “goodies” were well-received, but the radio announcement and issuing of cell phone got mixed reviews. Concerns about the sustainability of the intervention were highlighted, and the intervention package should fit into the clinical care context provided by the mines where the provision of incentives and health education is already routine.

Findings from elicitation research indicate a need for more thorough health education about TB disease and how to prevent it, as noted earlier. Mineworkers need to be prepared for returning home with adequate information to enable them to access care, treatment and support, particularly from their families. Skills in how to disclose TB status, how to protect family members and how to access health services are critical to ensure continuous care and treatment for mineworkers with TB whilst on leave. The findings also point to a desire for a more autonomous model of care among those with TB at the mines.

**Phase 2**

Findings in Phase 2 showed that the intervention had a notable impact on the primary outcome, total adherence to TB treatment, and on many other secondary outcomes as noted in the results section. Importantly, intervention participants also achieved higher gains in knowledge, perceived psychosocial support and less anticipated stigma than control participants. Such factors represent an important foundation for TB treatment adherence and were explicitly targeted in the intervention package based on the IMB model. It is worth noting that the study design does not allow for the isolation of the differential impact of each intervention component. Therefore, the estimated impact should be interpreted as being a result of the overall intervention as posited in the theory of change, although assumptions can be made on which component may have affected which outcome(s) based on the theory of change. Our recommendation would be to train health care providers at the forefront of TB care and treatment to enable
them to use an IMB-type model to foster TB treatment adherence in the mining sector. The report argues that the intervention should target everyone infected with TB, particularly because most study participants defaulted treatment at least once during adherence monitoring.

Depending on resources available, priority may be given to the “at risk” subgroups such as those with HIV coinfection, those with DR-TB, and those with a lower level of education, who tended to have the lowest adherence levels. There is a need for financial commitment from different structures of the health care system, including civil society organization, the government and the mining sector itself. Further, ongoing monitoring and evaluation of the processes of care and outcomes within the context of such an intervention based on an IMB model becomes imperative, for both accountability and learning processes.

Phase 2 results confirmed that participants in the intervention group experienced a much higher increase in psychosocial support score compared to those in the control group. This result was also encouraging and may demonstrate the potential of this intervention component in improving psychosocial support in this population.

Phase 3
The cost-analysis confirms that these outcomes can be achieved with modest per person expense (unit cost) of approximately US $250 (R3400) per mineworker. This is minimal when considering the cost consequence of treatment failure, the possibility of resistant disease or recurrent infection, which cost sick time for the company, production losses as well as the costs of the mineworkers’ ongoing clinical care and treatment. This analysis will inform decisions about resource allocation requirements and budget implications of the intervention, thus allowing planning, affordability, potential sustainability and scale up of the intervention.

References


Liu Q, K. Abba, M. M. Alejandria, D. Sinclair, V. M. Balanag, and M. A. D. Lansang. “Reminder Systems to Improve Patient Adherence to Tuberculosis Clinic Appointments for Diagnosis and Treatment.”


CHAPTER 2

PROMOTING ADHERENCE TO TB TREATMENT AMONG MINEWORKERS BY CAPACITATING NURSES IN SOUTH AFRICAN MINES

Following the success of MoLeSwaSA 2, this project aimed to design, implement and evaluate an intervention targeting health care workers (HCWs) caring for mineworkers with TB in the small to medium sized mining corporations in South Africa. The specific objectives were to:

- Describe baseline TB knowledge, attitude towards TB, and fortitude levels in a sample of HCWs caring for mineworkers infected with TB;
- Describe baseline TB knowledge and fortitude levels in a sample of mineworkers infected with TB who were cared for by the same health care workers;
- Assess whether a capacity development training intervention is effective in improving TB knowledge, attitude towards TB, and fortitude levels of HCWs caring for mineworkers with TB;
- Assess whether there are differences in TB knowledge and fortitude change among mineworkers with TB, based on whether they were cared for by HCWs who received the training intervention plus either the remote tablet-based digital intervention and support, or face-to-face intervention and support, or no support at all from the project team;
- Assess baseline and endpoint self-report TB treatment adherence rate and the rate of retention in care among mineworkers with TB who were cared for by the same cohort of health care workers;
- Describe health care workers’ perceptions about organization and individual-level barriers to TB care and service delivery in the mining sector; and
- Explore health care workers’ experiences with the intervention packages they received for patient engagement.

This study was carried out in three mining corporations in South Africa, namely: Goldfields, Sibanye Gold, and Harmony Gold. It targeted small- and medium-sized mine shafts where the need for a health systems strengthening intervention for TB treatment and care was presumed to be the greatest. The nature of the project allowed for a three-group, pre- and post-test quasi-experimental study design to be used to evaluate the effectiveness of the study intervention packages:

- Standard of care by the Department of Health (DoH) with no intervention (DoH group).
- Intervention group where HCWs were supported by face-to-face interactions by study team.
- Intervention group where HCWs were supported by digital means—a tablet with guidelines, workshop materials and email support system.

The study also involved a qualitative component which sought to explore HCWs experience with the intervention package they received. The study targeted two groups of individuals, namely HCWs (primarily nurses) and mineworkers with TB who were based at the three mining corporations mentioned earlier at the time of the study.

The tools for the study are summarized below in Table 2.1:

15 This chapter is based on a report, "Promoting adherence to TB treatment among mineworkers by capacitating nurses in South African mines." Enhancing Care Foundation (ECF), March 2017.
The HCWs who were identified were invited to a basic TB/HIV and soft skills training session which was developed based on the elicitation research findings of this study. HCWs then interacted with mineworkers enrolled in the study, using the skills and knowledge from the workshop to improve TB knowledge, adherence and retention in care among these mineworkers. The following outcome variables were measured:

- Among HCWs:
  - Composite knowledge score
  - Composite attitude score (self-report measure computed from 9 literature-drawn questions that asked HCWs about their attitude towards the TB patients they see, themselves, and their workplace)
  - Composite fortitude score (self-report measure and it was defined as strength of mind that enables HCW to endure with courage the adversity attached to being a health care provider in the mining sector)

- Among mineworkers:
  - Composite knowledge score
  - Composite fortitude score (self-report measure and it was defined as strength of mind that enables the mineworker to endure with courage the adversity attached to being a TB patient)
  - Self-report TB treatment adherence rate
  - Self-report retention rate of retention into care

**Results**

*Health care workers*

The majority of HCWs (54.7%) recruited in the study were based at Sibanye gold, and only 31.7 percent had received prior training in health education and counselling related to TB. More than half (54.8%) of the HCWs in the study were seeing TB patients daily and 75 percent had received some form of vocational training on TB in the 12 months prior to the current study. The baseline composite TB knowledge score was relatively low (median 65.3 percent), but the composite fortitude and attitude scores were high at baseline (median of 80 percent and 82.9 percent respectively).

Overall, there was a positive and statistically significant shift in the composite knowledge and fortitude scores from baseline to endpoint, from median of 65.3 percent to 70 percent; \( p=0.001 \); and from median = 80 percent to 83.3 percent; \( p=0.006 \), respectively. It should be noted that since all study participants underwent significant training and capacity building, this may have contributed to these improvements.
across the board. The shift in the composite attitude score following the intervention was also positive but not statistically significant (p=0.841).

Subanalysis assessed whether there were notable differences in knowledge, attitude and fortitude shift by study group. These results are presented in Figure 2. It is seen that with regard to the composite knowledge score, the DoH group did not experience a statistically significant shift (p=0.654) whereas the digital and face to face groups did (p<0.05). For the composite fortitude score, the shift was only statistically significant in the digital group but not the other groups. Also, the shift in composite attitude score was not statistically significant across all 3 groups. This result was also not unexpected since the attitude scores were relatively high at baseline.

HCWs were also asked at baseline to indicate whether certain professional and individual-level factors affect their ability to effectively deliver health care. These results are presented in Figures 2.1 and 2.2.

**Figure 2.1: Professional barriers to effective health care delivery**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Yes (%)</th>
<th>No (%)</th>
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</thead>
<tbody>
<tr>
<td>Knowledge/Education</td>
<td>70.95</td>
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</tr>
<tr>
<td>Time Management</td>
<td>73.68</td>
<td>26.32</td>
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<tr>
<td>Job Satisfaction</td>
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<td>29.73</td>
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<tr>
<td>Career Advancement</td>
<td>62.86</td>
<td>37.14</td>
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<td>Challenging Patients</td>
<td>60.53</td>
<td>39.47</td>
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<tr>
<td>Workplace Issues</td>
<td>69.46</td>
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<td>Facilities</td>
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<td>48.57</td>
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<tr>
<td>Management Issues</td>
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</tr>
<tr>
<td>Relationships with Co Workers</td>
<td>47.37</td>
<td>52.63</td>
</tr>
<tr>
<td>Emotion dealing with Sick patient</td>
<td>36.11</td>
<td>63.89</td>
</tr>
</tbody>
</table>

**Figure 2.2: Individual-level barriers to effective health care delivery**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Time</td>
<td>65.71</td>
<td>34.29</td>
</tr>
<tr>
<td>Health and Wellbeing</td>
<td>60.61</td>
<td>39.39</td>
</tr>
<tr>
<td>Sense of Accomplishment</td>
<td>59.33</td>
<td>40.63</td>
</tr>
<tr>
<td>Financial Issues</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Spiritual and Self Development</td>
<td>44.12</td>
<td>55.88</td>
</tr>
<tr>
<td>Stress and Worry</td>
<td>42.42</td>
<td>57.58</td>
</tr>
<tr>
<td>Home Environment</td>
<td>35.29</td>
<td>64.71</td>
</tr>
<tr>
<td>Family Relationships</td>
<td>28.57</td>
<td>71.43</td>
</tr>
<tr>
<td>Not enough Leisure or Fun</td>
<td>23.53</td>
<td>76.47</td>
</tr>
<tr>
<td>Relationships with Friends</td>
<td>21.88</td>
<td>78.13</td>
</tr>
</tbody>
</table>
This is a useful snapshot of the barriers to health care delivery and suggest that HCWs may benefit from interventions to address HCW wellness and self-care to address potential job stress and burnout.

**Mineworkers**

Two hundred and nine mineworkers were enrolled in the study, of whom 25 percent interacted with the HCWs in the DoH Standard of care (no intervention) group, 37 percent with the HCWs in the face-to-face intervention group, and 38 percent in the digital intervention group. The mean age was 45.1 years, with an average of 18 years of work experience at the mines. The average duration of TB illness at the time of the study was 3.7 months. The majority were recruited from Sibanye Gold mine (56%) and a large proportion were South Africans (59%). Close to 17 percent were on medication for either diabetes or hypertension, 37 percent had recurrent TB, only five percent were being treated for silicosis, 54 percent identified themselves as HIV positive, but 10 percent preferred not to divulge their HIV status.

On average, the baseline composite TB knowledge score in the entire sample of mineworkers was 67.4 percent. After the study, it only went up by 1.5 percent. An unintended effect was observed about mineworkers’ composite fortitude score. At 81 percent, the average baseline score was high, but this decreased to 79 percent after the intervention; this negative change was not statistically significant. At baseline, a high rate of TB treatment adherence was reported by 85 percent of mineworkers. The rest reported either intermediate adherence (13%) or low adherence (2%). However, the self-report retention rate in care at baseline was high, with 97.5 percent indicating that they had never missed their medical appointment or failed to collect their TB medication in the previous two months.

The linear mixed effect repeated measures ANOVA set out to assess whether the change in the composite knowledge and fortitude scores from baseline to endpoint in the three groups were statistically different. The results from this analysis revealed that, overall, there was a statistically significant main effect of time on the composite TB knowledge score: \( F(1,153)= 5.72, p=0.018, \eta^2=0.036 \), which means that in all three groups knowledge increased, and significantly so in at least one of them. This is further explained by the statistically significant interaction between time and group allocation in terms of the composite TB knowledge score \( F(2,153)= 4.53, p=0.012, \eta^2=0.056 \).

TB treatment adherence rate improved in the face to face and the digital intervention groups but not the DoH standards group. The proportion of patients who reported high adherence increased from 77.9 percent to 84.8 percent in the face to face group (7% increase), and from 92.3 percent to 94.7 percent in the digital intervention group. For the DoH standard group, there was a decrease from 84.6 percent to 83.3 percent. Generally, the self-report retention rate was good across groups at baseline. While the retention rate improved from baseline to end-point in the face to face intervention group—from 94.4 percent to 98.3 percent—the rates got worse in the DoH standard group—from 100 percent to 97.6 percent—and sharply so for the digital intervention group—from 98.8 percent to 92.9 percent.

**Workshops and support**

The TB session workshops were mostly enjoyed by the HCWs, who found the knowledge conveyed to be informative and empowering. Many learned about mine-related aspects of TB that they had previously been unaware of. The ability to reach even more patients with the right information was a motivating factor for the participating HCWs.

The soft skills conveyed to the HCWs assisted them in reaching out to their patients on multiple levels, creating a level of respect and trust between both parties. Many noted an improved level of confidence among patients who are now at ease with their HCWs due to the improved approach. Interviewed HCWs indicated a willingness to transfer the lessons learned from the soft skills training to other aspects of their lives.
The digital support initiative was well received by HCWs, who enjoyed the ease with which the digital platform operated as well as how it reduced their paperwork. Many found it to be user friendly and found that it heightened patients’ interests in the activity, leading to improved patient engagement. The HCWs noted that while it was not always possible to make use of the platforms during their busy clinic days, they could work with the platforms afterhours. The ability to render face-to-face support was also enjoyed by HCWs, who found being able to note a patient’s body language beneficial.

Conclusions
This project sought to address gaps in the knowledge of health care workers (HCWs) caring for TB-infected mineworkers in medium and small mining shafts, provide these HCWs with patient engagement and facilitation skills, provide support through face to face or digital means and evaluate the success of such a strategy among HCWs and mineworkers infected with TB. Among HCWs, the project demonstrated improvement in attitude and statistically significant improvement in knowledge and fortitude. Among mineworkers, significant improvement in knowledge and fortitude was not demonstrated – however, there were increases in the levels of self-reported adherence and retention in care in the intervention groups.

The results between the group of HCWs supported by a face-to-face approach compared with those supported by digital methods were mixed with the face to face group demonstrating slightly superior benefit. There were consistently better outcomes among HCWs who received some support compared to those with none. This support included ongoing engagement between HCWs and research team, report back on patients, query system for problem cases, and access to relevant guidelines.

It is important to note that the baseline composite TB knowledge score among this population of HCWs was very low at 69 percent. This is very concerning given the high TB incidence in this sector and the resulting high burden of TB cases faced by these HCWs. In addition, prior training in health education and TB counselling was also lower than anticipated. While the intervention workshop which sought to address gaps in TB knowledge among HCWs was successful in that significant knowledge transfer did occur, it is notable that no statistically significant shift was observed in the unsupported group – this further reiterates the value of ongoing support of these HCWs.

While positive changes in fortitude and attitude towards job and patients were demonstrated, it must be noted that the baseline levels regarding these two measures were very high, which may explain why this shift was relatively small. Leading professional barriers to effective health care delivery according to these HCWs included knowledge and education, time management and job satisfaction. The former factor highlights the need for a capacity development and support project such as this one. Time management and lack of quality time for HCWs emerged as the leading individual barriers to providing effective health care delivery. This suggests that the time commitment of the HCWs to their job, compared with time dedicated to personal lives requires further evaluation. Other individual barriers included personal health and wellbeing, sense of accomplishment and personal circumstances – this supports other studies which have demonstrated that health care personnel’s level of job satisfaction and personal well-being have impacts on their work performance.

Of the 209 mineworkers in the study, 38 percent reported a previous episode of TB; this is in line with the high burden of TB and re-infection in mines. It was noteworthy that the overwhelming majority of workers were aware of their HIV status, although the fact that 8 percent were unaware is significant, given the standard of routine for HIV testing in patients with TB. Fifty-four percent of the patients reported being HIV infected – this is in line with WHO but below the DoH estimate of the coinfection rate. Yet, roughly 10 percent chose to not disclose their status, which may explain this discrepancy. It is also significant for integrated management of illness that 17 percent of workers had concomitant hypertension and/or diabetes despite a mean age of 45 years.

Baseline TB knowledge in this population of mineworkers was low with an overall significant positive shift after engagement with HCWs. It must be noted that this project was accomplished in a short period of a few months and that while HCWs were capacitated with TB knowledge and facilitation and engagement skills,
their interaction with mineworkers was limited due to the short time frame. It is possible that ongoing engagement would have shown greater shift in mineworkers’ TB knowledge. This is borne out by the statistically significant effect of time on knowledge transfer.

Mineworkers’ fortitude demonstrated a decrease from a high baseline level using a self-reported tool. In the case of mineworkers, fortitude represented their ability to cope with adversity associated with their TB treatment. This outcome was unexpected; however, it is possible that the engagement and intervention may have raised awareness and implications of their treatment which caused the participants to respond more conservatively during their exit assessments.

Self-reported levels of treatment adherence were high at baseline, in line with results from the MoLeSwaSa 2 study. These levels increased in both the intervention arms but decreased in the unsupported, standard-of-care arm, a positive result for the intervention. The levels of self-reported retention rates were very high at baseline with some improvement in the face-to-face supported intervention group.

Overall, the workshops and soft skills and patient engagements were very well received. HCWs found the sessions empowering with reported improvement in levels of rapport with patients following these interventions. This also lends support for the case that a more client-centered, empowered model of care than is seen in traditional DOTS may be advantageous for patients and staff alike in the mining sector.

Despite the mixed results about positive shifts in the digitally supported intervention arm, the digital platform was welcomed by most HCWs. They found the approach to be user-friendly and appreciated the reduction in paper-based work.

**Recommendations**
The baseline findings from this study suggest that a capacity building intervention was needed to upskill nurses in the management of TB and HIV. The baseline knowledge levels among HCWs and the mineworkers they were caring for at the time of the study were low, suggesting that such an intervention was needed. This is particularly so considering that after the intervention, there was a positive shift in knowledge of TB in the two study target groups, more so in the group that benefited from the face to face intervention.

The interventions confirmed that some support, delivered via face-to-face or remotely, provides an advantage to no support. Further study would be required to understand the cost-effectiveness of the digital vs face-to-face support platforms. Perhaps with more time, the interventions would be equivocal in their effects which may present promise for such digital means of support. Such interventions have vast potential where HCWs work remotely to provide decentralized care – particularly in rural areas and smaller mines where access to mentorship and ongoing technical assistance is scant.

It is of note that mineworkers’ lives are often complicated by concomitant illnesses, including chronic diseases such as hypertension, diabetes and HIV, which may affect adherence and treatment outcomes. TB management should take into consideration the potential for these comorbidities to affect the adherence to one treatment regimen over another, and should highlight possible areas of confusion for the mineworker.

**References**


CHAPTER 3
HIGH IMPACT HEALTH SERVICES TARGETED AT THE MINING SECTOR IN LESOTHO

Lesotho has the highest TB incidence rate in the world. This has risen alongside the HIV epidemic over the past two decades and is currently 852 new cases of TB per 100,000 people per year. The mining sector has been identified as one of the key drivers of the TB burden in the southern Africa region. Lesotho, which over the past few decades has provided a substantial proportion of the workforce for South African mines, now has a fledgling mining sector of its own. Most Basotho mineworkers are migrants to South Africa—in 2013, Lesotho’s migrant mining workforce numbered approximately 42,000 individuals, with the domestic mining workforce comprised of approximately 3,000 individuals. The living migrant ex-mineworker population is estimated to be approximately 65,000 – 75,000 individuals.

Over the past five years in Lesotho, development partners and donors have engaged in addressing TB among mineworkers and ex-mineworkers, along with their family and community members. Despite these efforts, there has yet to be a comprehensive, country-wide programmatic response to TB in mineworkers and ex-mineworkers in Lesotho. The country is now poised to do so through new funding sources made available starting in mid-2016 and 2017, and particularly through regional grants from the Global Fund and the World Bank.

TB case detection in Lesotho is low, with a general population case detection rate of 49 percent; this is expected to be even lower among the miner/ex-miner population, given the additional barriers they face. On the health policy front, a recent positive development was the revision of the TB testing algorithm to allow for mineworkers and ex-mineworkers to be prioritized for GeneXpert MTB/Rif testing. However, this policy is currently not being implemented consistently due to limited access to GeneXpert and inconsistent identification of occupation of those being tested for TB.

This World Bank Group-supported project was designed and implemented to support the delivery of TB case finding, diagnosis and treatment services for mineworkers, ex-mineworkers, and mining communities. From February through July 2016, a TB and HIV campaign targeting ex-mineworkers and their family members was conducted in five districts of Lesotho—the largest community-level HIV and TB screening effort targeting this population in the country to date. This project aimed to deliver targeted TB and HIV case finding, access to rapid HIV and TB diagnostic tests, diagnosis and linkages to treatment services using innovative approaches. Specifically, the project did the following:

- Conducted targeted TB and HIV case finding among mineworkers, ex-mineworkers, and their family members by leveraging Mineworkers Development Agency’s (MDA’s) events and database;
- Linked newly diagnosed HIV and TB cases to follow-up care and treatment, using mobile technology to strengthen linkages; and
- Supported capacity building among the MDA team.

By identifying hotspot areas with concentrations of ex-mineworkers and reaching out through local community leadership structures, the project mobilized an average of 209 individuals on a weekly basis at central gathering places called “cluster areas” enabling communities to access services for TB screening, HIV testing and counseling (HTC), and isoniazid preventive therapy (IPT) initiation. To encourage patients to seek care, nominal mobile payments were made to patients verified to have presented at a facility. Nurse-counselor teams made household visits to HIV and TB patients to screen and test household members for HIV and TB, given their elevated risk for disease associated with close contact. Within the districts, cluster sites were selected based on MDA’s database of their ex-mineworker members and input from local authorities, with a specific focus on targeting areas with a high concentration of ex-mineworkers.

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16 This chapter is based on a report, “High Impact Health Services for Ex-Miners in Lesotho: Project Findings.” Clinton Health Access Initiative/Mineworkers Development Agency/JHPIEGO, August 2016. [https://clintonhealthaccess.org/world-tb-day-lesotho/](https://clintonhealthaccess.org/world-tb-day-lesotho/)
After identifying the cluster areas, the project mobilized ex-mineworkers for TB-screening and HIV testing at central sites within these communities on select dates, known as “cluster days,” with the assistance of local chiefs and councils. MDA developed a clearly defined mobilization process, which was followed five days prior to each cluster. The steps involved in mobilization are listed in Figure 3.1 below:

**Figure 3.1: MDA Community Mobilization Strategy**

1. Identify areas where ex-mineworkers reside within the selected cluster area, using the MDA Beneficiary Database.
2. Approach local authorities at the district level and across community councils, and sensitize them about the project via physical visits. The structures of authority involved include both political and traditional leaders. Obtain the buy-in of local authorities and deploy MDA mobilizers in the villages to approach the community members (door-to-door and at pubs, eating places, etc.) and sensitize them about the healthcare services being extended through the project. Communicate the cluster date (Pitso), venue and time.
3. Market the Pitso via local radio stations, clearly indicating the purpose and requesting ex-mineworkers to carry their libukanas (client’s medical record book) along.
4. Inform members in the database of the clusters via phone calls by the MDA staff. MDA staff made approximately 1796 calls to mineworkers/ex-mineworkers from the MDA database to complement the community-based mobilization efforts undertaken.

Other services that were offered at the cluster site included weight assessment, alcohol counseling as needed, voluntary medical male circumcision (VMMC) information and education, family planning (including condom distribution), and the first stage of hypertension screening (blood pressure testing). At cluster days, clinical staff also identified individuals who should receive household visits to offer family members TB screening and HIV testing. The process that followed is outlined in Figure 3.2:
Data on TB symptomatic clients and HIV-positive patients was captured using mobile phones through a mobile application. The mobile application was developed on Survey CTO, a platform which allows for the development of easily customizable survey forms and secures data storage using a strong encryption system.

**Results**
Across five districts, 6,966 individuals were registered at the project’s cluster days. Door-to-door mobilization, radio announcements, involvement of community councils and village chiefs, and telephone calls to MDA members were among the techniques used to ensure the project mobilized the community effectively, resulting in a high turnout per cluster.

Out of 6,966 individuals attending the cluster days and events, 5,995 were screened for TB (86%), 831 (12%) were not evaluated, and 140 (2%) were ineligible. Of those who were ineligible, 98 were currently on TB treatment, 26 were recently identified as TB symptomatic and awaiting diagnosis, and 16 declined to be screened. The clients who declined screening had either been screened recently for TB at a health facility or were not interested in being screened for TB at all. Of those that agreed to screening, 281 individuals were identified as requiring further evaluation for TB, and 12 of them were diagnosed with TB.

Of all attendees, 5,688 (82%) were evaluated for HIV. The remaining 1,278 (18%) did not attend the stations at which HIV status was assessed. While active counseling and support was provided to ensure clients were tested at the HTC station, some attendees did not get tested at the HTC station. This was because they were not aware of the additional services provided, they were expecting compensation and were
disappointed, or they were not interested in finding out their HIV status. In all, 1,866 people were found to be ineligible for HTC, 1,214 were known people living with HIV (PLHIV), and an additional 652 had tested HIV-negative in the past 3 months. Of the PLHIV who were identified “pre-intervention,” 94 percent were already on ART. The remaining 3,822 individuals either had an unknown status or their most recent test was more than three months earlier, 2,862 (75%) agreed to HTC, and 139 (5%) were newly diagnosed as HIV positive. In total, 2,238 (32%) declined HTC, either through lack of attendance or by explicit refusal at the stations. Out of 6,966 individuals who attended the cluster days and events, 5,688 (82%) were willing to disclose their HIV status at the nursing station.

Figure 3.3 below presents the changes in the HIV status of the 5,688 individuals who were willing to disclose their status because of the project.

**Figure 3.3: HIV status of reached clients before and after the project**

In Lesotho, current guidelines advise that all adults be tested for HIV every three months. The greatest impact of this project’s HTC activities was to decrease the number of people with an unknown or outdated (tested over three months ago) status, from 68 percent to 17 percent. Among those who were tested, 95 percent tested HIV-negative, as evident in the increase in the percent of individuals with a known, recent HIV-negative status from 11 percent to 59 percent.

Disaggregating by age group reveals that HTC activities had the greatest impact on older male age groups. Figure 3.4 combines the groups of males with an up-to-date status (either HIV-positive or tested in the past three months) and shows the percentage of males who had an up-to-date status before and after this project, by age group. The only individuals captured in this pool were those who disclosed their HIV status (82% of all registered individuals). It was evident that older male age groups were much less likely to have an up-to-date HIV status, which the project helped to level.
The overall HIV prevalence rate for male participants was 25.2 percent. The rate declines sharply by age group, with an extremely high rate of 58 percent in the 40-49 age group. Nearly all male participants (98%) fell within the occupation category of ex-mineworkers who worked in South Africa, and these rates remain within the one percent range when disaggregating specifically this group. In comparison, Lesotho's 2014 Demographic Health Survey (DHS) reported a HIV prevalence rate of 29.8 percent among males in the 40-49 age group, and a rate of 28.8% among males in the 50-59 age group, showing the rate among the ex-miner population to be significantly higher than in the general population. The DHS did not report age-disaggregated rates for any older age groups.

The overall HIV prevalence rate for female participants was 29.2 percent. Given the smaller sample of female participants, the only age groups for which there was a sizable sample was the 50-59 and 60-69 age groups. For the 50-59 female age group (n=197), the HIV prevalence rate was 32.0 percent and for the 60-69 female age group (n=232), the HIV prevalence rate was 26.3 percent.

For mineworkers and ex-mineworkers, data was also collected on smoking, alcohol consumption, silicosis history, and HIV status to better understand the distribution of these TB risk factors. The project documented high prevalence of these risk factors in the population, as seen in Table 1.1:
Table 3.1: Risk Factor Prevalence among Registered Clients

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Smoker (%)</td>
<td>29.9%</td>
</tr>
<tr>
<td>Past Smoker (%)</td>
<td>26.8%</td>
</tr>
<tr>
<td>Average Years of Smoking for Current Smokers (# years)</td>
<td>27.2 years</td>
</tr>
<tr>
<td>Average Years of Smoking for Past Smokers (# years)</td>
<td>17.6 years</td>
</tr>
<tr>
<td>Any Alcohol Consumption (%)</td>
<td>40.3%</td>
</tr>
<tr>
<td>Average Days per Week that Alcohol is Consumed (# days)</td>
<td>2.1 days</td>
</tr>
<tr>
<td>% Who Consume 1-2 Drinks on Days Alcohol is Consumed (%)</td>
<td>59.6%</td>
</tr>
<tr>
<td>% Who Consume 3-4 Drinks on Days Alcohol is Consumed (%)</td>
<td>32.6%</td>
</tr>
<tr>
<td>% Who Consume 5+ Drinks on Days Alcohol is Consumed (%)</td>
<td>7.8%</td>
</tr>
<tr>
<td>Past Silicosis Diagnosis (%)</td>
<td>10.8%</td>
</tr>
<tr>
<td>HIV Prevalence (%)</td>
<td>25.2%</td>
</tr>
</tbody>
</table>

Some 10.8 percent of mineworkers and ex-mineworkers self-reported to have been diagnosed with silicosis in the past. Past studies have documented a silicosis prevalence rate of 25 percent among this population, suggesting low detection of cases, especially given that most mineworkers had served more than 20 years in the gold sector, working underground.

Conclusions
Community mobilization was highly successful in drawing ex-mineworkers to TB and HIV screening activities. Through 42 cluster events, 6,966 individuals were registered, reaching over 127 percent of the project target. Some 5,945 (85.3%) were ex- or active mineworkers and 1,021 (14.7%) were family members. Of the ex- and active mineworkers, 5,702 (95.9%) worked in the gold mines in South Africa for an average of 23 years, almost all of them in an underground environment, which entailed high risk for TB. Eighty-seven percent of the participants mobilized for cluster events were male.

High HIV rates were observed in the population; among all those who disclosed their HIV status, 23.8 percent were HIV-positive. Initially, of all attendees, including both those who disclosed and those who refused to disclose their HIV status, 1,214 (17.4%) had a known HIV-positive status and an additional 652 (9.4%) were confirmed to have tested HIV-negative in the past three months. The remaining 5,100 individuals either had an unknown status or had tested for HIV more than three months ago and were therefore eligible for HTC according to national guidelines. Of these individuals, 2,862 (56.1%) agreed to HTC, and 139 (4.9%) were newly diagnosed as HIV-positive.

High rates of TB were also observed in the population, although many of these cases had been identified previously. A total of 6,135 individuals (88%) were assessed for TB, out of which 98 individuals (1.6%) were found to already be on treatment, and an additional 281 individuals (4.6%) were eligible to submit sputum based on their TB symptom screen. Of these, 12 TB patients were identified and initiated on TB treatment.

Recommendations

*Expanding case-finding activities to new districts*
One of the key gaps found while preparing the Innovation Brief was the lack of focus on the five “maintenance” districts not supported by development partners. The five districts could be focused on...
ensuring that ex-mineworkers living remotely and those who have not been targeted before are reached through targeted mobilization using the MDA database and screening efforts. Additionally, activities could be expanded within the five districts that have already been targeted to include conducting cluster events across villages/areas that weren’t already covered and/or repeating such outreach on a regular basis.

**Scaling up the use of mobile technology for patient tracking**

Community-based case finding requires dynamic and responsive strategies on a real-time basis. One of the primary contributors to ensure such decisions are made in a timely manner is the ability to review progress in real-time. The mobile application used for data collection purposes by the MDA and clinical staff during cluster days as well as home-based visits assisted with ensuring this. Not only was the data collected reliable, but it assisted partners in adjusting case finding strategies across the various implementation stages of the project. It also generated evidence to support that clinical staff – nurses and counselors – are comfortable to move from paper-based collection techniques to technology on a regular basis.

**Silicosis testing and linkage to compensation**

The pilot approach was found to be successful in improving access to BMEs for ex-mineworkers, and it could be scaled-up to provide services to all ex-mineworkers identified through this project. In addition, the lack of spirometry equipment at public facilities was identified as a gap in this project, and it could be addressed through the purchase of this equipment for facilities that experience a high volume of ex-miner patients. The concerned health facility/hospital staff would need to be trained on conducting lung function tests under the Ministry of Health (MoH) guidelines. This activity would help improve the capacity of public sector facilities to extend silicosis screening and testing services among mineworkers/ex-mineworkers and community members.

**Expanding other health services offered at outreach events**

If outreach activities continue in the future, other services could potentially be added, including: blood glucose testing (diabetes screening and referrals) and linkages for VMMC services, including scheduled pick-ups.

**Prioritizing TB screening among ex-mineworkers in MDA database with silicosis**

Over 500 clients who previously reported to have silicosis were identified from the MDA database. As these individuals are at increased risk of developing TB, if outreach activities are expanded, targeted phone calls could be made to them to encourage them to attend screening at clusters, along with follow-up household visits, if they did not attend. This would require regular rather than one-off screening.

**Improving treatment adherence**

Further empirical and implementation research is required to better understand the challenges faced by mineworkers and ex-mineworkers in adhering to TB treatment and how they can be addressed.

**References**


CHAPTER 4

QUICK ASSESSMENT OF A COMMUNITY-BASED APPROACH FOR THE MANAGEMENT OF MDR-TB IN SOUTH AFRICA, LESOTHO, MOZAMBIQUE AND SWAZILAND

This study was aimed at conducting a quick assessment of the infrastructure and human resources available for incorporating or strengthening a community-based approach in the management of drug resistance cases of tuberculosis (DR-TB) among mining workers, their families and their communities. While the study was limited by the lack of time to visit the health centers and communities in rural areas of Lesotho, Mozambique and South Africa, these initial findings could provide the basis for a continuous dialogue with the NTP managers and health care professionals responsible for DR-TB management, particularly among mine workers.

South Africa

According to the WHO Global TB report, there were 349,582 new and relapse cases notified in South Africa in 2012. Among new pulmonary TB cases, 119,898 were smear positive, 63,210 were smear negative, and in 71,421 cases smear was not done. Extra-pulmonary TB was notified in 42,467 cases. There were 26,668 relapses among retreatment cases and 25,918 retreatments excluding relapses. Through the National TB Program there is free access to diagnosis and treatment using both first and second line drugs.

In 2011, in a cohort of 129,770 TB patients, treatment success for Category I TB treatment was 79 percent (74% cured and 5% completed). A further 6 percent of these patients died, 2 percent failed treatment, 6 percent defaulted treatment and 7 percent were not evaluated. In the same year, in a cohort of 45,915 retreatment TB patients, 59 percent were cured, 7 percent completed treatment, 9 percent died, 3 percent failed, 12 percent defaulted, and 10 was not evaluated. Further, South Africa is one of the countries with a large number of “missed” TB cases; people who were either not diagnosed or diagnosed and not reported to the NTP. There is also uncertainty about the level of and trends in mortality in South Africa.

From a community and public health perspective, active contact tracing and promotion of infection control within households is recommended in the NTP. Ensuring adequate ventilation with open windows and doors, isolation of infectious patient in their own bedroom where possible, promoting cough hygiene, and ensuring use of a surgical mask by patients are all recommended for reducing transmission. Guidelines also exist for health workers to follow during home visits and during the transportation of TB patients. The treatment outcomes for Category I, smear-positive cases have been improving but still remain below the 85 percent WHO target. Mortality and defaulter rates are gradually declining. The treatment success for retreatment cases is 66 percent, below the 75 percent WHO target.

The estimated percentage of new TB cases with MDR-TB is 1.8; the estimated percentage of retreatment TB cases with MDR-TB is 6.7. The number of notified MDR-TB cases in 2012 was 15,419, and about 72 percent of them had DST results. Overall, the number of TB cases decreased from 405,982 cases in 2009 to 344,748 cases in 2012. The number of MDR-TB cases increased from 9,070 cases to 14,161 between 2009 and 2012.

Treatment success among MDR-TB cohorts between 2007 and 2010 varies from 40 to 48 percent; defaulters at 10-18 percent; mortality rate dropped from 20 to 17 percent, and treatment failure between 5 to 7 percent. Treatment success varies across the provinces, from a low of 22 percent in Western Cape to a high of 64 percent in North West. Defaulters at 7 percent in

17 This chapter is based on a report, “Quick assessment of community-based approach for the management of MDR-TB in South Africa, Lesotho, Mozambique and Swaziland.”
Mpumalanga to 34 percent in Northern Cape as the highest. Death rate variance among MDR-TB cohorts was highest at 28 percent in Eastern Cape, with North West having the lowest rate of 9 percent.

South Africa remains the country that reports the most XDR-TB cases in the world, and annual notifications increased from 467 in 2009 to 1,596 in 2012. About 10 percent of MDR-TB cases reported in South Africa are XDR-TB. The treatment outcomes for 623 XDR-TB patients (2010) were poor: 12 percent were cured; 6 percent completed treatment; 8 percent were treatment failures; 9 percent were lost to follow up; 49 percent died, and 17 percent were not evaluated.

Where capacity allows, households with MDR-TB and XDR-TB cases are mapped geographically using EDRWeb18 or GPS19 to support the follow-up intervention at household level, allowing for early identification of contacts and thereby interrupting the chain of transmission at community level.

South Africa’s National Strategic Plan sets 5-year targets to direct country level response to sexually transmitted infections (STIs) and the TB HIV epidemics. There are four priorities aligned with the UNAIDS “Getting to Zero Strategy”: 50 percent reduction in new HIV infections; initiation of at least 80 percent of eligible patients on ART, with 70 percent alive and on treatment five years after initiation; reduction in the number of TB infections and deaths by 50 percent; and reduction in self-reported stigma relating to HIV and TB by at least 50 percent. Several international organizations, academic organizations, and local NGOs are providing coordinated support to the NTP in South Africa.

The National Department of Health (DoH) introduced the DR-TB management program in 2000. A policy framework on decentralized and deinstitutionalized management for South Africa was later introduced in August 2011. The health framework for management of DR-TB patients was structured with centralized DR-Unit or Provincial Centre of Excellence supported by decentralized DR-TB units and satellite MDR-TB units and community involvement through primary health care services.

There are 2,500 MDR-TB beds and 63 DR-TB sites in the nine provinces, 53 districts, 253 sub-districts and 4,790 health facilities. The services offered to MDR-TB patients include regular clinical evaluation, free provision of injectable and oral medications, laboratory monitoring, HIV testing and care, adherence counselling, and prophylaxis as required.

After the outbreak of MDR-TB cases in KwaZulu Natal, several actions followed including identification and regular support of poorly performing facilities, appointment of more TB nurses and tracer teams, implementation of materials for proper monitoring and evaluation, systematic tracing and screening of contacts, and educational materials at community level.

All smear–negative, culture-positive MDR-TB patients are eligible to start ambulatory treatment. Stable, smear-positive MDR-TB patients without extensive disease are admitted until they have two negative smear microscopy results a month apart. MDR-TB patients with extensive disease and XDR-TB patients are admitted until consecutive culture-negative results are obtained.

South Africa’s guidelines, protocols, and definitions are based on the WHO Guidelines for the Programmatic Management of MDR-TB. Intensified case finding is conducted among TB patients at high risk of MDR-TB: failure of retreatment regimen (Category II or chronic patient), exposure to a confirmed MDR-TB patient, failure of treatment regimen for a new patient (Category I), relapse and default, history of concomitant use of medications that interfere with TB drugs absorption, use of drugs that compete or alter the metabolism of TB drugs, malabsorption or rapid transit diarrhea and HIV are factors that contribute to high risk of MDR-TB.

18 The Electronic Drug Resistant software (EDRWeb) is web-based software that allows authorized users to access a central database and enter data for drug-resistant TB units. EDRWeb is used for the surveillance and management of DR-TB.
19 The Global Positioning System (GPS) is a satellite navigation system used to make it possible for people to pinpoint their geographic location.
Other concerns to tackle include:

- Failures of TB treatment in the private sector and patients who remain sputum smear-positive at month two or three of a first-line anti-TB drug regimen
- Exposure in institutions with previous DR-TB outbreaks or high DR-TB prevalence area such as mines, prisons, homeless shelters, and health centers
- Residence in areas with high DR-TB prevalence
- Treatment in health centers with poor TB program performance.

The National Reference Laboratory is functioning well in the country and has an external quality assessment program that covers approximately 95 percent of centers nationwide. South Africa has less than one smear microscopy center per 100,000 populations which does not meet the target of the Global Plan to Stop TB 2011-2015. Fluorescent Light Emitting Diode (LED) microscopy is presented in 97 percent of the microscopy centers.

The WHO-recommended second line Drug Susceptibility Testing (DST) is available in the country. The laboratory network in South Africa, as part of a High TB and High MDR-TB burden country has conventional drug susceptibility testing, liquid culture and rapid speciation test, line-probe assay for detecting resistance to rifampicin and isoniazid, GeneXpert MTB/RIF for diagnosis of TB in persons at risk of HIV-associated TB and GeneXpert MTB/RIF for diagnosis of Drug-resistant TB in persons at risk.

South Africa alone accounts for 43 percent of the GeneXpert MTB/RIF and 60 percent of the cartridges procured globally. It is aiming to position GeneXpert MTB/RIF as a replacement for microscopy for the diagnosis of TB; at least one hundred labs in the country are using GeneXpert MTB/RIF. The experience in implementing and scaling up GeneXpert MTB/RIF nationwide is unique and can provide important lessons to other countries around the world.

Sizwe Tropical Disease Hospital is a dedicated MDR-TB Hospital with an average of 225 patients. It is one of the eight hospitals that provide MDR-TB treatment as well as surgical intervention. Patients remain hospitalized until they become culture-negative in two consecutive samples. The MDR-TB regimen for adults and children more than eight years old include six months of Kanamycin, Moxifloxacin, Ethionamide, Terizidone, and Pirazinamid, follow by 18 months of Pyrazinamide, Moxifloxacin, Ethionamide, and Terizidone. In children under eight years old, the regimen includes six months of Amikacyn, Levofloxacin, Ethionamide, Terizidone and Pyrazinamide followed by 18 months of Pyrazinamide, Levofloxacin, Ethionamide and Terizidone.

The therapeutic regimen for MDR-TB at the hospital achieved an 86 percent culture conversion at month six. The challenge, however, is following discharge from the hospital where adherence to treatment is affected by financial or work-related reasons. There is a lack of access to new drugs like Linezolid, which make designing a proper regimen for XDR-TB more difficult. Adverse effects are assessed using a check list and are reported promptly to and managed by the supervising unit. Clofazimine is used in one of the major hospitals.

The medical records of patients are completed daily and updated monthly on the paper-based and electronic DR-TB register (EDRWeb). Each hospital has a person responsible for data management and complete case finding, case holding, and treatment outcome reports. TB Data is kept at the Central MDR-TB Unit, Decentralized MDR-TB unit, and primary health care (PHC) facilities allowed to do so by DoH and provinces.

Lesotho

In 2012, the case detection rate for TB was 83 percent, the TB prevalence rate (including HIV) was 424 and the TB incidence rate (including HIV) was 630 per 100,000 people. There were 10,776 new and relapse cases reported in 2012 comprised of 3,298 smear-positive among new cases, 5,142 smear-negative/unknown new cases, and 1,877 extrapulmonary new cases. A reported 1,195 retreatment cases
and 459 relapses occurred. The male/female ratio among TB patients was 1.2/1. The contribution of public-private and public-public mix (PPM) to notification of TB cases was 10 percent.

During 2011, 11,971 patients were notified (new and retreat); among them 7,878 were HIV-positive TB patients, of whom 97 percent were on co-trimoxazole preventive therapy (CPT) and 53 percent on ART. Also, 16,403 HIV-positive people were provided with intermittent preventive treatment (IPT). Among identified HIV-positive TB patients, 97 were started on CPT (one of the 41 high TB/HIV burden countries who exceeded the target). The percentage of TB patients who tested HIV-Positive is 75 percent. The HIV status is known in 88 percent of TB patients (10,476). The treatment outcomes for the 3,666 notified patients in 2011 were below the recommended targets. The treatment outcomes for retreatment cases in that same year (n=1,728) were also poor, with high death and defaulter rates.

Data presented at the Project Implementation Committee (PIC) meeting in July 2014 showed a TB incidence of 633/100,000, treatment success rate of 72 percent, and a TB/HIV coinfection rate of 75 percent. Ten percent of the registered TB cases are mine workers and 30 percent of the registered MDR-TB cases are mine-workers. There is no recent drug resistance data at national level and this may limit scaling up of an effective and directed MDR-TB program.

In 2007, the Ministry of Health in collaboration with Partners in Health launched the country’s first community-based treatment program for MDR-TB to address a growing epidemic and extremely high rates of HIV/TB coinfection. To date more than 800 MDR-TB patients have entered this program based at Botsabelo Hospital in Maseru. The facility serves as a training center for the management of MDR-TB and TB/HIV coinfection for clinicians from throughout Africa.

In 2012, the construction of the new government-run national TB reference laboratory was completed. However, no recent drug resistance data at national level has been collected. Although the 2013 WHO report records 46 confirmed cases of MDR-TB, the number of estimated cases was over three times higher at 170 cases.

The estimated number of MDR-TB cases among new pulmonary cases and among previously treated cases stood at 77 and 94 respectively. In a cohort of 134 confirmed MDR-TB patients enrolled between January 2008 and September 2009, predictors of increased hazard of failure or death in a multivariable analysis were low and severely low body mass index, and a history of working in South Africa.

Several international and academic organizations as well as local NGOs, are supporting the NTP in a coordinated manner. For example:

- University Research South Africa (URSA) will be partnering with ICAP & TEBA to continue provision of TB services to mine workers and their families.
- URSA is collaborating with the ex-mineworkers Association to provide services to the community using Community Care givers in Mohale’s Hoek district.
- TB REACH Project (ICAP/MOH/TEBA), which focuses on rapid implementation of innovative interventions to increase TB case finding and successful treatment among Basotho mineworkers and their families in Maseru, Mafeteng and Leribe districts, is targeting 28,000 mineworkers and their families employed through TEBA.

The program integrates MDR-TB and HIV care at the community, clinic and hospital levels. Patients who are critically ill at the start of the treatment or have severe adverse effects are hospitalized for clinical management. A team of community nurses assists with a home visit prior to patient discharge and, following discharge, is integral to continued patient care. MOH and partners are using WHO Guidelines for the Programmatic Management of Drug Resistant Tuberculosis (2011).

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20 University Research South Africa (URSA) is now Aquity Innovations.
There are 0.9 Smear labs per 100K population, and five labs use GeneXpert MTB/RIF. There is a National Reference Laboratory, but the second line DST is not available in the country, and samples are sent to Supra National Reference Laboratories.

The Lesotho MDR-TB Program integrates MDR-TB and HIV care at the community, clinic, and hospital levels. Patients who are critically ill at the start of treatment or have severe adverse effects, are hospitalized at a specialized inpatient facility in Maseru, where a clinical team manages HIV and MDR-TB coinfected patients. When ready for discharge, a team of community nurses assesses the home situation, educates the family, and arranges for a trained community health worker (CHW) to provide twice-daily DOT in the patient’s home for both antiretroviral therapy and second-line anti-TB drugs. The patient is accompanied by the CHW to the monthly clinic visits for co-management of HIV and MDR-TB.

The MDR-TB regimen includes an intensive phase of 6-8 months, which includes the use of one injectable agent (Kanamycin or Capreomycin) plus 5 other effective drugs for the period. The continuation phase includes 5 drugs and has a 12- to 18-month duration. The choice of quinolones in the regimen includes Moxifloxacin, Levofloxacin or Ofloxacin. The other drugs used in the MDR-TB regimen are Ethambutol, Pyrazinamide, Ethionamide and Cycloserine. CHWs received regular training on HIV and MDR-TB and close supervision, including surprise spot visits by the community nurses. Feedback from the CHWs to the nurses on call occurs regarding severe side effects or clinical deterioration experienced by the patients, and further management is planned.

Patient care has a holistic approach that includes social, psychological and economic support. Patients receive a food package and reimbursement for travel expenses related to treatment. Adherence and psychological support are both offered through the CHWs. MDR-TB drugs are provided through the Global Drug Facility mechanism. The warehouse for the TB drugs has Good Storage Practice per WHO guidelines. There is no record of stock out in the previous year. A web-based Electronic Medical Record system tracks HIV-positive patients. Using satellite and solar electricity, each clinic sends progress updates on individual patients to a centralized database, where scheduled reporting alerts clinicians and administrators to patient progress, the overall health of each patient, and issues across the country. Similar software is used for the clinical management of MDR-TB patients. Monitoring and evaluation (M&E) staff perform regular onsite audits and check automated non-clinical inconsistency reports. For future MDR-TB treatment sites, it is suggested that a data entry point be established. This will allow for current clinical and programmatic management of patients.

**Swaziland**

Swaziland has one of the highest TB incidence rates in the world as well as a high HIV prevalence. More than 85 percent of notified TB cases have a documented HIV test. The TB HIV coinfection rate is 77 percent. The percentage of HIV-positive TB patients enrolled on CPT in 2012 exceeded 90 percent.

In 2012, the TB prevalence rate (including HIV) was 907 and the TB incidence rate (including HIV) was 1350. The rate of notified new and relapse cases was 582 and the case detection rate was 43 percent. A total of 7,165 new and relapses cases were reported in 2012; 2,548 were smear-positive new cases, 3,111 smear-negative/unknown new cases, and 1,209 extra-pulmonary new cases. There was a total of 871 retreatment cases, 297 relapses and 574 retreatments excluding relapses.

There has been a decline in index TB cases since 2010, with 11,057 TB cases reported in 2010 and 7,741 in 2012. The proportion of males to females who are diagnosed with TB each year remains equally distributed. Among new pulmonary cases 45 percent were smear-positive.

There are challenges in providing second line DST evaluations as the Supranational Reference Laboratory in South Africa is no longer available to provide this service. Among notified TB cases, there is an estimated number of 730 cases of MDR-TB, but only 280 cases were confirmed. Seven percent of MDR-TB occurred among new cases, and 37.9 percent among retreatment cases. Among notified new pulmonary cases, the
estimated number of MDR-TB cases was 430 (270-590) and among notified previously treated cases, the estimated number of MDR-TB cases was 290 (250-340). The combined cured and completed treatment outcomes was 57 percent in MDR-TB cases in 2009, with a high death rate of 27 percent.

The list of stakeholders for TB and HIV includes the Swaziland Stop TB Partnership, Médecins Sans Frontières (MSF), Swaziland Association for Positive Living for Life, Good Shepherd Hospital, University Research Corporation (URC), Muna Health Life Institute, Swaziland Church Forum, the Centers for Disease Control and Prevention, Traditional Health Practitioners, and Phumulela Clinic. Additionally, WHO, the World Bank Group, the President's Emergency Plan for AIDS Relief (PEPFAR), URC, MSF, Management Sciences for Health, and iCAP support the National TB Control Program.

It is suggested that a timeline for the implementation of harmonized management of TB in the mining sector be drafted. At the same time, it is important to secure the existing budget, and increase the funding for appropriate management of MDR-TB and XDR-TB cases. The program manager has coordinators for each of these thematic areas: TB/HIV, DOTS, pharmacy, laboratory, research and M&E, grant management, Stop TB partnership, MDR-TB, and childhood TB. At the regional level, there are four TB coordinators and two MDR-TB coordinators. There is also a TB focal person in each of the 73 health facilities nationwide.

A community-based organization that is part of the Stop TB partnership is assisting the TB Program. Incentivized strategies are linked to treatment and completion of treatment. In some regions, the treatment is provided at home. The program has printed guidelines for the programmatic management of tuberculosis. Regular activities have been introduced to strengthen the TB program and to prevent the escalation of MDR-TB.

The use of line probe assay (LPA), mycobacterial growth indicator tube (MGIT), and GeneXpert MTB/RIF have improved diagnostic capacity in the country. Eighteen GeneXpert machines were installed in the country by the end of 2012. GeneXpert MTB/RIF is the initial diagnostic test for all the persons with presumptive tuberculosis due to high HIV and MDR rates among incident cases. All retreatment cases, return after loss of follow up, health care worker status, contacts and lack of conversion after the second or sixth month of treatment in category one are indications for drug-susceptibility testing (DST). Sputum smear microscopy is used for bacteriological monitoring of treatment in the 2nd, 3rd and 5th month of treatment. The preferred method for sputum smear examination is LED microscopy. There are 1.5 smear laboratories per 100,000 people, which is adequate. The total number of laboratories using GeneXpert MTB/RIF is 19. There is a functioning National Reference Laboratory, but there is no capacity to perform in-country DST. In 2012, five laboratories in Hhohho region, six in Manzini region, five in Lubombo and three in Shiselweni participated in external quality assurance (EQA). The EQA data, QA data, and EQA for in-country regional labs for 2013 was not available at the time of the visit.

The cumulative number of MDR-TB cases since the first case was documented in 2006 is approximately 700. The national treatment success improved from 58 percent in 2008 to 73 percent in 2012. Cure rate among retreatment cases is 51 percent. In some regions, the treatment including an injectable is provided at home by the nurse. The current National TB Guidelines provide recommendation for regimens for Mono/Poly resistant TB. Training on interpretation of chest X-rays is recommended for health professionals. Standardized DR-TB regimen is based on the DST survey done between 2009 and 2010 and consists of an 8-month intensive phase using Kanamycin or Amikacin, Levofloxacin, Ethionamide, Terizidone or Cycloserine, para-aminosalicylic acid (PAS), and pyrazinamide. This is followed by the continuation phase of 12 months of levofloxacin, Ethionamide, Terizidone (or Cycloserine), PAS and pyrazinamide. The regimen for XDR-TB patients includes 12 months of Capreomycin, Moxifloxacin, Ethionamide, Terizidone or Cycloserine, Para-aminosalicylic acid, pyrazinamide, Amoxicillin/clavulanic acid, Clofazamine, and high-dose isoniazid (INH) initially, followed by 24 months of the same combination without Capreomycin.

The death rate remained high in 2012 at 8 percent of new cases and 17 percent for retreatment cases. Access to some second line drugs (Group 5: Bedaquiline, Linezolid, Imipenem/Clistatin plus Clavulanate, Meropenen plus Clavulanate) is limited and costly. During the survey, there was no scheduled visit to clinics to review the chart of MDR-TB patients. During the interviews, no serious adverse events were reported. There are drugs available for the proper management of side effects in patients using second line drugs for MDR-TB treatment. The use of fix-dose combinations for Category I patients facilitates adherence to treatment. There is a hospital facility with proper infection control practices for the management of MDR-TB patients in the first weeks of the treatment. Thereafter, treatment continues on an ambulatory basis. Treatment has also been gradually decentralized from one to seven hospitals.

There was no mention of stock outs of first and second line TB drugs during 2013. The ordering, storage, and distribution of TB drugs has been centralized and integrated into the Ministry of Health system, and is now fully coordinated by the Central Medical Stores. A dedicated pharmacist is responsible for the management of TB medicines and supplies. There is updated basic information on performance that generates an annual WHO-format report on case finding and treatment. There is no electronic medical record system available. The M&E of the TB Program activities is a paper-based, manual system shared between facilities and regional and program level authorities to provide summary aggregate patient data. The M&E Unit provides information on key program indicators collected from TB registers, DR-TB registers, patient cards, laboratory registers, and summary DOTS reports.

**Mozambique**

Mozambique is one of 12 countries that reported the highest number of missed cases; cases either not diagnosed or diagnosed but not reported to the NTP. There is also uncertainty about the level of and trends in mortality. The estimated rate of case detection is low, at around 50 percent. Diagnosis and treatment is freely available through the NTP. It is one of the African countries with a high HIV prevalence. More than 90 percent of the notified TB patients had a documented HIV test and 98 percent of TB HIV co-infected patients are enrolled on CPT. In 2013, the prevalence of HIV in TB patients, with the highest numbers in Gaza and Maputo and the lowest in Niassa and Nampula. Fifty-eight percent of tested TB patients were HIV-Positive, 55 percent of HIV positive TB patients were on ART and 17,317 had been linked to IPT. The TB prevalence (including HIV) was 553 per 100,000 people (111-1340), the TB incidence (including HIV) was 552 per 100,000 people per year (383-753). TB Incidence among those living with HIV was 330 per 100,000 people per year (228-450) and the TB mortality (excluding HIV) was 53 per 100,000 people (3.9–163).

In 2012, there were 47,741 notified new and relapse TB cases. Among the new cases, 20,951 were smear positive, 19,797 were smear negative/unknown and 5,542 extra-pulmonary. Treatment success reported in 2010 was 85 percent for new cases. The treatment outcomes for a cohort of new smear-positive cases (n= 20,917) were: 83 percent cured, 2 percent completed treatment, 8 percent died, 1 percent failed, 4 percent defaulted and 1 percent was not evaluated. Among new pulmonary TB cases, 51 percent were smear-positive. There were 4,537 total TB retreatment cases, of which 1,451 were relapses. There is no recent data available for treatment outcomes among retreatment cases.

A total of 266 confirmed cases of MDR-TB were documented in 2012. The estimated number of cases among those notified is 2,000 and the estimated number of cases of MDR-TB among notified new pulmonary cases is 1,400 (900-2000). The number of cases of smear positive tested for MDR-TB was 205. The surveillance data on drug resistance is more than 5 years old. Data from the National Survey in 2007 showed 3.5 percent MDR-TB among new cases and 11.2 percent in previously treated cases. The 1995 survey documented 12 percent MDR-TB among previously treated TB cases.

Treatment for MDR-TB was introduced in 2006; 214 cases were treated in 2012, and 304 in 2013. The treatment outcomes for the 2011 cohort showed 45 percent cure, 8 percent failure, 16 percent default, 16 percent death and 15 percent still on treatment. The National Referral Hospital has 174 beds for TB patients and 18 for MDR-TB. There is a need to improve infection control measures in the MDR-TB wards. Treatment for MDR-TB is initiated at the hospital and after three months, it is continued at the health center. Eight percent of the patients are HIV coinfected. Supplemental nutritional programming provided by the World
Food Program covers only the first six months on treatment. Eight XDR-TB cases have been reported in the Gaza region.

The NTP has agreed to institute priority actions regarding TB in mines. Several mapping exercises have been conducted in Mozambique, including a prevalence study on Mozambican mineworkers working in South Africa by the National Institute of Health and the MOH in 2013. Nationwide mapping of current mineworkers, ex-mineworkers and other migrants was conducted by TEBA, the Mozambican Mine Workers Association (AMIMO) and the International Organization for Migration (IOM) in 2012, and geographical mapping was conducted by Health Alliance International in four provinces in 2013.

United States Agency for International Development (USAID) provided funding to create an online database to track key populations including mineworkers in Mozambique. The National Council of Combating HIV/AIDS is providing technical guidance to government departments in coordinating activities targeting key populations (including mine workers). AMIMO is providing support to health prevention and promotion activities. In partnership with the Southern African AIDS Trust, they are mapping ex-mineworkers in Maputo, Gaza and Inhambane for social benefit tracing, health care status and data collection. With the support of the NTP, AMIMO will also design a new communication strategy to reach mine workers. TEBA is providing home-based care support to current and ex-mineworkers and their families. They are also ensuring the provision of livelihood support to ex-mineworkers as part of an agreement with mining companies. Family Health International is the main NGO providing technical support on HIV/TB, TB Directly Observed Therapy at community level, and MDR-TB. They acknowledge the lack of expertise on MDR-TB programmatic management at the Ministry of Health and in NGOs. URSA and NTP will analyze all previous mapping exercises conducted in Mozambique and will introduce their work on TB in mines to provincial level. This collaboration will also work to build the capacity of local organizations to work on TB in the mines.

The NTP is recruiting new staff who will take responsibility for the programmatic management of MDR-TB in the country. Due to the lack of beds available at the hospitals for the clinical management of the MDR-TB patients, outpatient care should be a consideration. This will require additional human resources and the involvement of a group of very well-trained community health workers. There were no complete guidelines for the clinical management of MDR-TB patients available online or print version.

Following WHO recommendations in 2009, Mozambique increased the use of more sensitive fluorescent light-emitting diode (LED) microscopy from <1-9 percent. At the time of the assessment, there were 1.2 smear laboratories per 100,000 population and nine laboratories using GeneXpert MTB/RIF. There are no GeneXpert MDR/RIF machines at the National referral hospital; usually they are placed at NGO clinics due to the larger volume of patients. There is a National Reference Laboratory but DST for second line drugs is not available in the country.

The treatment for MDR-TB is considered for the following patients: laboratory confirmed cases of MDR-TB, failures in retreatment cases, close contacts of an MDR-TB case, patients with a history of previous TB treatment using second line drugs. The treatment regimen for MDR-TB includes an intensive phase of at least 6 months of Kanamycin or Capreomycin, Pyrazinamide, Levofloxacin, Ethionamide, Cycloserine and ethambutol, followed by 18 months of Pyrazinamide, Levofloxacin, Ethionamide, Cycloserine and Ethambutol. Cycloserine could be replaced by Para-aminosalicylic acid (PAS). Treatment is administered at a National Reference Hospital. However, the infection control measures and bed capabilities are limited. There is a need to train health professional at national level to scale up the clinical management for MDR-TB. The treatment for MDR-TB is hospital-based for three months and later continues at the nearest health center from a patient’s home as mentioned earlier in the report. The previous work in the country with community health workers on HIV may facilitate their involvement of health care delivery for MDR-TB provided at community level.

To increase the detection of DR-TB cases among patients already in the TB Program, it will be preferable to review on a quarterly basis the performance of patients in Category I smear-positive, make the necessary adjustment to improve the findings, and aim to achieve the target of an 85 percent cure rate. It is also
important to perform cohort analysis of patients in Category II and, based on the results, decide the best moment to place the DR-TB patients into the appropriate treatment. All failures in Category I and patients enrolled in Category II must have an evaluation using rapid test diagnostics such as GeneXpert MDR/TB. If the laboratory results document resistant to Rifampicin, patients should be placed in DR regimen.

The lack of human resources is limiting several important activities for TB control. One of them is contact tracing. There is an opportunity to engage motivated health staff or community members to do the home visits and proceed with the enrolment of contact tracing, provide educational messages and motivate patients to go to the nearest health facilities for a proper screening.

The countries should provide a timeline for the proper implementation of harmonized management of TB in the mining sector, secure the existing budget and increase the funding for proper management of MDR-TB and XDR-TB cases. Ideally the NTP budget, financed by the government or partners, should start including the cost of the participation of community health workers.

Since all the countries start therapy for MDR-TB at hospitals, it is recommended to consider pilot sites where the initiation of MDR-TB therapy is ambulatory and remains the same for the rest of the treatment. Once CHWs, nurse technicians, and nurses are well-trained on the clinical management of MDR-TB cases, they can provide support for the daily monitoring of patients. The home visits will be an opportunity to reinforce adherence to treatment and to identify problems at home that may influence the taking of medicines.

The performance of DST for full panel of first line drugs and second line drugs is limited due to accessibility to Supra-National Reference Laboratory. It is recommended that international partners consider funding this activity due to its relevance to the TB epidemiological situation in the region. The rollout of GeneXpert MTB/RIF is helping to identify DR cases early. However, the clinical management of DR TB patients will require regular smear and culture follow up until the completion of the treatment. Here again, the CHW could do a home visit as a friendly reminder to produce a sputum sample. CHW can get organized as well as provide a courier service for transport sputum samples or deliver lab results to the health centers.

The increased number of XDR-TB cases requires more comprehensive and coordinated efforts for health care delivery. On this matter, the access to good quality TB drugs in the 5th category through Global Drug Facility mechanism is important. Since WHO has recently authorized the use of Bedaquiline, it will be necessary for NTP managers to consider access to this new drug and its use as part of the regimen for XDR-TB patients.

The supervision of proper administration of second line TB drugs is a time-consuming effort and the lack of human resources at MOH leads to a high number of defaulters among DR-TB patients. Therefore, it will be optimal to increase the number of health workers as part of NTP. It will be also an excellent opportunity to engage CHW and with their active participation provide social, economic, and psych-emotional support to TB patients and relatives sharing the same household. In areas where the number of patients is high, it is recommended to integrate them into existing social protection programs.

The integration of CHWs into the TB team at the MOH will require ad-hoc training. The exchange of knowledge with teams from other countries facing similar problems is encouraged. The translation of training materials into local language(s) is recommended to facilitate sustainability of the intervention and to scale up the number of participants.

**Recommendations**

- Improve the diagnosis, management and follow up of DR-TB.
- Increase detection of DR-TB by appropriate monitoring of patients in the TB program for treatment failure including good access to reference laboratories.
- Improve detection of DR-TB in new patients by use of appropriate technology, for example, GeneXpert testing.
• Improve contract tracing efforts. This may require the use of existing staff or engaging with community caregivers.
• Review budgets to ensure attention is paid to DR-TB including diagnostics, therapeutics and human resources.
• Incorporate community health workers into the workforce and ensure appropriate training for them.
• Training of nurses in the management of DR-TB so that the initiation of MDR-TB therapy is ambulatory and remains the same for the rest of the treatment.
• Ensure access to appropriate drugs for the treatment of XDR-TB including the availability of WHO-approved Bedaquiline.
• Provide social, economic, and psycho-emotional support to TB patients and relatives sharing the same household. In areas where the number of patients is high, it is recommended to integrate them into existing social protection programs.

References


PART 5: OCCUPATIONAL HEALTH AND COMPENSATION SERVICE
In an effort to gain a broader understanding of and to respond to the occupational health needs of mineworkers in southern Africa the South Africa Knowledge Hub commissioned a study on the occupational health, legal and institutional frameworks in the southern Africa region, current OHS models and packages, and service delivery gaps. Four study countries were identified: South Africa, Tanzania, Zambia and Zimbabwe. The aim of the study was to suggest minimum occupational health service packages and a model that can be applied in the mining sectors in the wider region. A rigorous review of scientific and unpublished literature related to occupational health and safety services and needs among mineworkers in southern Africa formed the first stage of this study. The second stage included a stakeholder analysis, followed by four country studies, which built on preliminary findings. Interviews were conducted based on guidelines containing a collection of key questions. In each country, 20 – 30 interviews were conducted.

The results of the country studies were put into context using international frameworks for occupational health and safety, and particularly the Basic Occupational Health Services (BOHS) model. The Finnish Institute for Occupational Health designed the BOHS model, informed by ILO Conventions Nos. 161 and 155. It is an application of the Alma Ata principles of occupational health and the “Global strategy on occupational health for all.” The BOHS model describes four stages of occupational health services development, as illustrated in Figure 1.1 below.

Figure 1.1: Basic Occupational Health Service model illustrating Stepwise Development of Occupational Health Services.

(ODs = occupational diseases, PHC = Primary Health Care, OHS = occupational health services, SME = small and medium-sized workplace, SSE = Small enterprise, SE = Self-employed, IFS = Informal sector). Source: Adapted from Timo Leino, FIOH, 2008; Ref. J. Rantanen, S. Lehtinen).

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22 This chapter is based on a report, “Study on occupational health service delivery in the Southern African region to establish minimum packages and models for provision of occupational health services,” by Health Focus; June 2016. See http://www.health-focus.de/mining-sector-health-services-package.188.en.html
BOHS Stages I and II are primarily designed for the smallest micro-enterprises, the self-employed, and the informal/artisanal sector where the application of comprehensive international standards is virtually impossible. Big industries such as large-scale mines in this context and well-organized small and medium sized enterprises or mines should, however, always establish Stage III services, which are aligned to the ILO Conventions Nos. 161 and 155. Stage IV services are comprehensive employee wellness programs, which extend beyond occupational health and safety concerns.

The study describes the following in the 4 study countries:

- National socio-economic framework,
- Mining sector,
- Occupational health and safety,
- Organization and management of occupational health services, and
- Compensation of occupational injuries and diseases.

Mining plays a significant role in the development process of SADC by creating wealth and employment, and a market for other industries such as manufacturing and services. Recognizing that a thriving mining sector can contribute to economic development, alleviation of poverty and an improved standard and quality of life throughout the region, Member States of SADC have signed a Protocol on Mining agreeing to adopt internationally accepted regional standards within the mining sector (Enforced 10/02/2000). The Protocol outlines that signatories "agree to cooperate in improving the practices and standards of occupational health and safety in the region’s mining sector.” Occupational Safety and Health (OSH) and Occupational Health Services (OHS) are explicitly mentioned in the SADC Protocol on Health, which was approved by the SADC Heads of State in August 1999 and implemented in August 2004: “States Parties shall assist each other in the development and delivery of integrated occupational health services and cooperate in reducing the prevalence of occupational injuries and diseases.”

National socio-economic frameworks in study countries
The four study countries differ significantly in terms of their socio-economic status. South Africa and Zambia are considered middle-income countries, with Zambia classified a lower middle-income country (GNI per capita ranging from US$ 1,045 to US$ 4,125). Tanzania and Zimbabwe are considered low-income countries (GNI per capita below $1,045). Thus, their capacities to develop, monitor, and particularly enforce occupational health and safety regulations show considerable differences. These differences in capacity also characterize the availability and accessibility of health services in general.

South Africa
The South African economy has come under significant pressure of late, with structural issues ranging from debilitating labor disputes to electricity disruptions, coupled with external headwinds including slowing demand from major trade partners Europe and China. Falling international commodity prices and monetary policy normalization by the US Federal Reserve have also impacted the economy. The structural obstacles facing South Africa and its general level of development have resulted in the economy lagging the steady growth pace of many other African states. Growth will quicken in 2017 but will remain subdued at 2.6 percent, in view of heightened global uncertainties, including the prospect of further slowdown in China. Electricity supplies are poised to improve as additional units at new power plants are commissioned, but there is a risk of further delays, and power tariffs will remain on an upward trajectory, adding to business and household costs.

South Africa has almost all the commodities essential for international competition except crude petroleum products. However, the two-tiered nature of the economy continues to constrain the country’s potential; one rivalling developed countries and the other with only the most basic infrastructure. The economy is productive and industrialized around urban nodes, but at the same time exhibits many characteristics associated with developing countries, including a division of labor between formal and informal sectors. The country has one of the highest Gini coefficients in the world, indicating a significant disparity between the
income and wealth of its poorest and richest citizens. In 2010, 53.8 percent of the population was still living below the poverty line.

**Tanzania**
Tanzania’s economy has been growing strongly in the past years, recording GDP growth of 7.3 percent in 2013, up from 6.9 percent in 2012. Tanzania’s economy is driven by strong gold production, tourism, information and communications, construction, manufacturing and other services. Medium-term prospects are favorable, with GDP growth projected to remain above 7 percent, supported by public investments in infrastructure, particularly in the transport and energy sectors. Agriculture remains the mainstay of the economy (one-quarter of GDP), employing 80 percent of the workforce, and providing 85 percent of exports. But the sector is plagued by infrastructure gaps and low productivity. The Economist Intelligence Unit (EIU) expects economic growth to remain brisk, with annual real GDP growth forecast to average 6.9 percent in 2016-2020. This outlook reflects rising private consumption and strong growth in construction and services. Tanzania has managed to decrease the percentage of its population living below the poverty line from around 34 percent to 28.2 percent between 2007 and 2012, the first significant decline in the last 20 years.

**Zambia**
The Zambian economy has previously experienced strong growth and was one of the fastest growing economies in Africa with real GDP growth averaging 6.3 percent in 2011-2014. A significant contributor to Zambia’s growth can be attributable to the privatization of government-owned copper mines in the 1990s which relieved the government from covering mammoth losses generated by the industry and greatly increased copper mining output and profitability to spur economic growth. Copper output has steadily increased since 2004 due to higher copper prices and foreign investment. The economy depends heavily on the copper sector, which brought in on average 71 percent of export revenues during the past five years and accounted for almost 10 percent of GDP in 2014. This leaves the country highly exposed to reduced global copper prices and demand, as well as to China’s economic conditions, which has been a significant factor since 2015. The Economist Intelligence Unit (EIU) expects growth to remain weak in 2016, slowing from an estimated 3.9 percent in 2015 to 3.6 percent (which would be the lowest rate since 1998), as public investment is cut, high inflation dents local confidence and monetary policy is tightened. In addition, political positioning ahead of the 2016 elections will cause policy uncertainty and weaken consumer and investor confidence.

**Zimbabwe**
Zimbabwe’s real GDP was projected to be 3.2 percent in 2015, driven by planned investments in agriculture, mining, communications and other infrastructure projects, including in the water and energy sectors. Against the background of weak domestic demand, tight liquidity conditions, and the appreciation of the US dollar against the South African rand, inflation was slightly negative in 2014, and remained low in 2015. Industrial capacity utilization continues to decline, and is estimated at 36.3 percent owing to underproduction and lack of competitiveness. The EIU expects economic growth in Zimbabwe to remain well below the levels envisaged in the government's five-year economic program, the *Zimbabwe Agenda for Sustainable Socioeconomic Transformation*, which was announced in late 2013. This projects growth ramping up to 9.9 percent by 2019, with expansion being driven by the agriculture, mining, transport, and information and communications technology sectors, and general infrastructure development. However, Zimbabwe continues to struggle to attract adequate financing for the program, and foreign investors continue to be deterred by its indigenization program and general policy environment.

**Mining sector**
The mining sector plays an important role in the economy of all four study countries. While the mining sector in South Africa is mainly formalized, with large- and medium-scale mining houses leading the sector, Tanzania and Zimbabwe have a rapidly growing non-regulated artisanal small-scale mining sector contributing significantly to the countries’ economies.
South Africa
South Africa is one of the most mineral and resource rich countries in the world, and mining commodities form a major part of the country’s exports (60%). The country is a leading producer and supplier of a range of minerals; in 2013 it produced approximately 53 different minerals from 1,712 mines and quarries. Gold was produced from 53 mines, platinum-group metals (PGMs) from 43 mines, coal from 143 mines, and diamonds from 388 mines, all as primary commodities.

The depreciation in commodity prices over the last year has been a major negative factor affecting the South African economy. Total mining production receded in the third quarter of 2015, subtracting 0.8 percentage points from growth in aggregate GDP. Key factors were decreases in the production of platinum, diamonds, iron ore and manganese ore. Production volumes of coal and gold mines, however, remained broadly unchanged over the period. Platinum production declined in the third quarter of 2015 affected by, among other factors, scheduled maintenance to platinum furnaces and Section 54 safety stoppages. A global oversupply of iron ore alongside sluggish demand and attempts to contain operational costs gave rise to lower production levels at certain iron ore mines.

Job-shedding continued in the mining sector in the second quarter of 2015, albeit at a much slower pace than before. Employment levels in the non-gold mining sector decreased marginally in the second quarter of 2015, following a moderate pickup in the first quarter, while the pace of job-shedding in the gold-mining sector moderated in the second quarter of 2015. Following protracted and tough wage negotiations since June 2015, three- and two-year wage settlements were eventually reached among the majority of trade unions and employers in the gold- and coal-mining sectors respectively in October 2015. However, prospects for employment growth in the mining sector remain bleak, as international commodity prices have been falling since 2011, with the decline gathering renewed pace in 2015 owing to reduced demand from China and a global oversupply of commodities. These developments, together with escalating operational costs and a strained labor relations environment, are threatening the longer-term sustainability of some domestic mining operations.

Tanzania
Tanzania’s mining sector has experienced exceptional growth since the mid-nineties, with an average growth rate between 10 and 15 percent per annum. Nevertheless, the sector’s contribution to the GDP, which was less than one percent in 1997 and 3.5 percent in 2013, is still relatively low. The mining sector has been identified as an important sector for growth in Tanzania’s National Strategy for Growth and Reduction of Poverty and Tanzania’s Mineral Policy (2009). Tanzania tries to attract foreign investors and facilitate growth of the sector as part of the country’s vision to be realized by 2025. In addition to investments into large mining operations, Tanzania has encouraged small-scale and artisanal mining through granting of so-called primary mining licenses to Tanzanian nationals; more than 35,000 licenses have been issued. This mining segment has grown rapidly, but it has also brought about numerous challenges, particularly where the health of mineworkers and the environment are concerned.

Zambia
Zambia’s mining sector has experienced significant foreign investment since the privatization of the state-owned copper mines in the 1990s, and the country largely depends on this sector. By 2011 and 2012, mining taxes plus royalties had risen to account for over 30 percent of total government tax revenue from only 8 percent in 2006. Copper and cobalt are the main commodities produced in Zambia, followed by lead, zinc, silver, gold and emeralds. Zambia produces nearly 20 percent of the world’s emeralds. The Copperbelt and North-Western provinces are the primary centers of mining activities. The Ministry of Mines and Minerals Development issues different mining licenses to large and small investors:

- Prospecting license: Renewable right to prospect for any mineral over any size of area for a period of 2 years.
- Large-scale mining license: Exclusive rights to carry out mining operations in area above 400 hectares for a maximum of 25 years. Applications need to be accompanied by environmental protection plans.
• Small-scale mining license: Areas not exceeding 400 hectares are valid for 10 years and are renewable.
• Artisans’ mining rights: Local citizens have the right to mine on an artisanal basis in an area not exceeding 5 hectares, are valid for 2 years and are non-renewable.
• Gemstone license: Holders of this license may carry mining operations over an area not exceeding 400 hectares, for a period of not more than 10 years.

In 2013, the country was ranked seventh among copper mining countries of the world—behind Chile, Japan, Peru, USA, Austria and Russia. Copper production increased from 570,000 tons in 2008 to 800,000 tons in 2013. Despite production gains, Zambia has been facing serious economic difficulties since 2008, when commodity prices on the world market fell sharply. In 2014, the large copper mines started lowering copper production, which led to the dismissal of thousands of mineworkers.

Zimbabwe
The mining industry is key to Zimbabwe’s economic and social recovery and contributed approximately 8 percent towards the country’s GDP in 2011. Beside the formal mining sector driven by foreign investments, Zimbabwe has a large non-regulated mining sector, with small-scale and artisanal mines. This practice started in the 1990s when Statutory Instrument 275 came into force, under which rural districts councils were allowed to issue River Bed Panning Licenses to resident gold mineworkers. The contribution of artisanal mineworkers to Zimbabwe’s overall gold production is significant. It is estimated that in 2011, the monthly amount of gold produced by artisanal mineworkers rose from 125 kg in January to 429 kg in December. These figures seem realistic; small-scale mineworkers in Gweru, for example, reported producing up to 2 kg per months using various gold processing methods. Table 1.1 below presents an overview of the mining sector in each of the countries.

Table 1.1: Key data on mining sector in study countries

<table>
<thead>
<tr>
<th>Mining sector overview</th>
<th>South Africa</th>
<th>Tanzania</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important commodities</td>
<td>Gold, diamonds, platinum, coal, chromium, iron, vermiculite, copper, a.m.</td>
<td>Gold, tin, phosphate, iron ore, coal, graphite, diamonds, tanzanite, gemstones, nickel, a.m.</td>
<td>Copper, cobalt, lead, zinc, coal, silver, gold, emeralds, gemstones, a.m.</td>
<td>Gold, diamonds, iron, palladium, platinum, rhodium, selenium, silver, tin, barite, graphite, a.m.</td>
</tr>
<tr>
<td>Contribution to exports</td>
<td>60% (2013)¹</td>
<td>52% (2013)²</td>
<td>80% (2014)³</td>
<td>52% (2014)⁴</td>
</tr>
<tr>
<td>Contribution to GDP</td>
<td>8.6% (2013)¹</td>
<td>3.5% (2013)²</td>
<td>7.2% (2014)³</td>
<td>22% (2014)⁴</td>
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<tr>
<td>Labor force (formal employment)</td>
<td>500,000</td>
<td>15,000</td>
<td>92,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Estimated labor force in informal/artisanal mining</td>
<td>No estimates</td>
<td>750,000</td>
<td>30,000</td>
<td>400,000</td>
</tr>
</tbody>
</table>


Occupational health and safety systems in study countries
All the study countries have put into place comprehensive legislative frameworks to ensure occupational health and safety in the mining sector, including compensation for occupational injuries and diseases. In addition, all the countries, with the exception of Zimbabwe, recognize TB as an occupational disease when contracted in the context of mine work.
South Africa

Although South Africa ratified the ILO Convention No. 155, it has not yet put in place a single overarching occupational health and safety law or statutory instruments. However, various laws do exist that have a direct bearing on the delivery of occupational health services by requiring medical surveillance and evaluation of the work environment. The country’s mining sector is regulated by the Mine Health and Safety Act (MHSA), which was enacted in 1996 and heralded a new era of progressive and forward-looking legislation that would enable the protection of health and safety in the mines. The aim of the Act is to protect the health and safety of employees, and it places firm accountability on the mine owner to do so. However, there is also a firm obligation on both employers and employees for health and safety, recognizing that contractors are included as employees of the mine. The MHSA is administered by the Department of Mineral Resources (DMR), responsible for overseeing the mining industry and the exploitation of the mineral resources in South Africa. The Mine Health and Safety Inspectorate (MHSI) situated within the DMR is the country’s largest specialist occupational health and safety inspectorate. In line with the MHSA, the DMR has developed Codes of Practice that the South African Mining Industry (SAMI) must adhere to. These are enforceable by law, and when audited by the inspector of mines, a mine is expected to produce codes of good practice applicable to their specific mining environment and context.

South Africa’s Department of Health (DoH) administers the Occupational Diseases in Mines and Works Act (ODMWA) of 1973, which provides for the medical surveillance and compensation of lung and heart diseases contracted in controlled mines and works. The regulator is the Compensation Commissioner for Occupational Diseases (CCOD). The Medical Bureau for Occupational Diseases (MBOD) of the DoH provides benefit medical examinations (BME) for workers and processes ex-mineworker claims submitted at sites such as at the occupational health one-stop service centers (OSSCs).

The Department of Labor (DoL) administers the Compensation for Occupational Injuries and Diseases Act (COIDA) of 1993, which covers all sectors of the economy other than informal workers and those under ODMWA. The primary agency responsible for regulating work-related accidents and diseases for workers employed in the formal sector, except mining, is the Chief Directorate: Occupational Health and Safety in the DoL. It provides no-fault compensation for employees injured in accidents or who sustain occupational diseases arising out of and during their employment. All employers are obliged to register with a “carrier,” either the Compensation Commissioner of the Compensation Fund or an approved designated mutual. Employers are then required to provide their respective carrier with the particulars of their businesses and failure to register with a compensation fund constitutes an offence. There are laws also covering occupational safety and health in the aviation, maritime and transport sectors.

Tanzania

Tanzania’s Factories Ordinances Cap. 297 of 1950 was replaced in 2003 with the new Occupational Health and Safety Act No. 5. Although Tanzania has not yet ratified ILO Convention 155, the Act provides for the safety, health, and welfare of persons at work in factories, construction, and agriculture—including workplaces in the private and public sectors, local government services, and public authorities. There are no extra provisions for the mining sector. The Act addresses identification, registration, inspection, monitoring and evaluation of all OSH issues on mainland Tanzania and provides outreach, training, education, and assistance to employees and employers in registered workplaces. Section 96 of the Act requires every employer with more than four employees in any factory or workplace to prepare a written policy on the protection of health and safety of employees and a description of the organization for implementing their OHS policies. The employer is required to prepare guidelines about the implementation of the contents of the policy and distribute copies of the policy and guidelines to all employees. The Auditor General noted that many workplaces do not have such policies. In addition to the Act, the country has also adopted including the following, providing for protection in industries that are perceived to be more hazardous than usual:

• Mining Act of 2010.

The Employment and Labor Relation Act No. 6 of 2004 also contains provisions for OSH, although it is primarily concerned with industrial relations matters rather than worker safety. The Workers’ Compensation Act of 2008 replaced the outdated Workmen’s Compensation Ordinance from 1949, and makes provisions for compensation of injuries, diseases or death arising during employment. The Workers Compensation Fund was established in 2015 and became operational by the end of 2016.

Zambia
Zambia does not have an overarching occupational safety and health legislation or policy as required in accordance with the principles of Article 4 of the ILO Occupational Safety and Health Convention No. 155 of 1981. The following Acts govern occupational health and safety in the country’s mining sector:

• Factories Act, Cap.441 of the Laws of Zambia.
• Mines and Minerals Development Act No.7 of 2008.
• The Workers Compensation Act, No. 10 of 1999 (supersedes the former Pneumoconiosis Act).
• Explosives Act No. 115.
• Employment Act, Cap. 268 of the Laws of Zambia.
• Industrial and Labor Relations Act, Cap. 269 of the Laws of Zambia.

As per the Report of the Auditor General on the Management of Occupational Safety and Health (June, 2015), there are eight pieces of legislation that pertain to the occupational health and safety of the Zambian workforce. Four of these are of specific relevance for OSH in the mining sector.

The Occupational Health and Safety Act No. 36 of 2010, was enacted in 2010. While the commencement order was issued in 2012, by May 2015 it was still not fully implemented. However, measures are underway to rectify the situation and implement the Act through the development of regulations and guidelines. The Act establishes the Occupational Health and Safety Institute (OHSI) and provides for its functions. It further provides for the establishment of health and safety committees at workplaces for the health, safety and welfare of persons at work. It defines the duties of manufacturers, importers and suppliers of articles, devices, items, and substances for use at work and provides for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work.

The Factories Act of 1964 makes further and better provision for the regulation of the conditions of employment in factories and other places as regards the safety, health and welfare of persons employed therein. It also provides for the safety, examination, and inspection of certain plant and machinery. The coverage of the Act is restricted to factories and does not provide for establishment of health and safety committees, neither does it specify the development of OHS policies.

The Workers Compensation Act (10) 1999 was promulgated to revise the law relating to the compensation of workers for disabilities suffered or diseases contracted during employment. This Act provides for compensation of TB and pneumoconiosis, but not for any other occupational disease. It provides for the medical examination and certifications of fitness to work on a mine. It also provides for the payment of compensation to dependents of workers who die because of accidents or diseases. Importantly, it provided for the merger of the functions of the Workers’ Compensation Fund Control Board and the Pneumoconiosis Compensation Fund. It also provides for the appointment and powers of a Workers’ Compensation Commissioner.
The **Mines and Minerals Development Act** (2015) regulates the exploration, mining, and processing of minerals; provides for safety, health, and environmental protection in mining operations; and provides for the establishment of the Mining Appeals Tribunal. Mining regulations enable the implementation of the Act. While it defines the process of granting mining licenses, the Act does not stipulate how matters of OHS and environmental impacts will be handled.

**Zimbabwe**
Although Zimbabwe has ratified ILO Convention 155, the country does not have a single overarching occupational health and safety legislation in place. It has, however, developed a Draft Occupational Safety and Health Act that encompasses all the provisions of the previous acts for OSH. This draft act makes provisions for the following:

- Safety, health and welfare of persons at work.
- Regulates and controls the use of plant, machinery and hazardous substances at workplaces.
- Gives effect to international obligations of the Republic of Zimbabwe as a member state of the International Labour Organization and as a member of or part to any other international organization or agreement governing safety and health at work which Zimbabwe would have ratified.
- Delegates to the National Social Security Authority, the implementation of this Act, and provides for the employment of technical experts by the Authority.
- Provides for the establishment of an Occupational Safety and Health Advisory Council, and provides for matters connected with or incidental to the foregoing.

The Act also calls for a Medical Bureau of Occupational Health to be established and stipulates that the bureau be composed of five members, one of which must be a Medical Practitioner employed as a Mine Medical Officer and specialized in occupational medicine, to be chosen by the Minister.

Currently, OSH is mainly governed by Statutory Instrument (SI) 68 of 1990, Act 89, which provides information on the right to compensation for the worker involved in accidents at work. It also includes details of exclusion criteria such as willful misconduct 12 months after leaving the job. The SI defines the occupational diseases that may occur from the different exposures at work and also outlines the “serious accidents” that could result in 30 percent disability. The SI is a comprehensive document that details how to address occupational health (OH) issues in the workplace and identifies the National Social Security Authority (NSSA) Act as the administrator of the compensation fund. The Act makes provision for the establishment of the NSSA and its functions, other social security schemes, and benefits for employees.

The Factories and Works Act (Part 1V) places responsibility on the mine owner to keep a register of all accidents and to report all accidents in absence of three days or more to the inspector of all accidents under the Ministry of Mines, in this instance.

Occupational lung diseases are regulated in the Pneumoconiosis Act of 1971 revised in 1996. TB does not fall under the provisions of the Act. This Act specifically calls for the establishment of a medical bureau that does the surveillance of workers in dusty environments in the way of entry, periodic and exit medical examinations.

**Organization and management of occupational health services**
Occupational Health service delivery in the four countries demonstrated various modalities of service provision that catered to large and small formal mines, and artisanal mines because of the geographic spread of mining operations, and the available resources.

**South Africa**
Regulated by the Mine Health and Safety Act of 1996, whereby the employer is responsible for the provision of a medical surveillance program, all regulated mines in South Africa provide some level of PHC and occupational health services, either on site or utilizing the services of an OH service provider. Service
provision is guided by the DMR Guideline for Compilation of a mandatory COP on Draft Minimum Standards of Fitness to Perform Work at a Mine.

Hazard identification and risk assessments are generally conducted in the mines by the occupational hygiene and/or safety departments in collaboration with occupational medicine services. These assessments consist of baseline, issue-based, and continuous and on-going risk assessments of the occupational environment. Workers are allocated an Occupational Risk Exposure Profile (OREP), which is a summary of the key inherent requirements of the job and the key hazards or risks to which the employees are exposed. Health risk management including occupational and individual health risk assessment and OREP development are usually conducted jointly by occupational medical practitioners, occupational hygienists, safety, and human resources officers.

Risk-based medical surveillance examinations are statutory examinations undertaken for all employees identified as being at risk to identified hazards. Examinations are undertaken at least annually for employees identified as high risk by the OREP, and periodically thereafter and on exit or on departure from the mine. Each mine keeps its own record of service per employee as well as the retention of the medical surveillance record, which should be kept for 40 years, per MHSA guidelines. In addition, fitness-to-work examinations are undertaken when risks change through change of occupational exposures, illnesses and injuries. Specific health priorities in the South African Mining Industry that require focused attention are HIV/AIDS, TB, and Silicosis (HATS) and medical surveillance systems. Most large mining houses integrate HATS services into the general OHS of the mines.

Depending on the level of risk, some workers may be required to do additional medical tests to determine fitness, for example:

- Heat tolerance stress test – step test in hot and humid conditions, simulating underground environment e.g. all underground workers.
- Physical work capacity testing or physical ability assessment– developed and conducted by an Occupational Therapist (OT) or Biokinetestist with experience in such assessment such as post-injury or illness
- Work hardening – a period of rehabilitation to optimize physical and functional capacity such as post-injury and illness
- Drug and alcohol tests for drivers or operators of moving machinery

Large mines (more than 5,000 employees) and even some smaller mines, would usually operate at a BOHS Level III or IV. Remote mining sites often use the services of a general practitioner who has occupational health qualifications, or utilize the services of mobile OHS, BOHS levels I and II. Large mining houses in South Africa have designed and implemented Health Hubs. These are PHC and occupational health facilities integrated under one roof, where workers can access the full value chain of comprehensive OHS close to where they live and work. Health care workers in these settings are either employed by the mine itself or services are outsourced to a managed care organization. These mining houses, to further enhance efficiencies in cost and service delivery, typically enter into service-level agreements with private hospitals, specialist networks, emergency medical response teams, and provincial and district health services to ensure optimal care and treatment for their workers.

Reporting on occupational health indicators is conducted according to DMR 164 Reporting on HIV and TB, and DMR 165. Annual medical reports are submitted to the DMR.

**Tanzania**

The Occupational Safety and Health Authority (OSHA) was established under the Executive Agencies Act No. 30 of 1997 and is the custodian of the Occupational Health and Safety Act No.5 of 2003. Workplaces are supposed to register with OSHA. Once registered, they have to comply with occupational health and safety standards issued by the authority and undergo regular inspections. The performance audit report on the management of occupational health and safety in Tanzania, conducted by the Auditor General in 2013,
notes that only a fraction of all workplaces have actually registered with OSHA: “Workplaces located in peripheral, rural, suburban areas and other region far from OSHA zone offices face a risk of not being registered at all.” This is particularly true for small-scale and artisanal mines.

The Authority is mandated to undertake occupational health surveillance for the country’s entire workforce. Surveillance activities include pre-employment and periodic “fitness-to-work” examinations. Surveillance services are rendered at OSHA’s premises in Dar es Salaam and through mobile teams visiting the workplaces. OSHA also outsources fitness-to-work examinations to private medical practitioners and health services including on-site services at mines. OSHA has issued the fitness-to-work medical examination guideline, which provides orientation to the contracted medical doctors and consistency of examinations.

Large mining operations usually provide in-house occupational health surveillance, as well as emergency and primary health care services to their workforce equivalent to BOHS Level III or IV. These go as far as medically evacuating severely injured or ill workers via air ambulance services to hospitals in either Kenya or South Africa.

Medium-scale mines should be registered with OSHA and should have services in line with BOHS Stage I/II. Many, particularly smaller, medium-size mines, do not meet OSHA criteria for compliance with regulations. Mineworkers generally do not undergo regular “fitness-to-work” surveillance examinations. Health care in terms of primary care and/or the treatment of injuries and diseases takes place at public health facilities. Mine owners directly cover these costs or the company pays into the National Health Insurance Fund and expect the fund to cater for the health care of the personnel.

Although periodic medical examinations are mandatory, the majority of mineworkers, particularly the estimated 750,000 artisanal mineworkers, are not covered with medical surveillance examinations, nor are they provided with minimum services as defined in BOHS Stage I. Small-scale mining sites are scattered and far from any urban structure. Distances to the next urban center can amount to 25 km and travel time is increased by rough roads and no public transport system in place. Sometimes a rural health post is the nearest health facility to these mining areas, but it may not provide diagnostic and treatment services for HIV or TB, let alone have any competences in occupational health: (silicosis, dust exposure assessments, etc.). Community health services including outreach services, which are very successful in terms of TB detection and treatment, do not reach out to the informal housing of mineworkers in small-scale mining areas. The high degree of mobility of this population, who tend to look out for ever better prospects to find gold, makes it difficult to detect, refer and follow-up on suspect cases and patients. Another common problem in small-scale/artisanal mining communities is the lack of health promotion and education. Additionally, there is a paucity of information on good dust control methodologies and lack of personal protective equipment.

Regarding occupational diseases prevalent in mining such as silicosis and tuberculosis, OSHA has clear capacity problems. The authority does not have an x-ray facility, neither at headquarters in Dar es Salaam nor for the use by their mobile teams. Suspect cases (e.g. detected during lung function testing) are referred to public or private hospital facilities for an x-ray. Since there is no trained occupational health physician in the country who is certified to diagnose silicosis (the country’s only OH medicine specialist has retired), it is most unlikely that pneumoconiosis cases are detected at all. This may further explain the weak information on pneumoconiosis cases in the country. Tanzania has established a collaboration with WHO and is currently working on models of providing integrated occupational health services within a PHC care setting.

Zambia
Zambia does not have an integrated OSH legal framework and policy, but, there are various policies and institutions charged with OSH functions, and the country is still able to function in an integrated manner with regards to OSH. There are various administrative bodies and government departments accountable for OSH regulatory function in promoting and enforcing OSH.
The Occupational Health and Safety Institute (OHSI) in Kitwe is a regulatory body established under the Occupational Health and Safety Act No. 36 of 2010 and as such, falls under the Ministry of Health with a wider mandate and scope. While the OHSI formerly focused on the mining sector and occupational lung diseases, it now conducts medical surveillance examinations for all industries, including occupational disease diagnostics and is responsible for developing occupational health promotion and prevention programs. The OHSI carries out the following services:

- Designing OHS services for all industries.
- Developing health promotion programs.
- Conducting medical surveillance examinations for all industries, including occupational disease diagnostics.
- Providing an occupational laboratory service.
- Developing and implementing programs to provide incentives for employers to implement measures to eliminate or reduce risks to health and safety.
- Investigating and detecting occupational diseases and injuries at workplaces.
- Conducting OHS research—including surveys and research.
- Monitoring morbidity and mortality statistics.
- Conducting village benefits examinations, pneumoconiosis diagnostics, and medical evaluation services for retirees.

In terms of location, equipment and human resources, OHSI has the capacity to provide the mentioned services and is selected to become a regional center of excellence by the World Bank Group and WHO. The OHSI shares a campus with the Worker’s Compensation Fund and the Mine Safety Department, thus providing an ideal setting for comprehensive service delivery to the mining sector’s workforce. However, there are limitations in terms of coverage. The sector activities, which now cover the whole of Zambia, leave non-Copperbelt regions underserviced. The Institute carries out mobile services in these areas and is preparing to expand to two new locations, namely Solwezi and Lusaka. When asked whether OH surveillance should be outsourced, for example to the excellently equipped mining hospitals of the large mines across the country, there was clear reluctance. It is assumed that mineworkers would not accept surveillance carried out by their companies and do not trust the impartiality of the medical staff of the mines. Several stakeholders including the Mine Workers Union of Zambia and the Congress of Unions expressed this opinion. Further, given the number of occupational health specialists in the country, it is believed that a privatized OH screening system would not be sufficiently capacitated to enact the OH legislation effectively and for maximal impact on workers’ health.

Large mining houses in the country provide OHS at BOHS Level IV. The visited mining hospitals are state-of-the-art facilities with quality prevention, health promotion, curative, and rehabilitation services. A network of satellite clinics attends to patients on site and refers complicated cases to the large mine-owned hospital facilities. Smaller medium-sized mines provide on-site PHC services and emergency care, at BOHS Stages I or II. Major health problems are referred to services of the public health system, which are offered free of any charges. In the Copperbelt, the mining companies organize transport to the Kitwe OHSI for fitness-to-work examinations. In other regions of the country, mining houses rely on the mobile services provided by OHSI. Due to transportation challenges, artisanal mineworkers rely mostly on services provided at rural health centers/posts, which are poorly resourced in terms of equipment and staff. In addition, the small-scale mines operate almost uncontrolled and workers do not undergo fitness to work examinations, as required. They have essentially no access to any kind of BOHS.

The Department of Occupational Safety and Health Services under the DoL administers the Factories Act of 1964 and inspects the state of health and safety at all workplaces apart from mines. There are certain rivalries of competence concerning functions of the Mine Safety Department and/or OHSI—for example, when gold processing plants are not located on the mine’s grounds—but generally, the different actors have found ways to distribute tasks among themselves.
Zimbabwe

The Statutory Instrument (SI) 68 of 1990, Act 89, provides the framework for OHS delivery in the workplace. It identifies the National Social Security Authority (NSSA) as the administrator of the compensation fund. NSSA has an established Medical Bureau that issues pre-employment certificates of fitness and validates periodic examination results submitted by any medical doctor in the country.

Occupational health surveillance in terms of fitness to work examinations is mandatory in all workplaces in the country. The respective examinations are carried out by district hospitals, private practitioners or mine health facilities (in the mining sector). No particular qualification is required, but NSSA offers a 5-day OHS training course for physicians conducting the examinations. The results of periodic examinations are forwarded to the NSSA Medical Bureau that issues certificates of fitness and validates periodic examinations. The Medical Bureau has recently acquired a mobile unit to target hard-to-reach mining populations with periodic occupational examinations. The mobile unit has diagnostics such as spirometry, x-rays, and vision tests.

The frequency of periodic examinations of mineworkers varies. Usually a first examination takes place after five years of employment, depending on the individual’s health status, age, and job; afterwards, examinations are carried out annually. A major weakness in the system is that no medical examinations are offered for ex-mine workers. Detection of pneumoconiosis or any other occupational disease must be immediately reported. TB is not mentioned as a specific compensable disease in legislation. Given the fact that there are very few trained occupational medicine specialists in the country, underreporting is very likely.

Large mining houses in the country provide OHS at BOHS Level IV. The visited mining hospitals are state-of-the-art facilities with quality prevention, health promotion, curative and rehabilitative services. A network of site clinics sees patients on-site and refers complicated cases to the large, mine-owned hospital facilities. Some of these hospitals cater for small or medium size mines on a contract base. Medium-sized mines provide on-site services of BOHS Level I or II and refer patients with injuries or diseases to the next public hospital.

Small and artisanal mines particularly are insufficiently integrated into the occupational health system. As in Tanzania, these mineworkers are self-employed contractors who are paid a commission of production. They are not counted as employees who are required to undergo any routine medical check-ups. They often live and work far away from any kind of health and social infrastructure, and they would primarily use public health services for severe injuries or diseases.

Compensation of occupational injuries and diseases

South Africa

The current compensation system for occupational injuries and diseases in South Africa is fragmented and complicates access, particularly for ex-mineworkers, to compensation. Occupational cardio-respiratory diseases resulting from of hazard exposures in workplaces in controlled mines are covered by the Compensation Fund for Occupational Lung Diseases (CCOD). The Medical Bureau for Occupational Lung Diseases certifies the presence of a compensable disease based on the results of a benefit medical examination (BME) or a post-mortem. The CCOD pays lump sum benefits for “loss of earnings” for TB (6 months’ wages), and first and second degree disability claims as determined by the Certification Committees.

In the past, BMEs for ex-mineworkers were carried out exclusively by the MBOD in Johannesburg. This limited the geographical and financial accessibility of services for ex-mineworkers having returned to their homes in distant labor-sending areas in South Africa, particularly Eastern Cape, North West Province, Mpumalanga, Free State, or in neighboring countries (particularly Lesotho, Swaziland, and Mozambique). Most ex-mineworkers are not even aware of their right to compensation and the process involved in claiming due benefits. This has left out thousands of ex-mineworkers from compensation over the last decades.
The CCOD/MBOD under the Department of Health has responded to this challenge by developing an electronic database containing information on current and ex-mineworkers in the 246 so-called controlled mines and works falling under the responsibility of the CCOD/MBOD. It allows the active tracking and tracing of mineworkers and will facilitate communication and compensation in the future. Secondly, the MBOD is setting up decentralized service structures where benefit medical examinations (BMEs) are performed on ex-mineworkers. There are two models of decentralization: (i) the establishment of OSSCs and (ii) the contracting of private practitioners and provincial health facilities to perform BMEs. Third, the CCOD has appointed a number of occupational health doctors to the Certification Committees to tackle the backlog of claimant files in order to speed up certification of compensable diseases.

A separate system under the Department of Labour, which administers the Compensation for Occupational Injuries and Diseases Act, 1993 (COIDA), covers compensation for all other injuries and diseases, including occupational lung diseases in mineworkers having worked in uncontrolled mines.

Rand Mutual Assurance (RMA) is licensed under COIDA to cover compensation of disability related to injuries in mineworkers. RMA mainly covers claims from management and outsources its medical and disability assessment activities. The compensation of disability related to an injury is a straightforward process facilitated by the mine where the injury occurred. Compensation payments under COIDA are superior in benefits and comprise payments based on temporary or permanent disability. The costs of health care are also covered under COIDA. RMA recently opened an in-patient rehabilitation and care facility in Welkom.

The Government of South Africa is well aware of the challenges around compensation and is committed to establishing a unified dispensation for an integrated compensation system that will be typified by equity in benefits and care for all mineworkers, and a more effective administrative system. In a collaborative effort, the Minister of Health together with the Ministers of Labour and Mineral Resources, launched this reform process in December 2015.
Good practice example

**Occupational Health One-Stop Service Centers (OSSCs) in South Africa**

OSSCs for mineworkers and ex-mineworkers is a good practice model that was conceptualized to address the plight of the former mine workers in the labor sending areas who did not have access to BMEs. The OSSC concept is a hybrid of all the modes of service delivery, bringing services to where former and current mineworkers live and work. A collaborative partnership between the Chamber of Mines (employers), trade unions and Government, resulted in two centers “operating” in South Africa. This mode of service delivery has been hailed as a solution mainly for ex-mineworkers who now gain access to BMEs and other services such as assistance with compensation matters offered at the centers. While two OSSCs are fixed facilities, one mobile center that has recently become operational is gaining acceptance among former mining communities. Negative experiences reduce people’s willingness to engage with the health system and reduce adherence to and compliance with treatment. The OSSC offers an independent, separate, safe and clean environment that is not associated with prior memories and experiences some mineworkers may have and increases their willingness to engage with the clinics and treatment. The benefits of an OSSC model, when optimally implemented, are:

- All services can be accessed in one place with holistic care.
- The OSSC is based in proximity to primary and secondary care, and if someone requires treatment for other conditions they do not have to travel far.
- Supported by primary and secondary health care.
- Opportunity to share learning and resources across services.
- Reduction in duplication of effort, provided that workers do not go to BOTH employer and the OSSC.
- Information sharing.
- Reintegration to the community is paramount and an opportunity to reskill through vocational rehabilitation on referral.
- Modern up-to-date equipment and environment that is not associated with past negative experience that results in poor adherence and compliance.
- Close working arrangements with other organizations.
- Single point of contact for the individual.
- Opportunity to run mobile clinics with linked IT systems in the communities.
- Strong leadership and effective governance.
- Able to gather intelligence and improve service redesign.
- Fosters partnerships across government departments, employer groups and trade unions.

**Tanzania**


This largely outdated legislation was replaced by the Workers Compensation Act (2008). Although the Act was enacted in 2008, the actual Workers Compensation Fund was only established in 2015 and was
expected to become operational in July 2016. During the country mission, the Fund had moved into its offices and was about to recruit the personnel for its operations. The Fund will cover:

- Expenses for medical aid in the context of occupational injuries and diseases.
- Compensation payments for temporary disablement and rehabilitation.
- Compensation payments for permanent disablement (up to 70 percent of former earnings)
- Survivor’s benefits (spouse 40 percent, children 20 percent)
- Assistance grants when needed

It is planned that physicians in health facilities across the country certify an occupational disease or injury. The Public Health School of Muhimbili University will train respective medical cadres in short courses. In the short term (2016) three physicians per district shall be trained and accredited to undertake the certification function. It is further envisioned that the fund will contract specific health and rehabilitation facilities to provide medical aid and rehabilitation services. The Workers Compensation Fund supports rehabilitation interventions based on an assessment and a respective rehabilitation plan (§70 of the Workmen’s Compensation Act).

The Ministry of Labour and Social Security administers the Workers Compensation Act (No. 10 of 1999). The Act specifies that a Workers’ Compensation Fund Board (WCFB) and a Workers Compensation Tribunal be established to manage the compensation fund. In administering the Act, the WCFB receives notices of accidents and claims for compensation, and inquires into the cause of the injury or disease. Employees are expected to submit a claim within three days of gaining knowledge of the incident. Further, the WCFB collects, compiles and maintains statistics and information relating to the occurrence or cause of accidents and diseases and keeps a schedule of diseases. WCFB compensation benefits include:

- Periodic payments—made to an employer for sustaining an employee on a salary during hospitalization, up to eighteen months.
- Medical refunds – all expenses incurred relating to the treatment are refunded at 100 percent.
- Lump sum payments – granted to workers who suffer disability assessed at less than or equal to 10 percent.
- Life pension – is granted for disabilities assessed to be between 11 and 100 percent.
- Survivors benefits – are paid to the dependents, spouses and children of deceased workers
- Vocational training and rehabilitation.

Employers in both the private and public sectors are expected to make financial contributions into the fund. However, the Auditor General (2015) noted that there were 18,295 companies registered for compensation in 2013, and only 49 percent complied in paying compensation assessment fees. The Fund has established an injury and illness program, at no cost to the employer, aimed at proactively supporting employers to “find and fix workplace hazards before workers are hurt.” The Fund, in responding to a worker centric approach, has embarked on an aggressive Rehabilitation and Return to Work Program. The concept focuses on enabling to injured or ill workers to be “reintegrated in gainful and sustainable employment” as early as possible.

Zimbabwe
The National Social Security Authority Act makes provision for the establishment of social security schemes for the provision of benefits for employees. The Act further entails promoting awareness and health safety at all workplaces and encouraging the implementation of health and safety regulations. According to provisions in the Act, all employers except government, domestic workers and informal sector employers are to contribute to the scheme for their employees. The aim of the scheme is to aid employees and their families when workers are injured or killed in a work-related accident, or suffer from a work-related disease, or die because of this disease. TB is not mentioned as compensable disease.
The scheme provides for rehabilitation services to disabled employees to reduce their disablement and enable them to return to their former employment, or otherwise prepare them for a useful and meaningful place in society. Benefits of the scheme include:

- **Periodic Payments in Respect of Loss of Earning:** Provide compensatory income where this has been lost or stopped by work-related accidents. Guarantee continual payment of normal monthly wages for the first 30 days following an accident, and a percentage thereof thereafter.
- **Funeral Grant:** In the unfortunate event of a member losing his/her life because of a work-related accident, the scheme currently pays out a maximum of US$200 towards funeral expenses.
- **If an employee's injury results in permanent disablement, compensation will be paid to him/her as a lump sum if the disability is less than 30 percent. A children's allowance for children up to the age of 19 years is included.**
- **Employees’ Pension:** In instances where an employee's injury results in 30 percent or more, permanent disability, compensation will be paid to the employee as a pension. A children's allowance is included in employee's pension, for children up to the age of 19 years and/or those who are below 25 years, provided they are in full time education. The benefit may also be given to permanently disabled dependent children who are incapable of supporting themselves regardless of their age.

**Rehabilitation in study countries**

People working in the mines have a high risk of occupational injury and disease, particularly in the non-regulated, informal and illegal mining sector. Depending on what job they have, the risks can multiply and the results of accidents can often be catastrophic and life-changing. There are numerous benefits of rehabilitation for the employer, the person living with disabilities and the economy. In the case of the employer, they may gain by expanding the number of experienced workers through continuing the employment of those who become disabled and adapting the job or making ‘reasonable accommodation’ for the person to return to work. Injuries can include loss of a limb(s), head injury, musculoskeletal or mental health problems particularly after seeing colleagues die or sustain major injuries underground.

**South Africa**

In South Africa, most of the large mines have contracts with rehabilitation providers (outsourced) and therapists have a well-aligned relationship with the occupational medical practitioners and often start rehabilitation in the acute phase in the mining hospital, if appropriate and available. They provide rehabilitation for 6-8 weeks depending on the nature of the injury. They use different cognitive and functional assessments to assess and treat patients. The therapists provide daily work hardening programs and the mining house provides transport for the workers to the provider’s rehabilitation center for the duration of the treatment. This model, whereby one provider covers both functional and vocational rehabilitation, works well.

In other instances, mines have an occupational health department with therapists who oversee a worker’s rehabilitation and who are responsible for checking that worker’s fitness to return to work, and a different therapist who does the vocational rehabilitation in-house. Vocational rehabilitation is covered as part of the basic undergraduate training but one has to undergo years of specialist training under a more senior therapist. This dynamic can result in challenges recruiting staff with the right competencies on the mines.

Workers on small-scale mines most likely access public health services and get very little or no rehabilitation. The RMA has arrangements with several healthcare providers that are on a preferred supplier list. Equipment is sourced from a range of suppliers by the therapists but it has been identified that some of the big international companies dominate the market particularly for supply of prosthetic devices.

**Zimbabwe**

The NSSA helps workers who have become seriously disabled because of a work-related accident to settle back into their homes and communities after undergoing an intensive rehabilitation program at its rehabilitation center. The Workers’ Compensation Rehabilitation Centre run by NSSA is a parastatal organization funded by the Worker’s Compensation Insurance Fund, to which employers pay a premium.
each month in respect of each of their employees. The Accident and Workmen’s Compensation Scheme is well organized but only covers 30 percent of the national labor force. It meets all the costs of workplace injuries such as transport, drugs, medical assistive devices but a major challenge is to find a way to include the informal workforce.

There is one rehabilitation center in Bulawayo/Mpilo that accepts patients including mine workers covered by NSSA. The goal of this center is to reduce the patient’s disability so that they can return to their work, wherever possible, or learn new skills that could be employed in a new job or enable them to be self-employed. The multidisciplinary team at the center includes physiotherapists, occupational therapists, rehabilitation technicians, a doctor, nurses, a social worker, vocational training officers, and administrative and support staff. Assistive devices such as prosthesis and bathing aids are provided. Severely injured workers, including those whose disability is too severe for them to be able to resume work of any kind, are trained on how to live with their disability and to fit into society with little difficulty. Care attendants are trained by the center to provide home care to those who need somebody to look after them all or most of the time. Preferably, the person trained as an attendant will be the disabled person’s wife, husband, brother, sister or someone else who will be looking after the disabled worker at home. These attendants are paid a monthly allowance by NSSA, even if an attendant is a close relative—which is good practice.

The vocational training courses offered at the center are welding, carpentry, tailoring, leatherwork, poultry, gardening and business planning and management. Patients receive peer support from other patients with similar conditions. A major problem with this model is that in order to benefit from the services, individuals are displaced from all over the country, sometimes with their families.

This service works well for those who are covered by NSSA but around 400,000 mineworkers (or 80%) are working in non-regulated mines, and around 60,000 (or 15%) are working in small scale mines. If they were to sustain an injury they would probably access the public health system with very little or no rehabilitation and very little opportunity to get assistive devices or gain alternative skills through vocational rehabilitation. This non-regulated field is growing and more needs to be done to regulate these mines and ensure that their workers have access to appropriate rehabilitation.

**Tanzania**

The *Workers Compensation Act* of 2008 includes a section on rehabilitation, which clearly states that a person injured or diseased at work shall “undergo any assessment required in order to develop an individual rehabilitation plan.” The rehabilitation plan certifies an employee’s need for rehabilitation, identifies the services appropriate for his/her needs, and specifies the rehabilitation services to be provided to the employee.

The cost of assessment and implementation of the plan is to be covered by the Compensation Fund. Since the Compensation Fund is not yet operational, little is done in this area today. In some cases, the employers establish support programs for their employees, should they suffer from an impairment or disability after a work-related disease or injury.

The landscape for the treatment of impairments and the provision of rehabilitation services is small. Although Tanzania had quite a number of well-equipped regional centers for people with disabilities, which were previously set up and run under the National Leprosy Program, these services have suffered from underfunding and the loss of qualified personnel during the past two decades and are no longer functional. Generally, it is estimated that less than five percent of persons with disabilities in Tanzania receive rehabilitation services.

One center that is still operational is the Comprehensive Community Based Rehabilitation in Tanzania (CCBRT) in Dar es Salaam. It is today the country’s largest indigenous provider of disability and rehabilitation services. CCBRT is comprised of a well-established disability hospital in Dar es Salaam, community programs in and around Dar es Salaam and Moshi, and training and advocacy units. Every year, around 120,000 adults and children with disabilities and their caregivers are treated and supported at the
CCBRT. Another center that provides rehabilitation services is the Department of Prosthetics and Orthotics of the Faculty of Rehabilitation Medicine at the Kilimanjaro Christian Medical College of Tumaini University. The center has incorporated the Tanzania Training Center for Orthopedic Technologists, a supra-regional training center providing courses in the field of orthopedic technology in Africa that enrolls students from all English-speaking African countries and other interested countries. The center provides practical education to professionals who are required to provide technical services to people with amputations and other neuromuscular disorders such as poliomyelitis, paralysis, cerebral palsy, clubfoot and trauma.

Zambia
The Workers Compensation Act authorizes a Workers’ Compensation Fund Board (WCFB) and a Workers Compensation Tribunal. The WCFB ensures that workers receive compensation for loss of earnings for occupational injuries and diseases, and provides social security for employment-related injuries and diseases to all workers in Zambia except Civil servants and members of the Defense Force, Air Force, Zambia Police, and Zambia National Service.

The Fund has established an injury and illness program, at no cost to the employer, aimed at proactively supporting employers to “find and fix workplace hazards before workers are hurt.” The Fund, in responding to a worker centric approach, has embarked on an aggressive rehabilitation and return-to-work program. The concept focuses on enabling injured or ill workers to be “reintegrated in gainful and sustainable employment” as early as possible.

Vocational rehabilitation is addressed through the return-to-work program funded through the compensation fund. A rehabilitation counsellor investigates options to ensure that the injured or ill mineworker is either re-accommodated at the workplace or is able to integrate back into the community. This is a very good approach that has increased benefits to the employee, employer and the country.

Human resources for occupational health
There is a shortage of occupational medicine specialists in the study countries, with South Africa registering 31 specialists, Zimbabwe registering two specialists, and Botswana, Zambia and Tanzania registering one each. A four-year Registrarship in Occupational Medicine is offered at four universities in South Africa.

Since 2005, South Africa offers a Master’s Degree in Occupational Medicine for medical doctors. The course work includes the broad areas of occupational hygiene, occupational medicine, and toxicology over two years part-time. Tanzania now offers a post-graduate two-year Master’s Course on occupational health and safety for medical doctors. It was inaugurated in 2014 and six students are about to graduate. Most physicians working in the mining industry in Tanzania, Zambia or Zimbabwe have obtained a post-graduate Diploma in Occupational Health, a post-graduate qualification offered by at least six universities in South Africa. Little information is available on the actual number of physicians with this diploma practicing in study countries.

South Africa trains specialized occupational health nurses. The Bachelor of Technology in Occupational Health Nursing, which is a degree qualification, is a prerequisite for working in an OH center as an Occupational Health Nursing Practitioner. Some nurses have a Community Health Nursing diploma or degree and do a post-graduate course in occupational health; this practice is being phased out. Qualification studies for nurses in occupational health/medicine are not offered in any of the other countries.

The cadres trained in under-graduate and post-graduate courses in Zambia, Zimbabwe and Tanzania are occupational safety, health, and environment specialists. The programs focus on occupational safety, with little input on occupational medicine and rehabilitation.

Minimum effective package of occupational health services
Derived from the BOHS concept and discussions held with in-country OH experts, Table 1.2 details minimum packages of services suitable for covering the occupational health and safety needs of artisanal
small-scale mining. Large industries and well-organized SMEs should, however, always establish BOHS Stage III services as stipulated by the ILO Conventions Nos. 161 and 155.

**Table 1.2: Minimum effective OHS packages**

<table>
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<tr>
<th>Minimum effective packages</th>
<th>Minimum requirements at any small-scale and artisanal mining site</th>
<th>Service Packages: BOHS Stages I/II</th>
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<tr>
<td></td>
<td>Workplaces that do not have any OHS at all: Safety instructions displayed, PPEs distributed and enforcement of use, designated and trained safety officer, first aid trained staff, first aid box, emergency procedures in place.</td>
<td>Services</td>
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<td>Service delivery models</td>
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<td>Personnel requirements</td>
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<td>BOHS Stage III/IV</td>
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<td>Equipment</td>
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- **Services**
  - Primary health care provision;
  - Advisory services on occupational safety and health, that is, chemical and physical hazards and exposures, accident risks, heavy physical work, basic sanitation and hygiene, through formal and structured health talks in-service/outreach, for example at toolbox talks;
  - First aid and management of injuries and diseases that warrant medical attention through effective referral processes;
  - TB, HIV, AIDs awareness and education, HIV/TB diagnostics (rapid tests, sputum diagnostics), either treatment and care according to national guidelines or referral to next competent center;
  - Recording and reporting of occupational injuries or suspected occupational diseases for further processing in the OH and compensation systems

- **Service delivery models**
  - OHS delivered through a fixed facility such as a rural health post / PHC clinic at peri-mining community and/or mobile unit visiting the operations at periodic intervals.

- **Personnel requirements**
  - Basic OHS-trained field nurse and safety officer to advise and counsel workers, record and report occupational injuries/diseases, refer to competent service in addition to PHC facility staff.
  - As per BOHS concept, approximately two staff/5,000 mineworkers.

- **Equipment**
  - Basic laboratory service including HIV rapid testing and TB sputum diagnostics.
wheelchairs (manual and electric), transfer boards, hand therapy kits, bath or showers boards.

Recommendations

Legislation
It is recommended to support the harmonization of occupational health and mine safety legislative frameworks in the Southern Africa region (SADC) based on the relevant ILO conventions and recommendations. Harmonized standards and norms strengthen regional integration and set aligned rules for (foreign) investors in a globalized world. Two recommendations stand out from the findings:

- As a first step towards harmonization, it is recommended to support SADC to (i) agree on a list of compensable occupational diseases in mine work and clearly integrate tuberculosis as a mine work related occupational disease and (ii) harmonize and align hazard exposure limits, such as silica dust levels, etc.
- It is furthermore recommended to provide technical assistance to the ministries/departments of health, labour and mines, particularly to the inspectorates to enable them to monitor compliance with the current legislation and enforce regulations and minimum standards set out in the law.

Occupational health management and services
Derived from the above conclusions, efforts to scale up service should address the challenges observed in small-scale and particularly in artisanal small-scale mining. The following recommendations are therefore looking at entry points and into minimum service packages for these groups in particular.

To increase coverage of occupational health surveillance and services, it is recommended to adopt the Basic Occupational Health Services Concept (BOHS) at a national level and develop networks offering service at different BOHS stages. Figure 1.2 below presents a generic national BOHS system.

Figure 1.2: The Integrated Occupational Safety and Health System

The concept provides a pathway to comprehensive services and allows for the setting of standards in relation to the size of the mining operations and the hazards involved. This can be done either through scaling up and decentralization of public service provision or through the introduction of outsourcing models to private providers.

**Compensation systems**

Compensation systems and mechanisms in each of the four countries must be strengthened. This involves the establishment and maintenance of functioning occupational accident and disease reporting systems, claims processing and management optimization, but also the development of communication strategies informing and educating about the right to compensation and where and how claims are made need to be built in. Currently, the systems are reactive rather than proactive.

**South Africa**

Support the on-going integration of compensation systems in South Africa: The Government of South Africa has embarked on establishing a unified integrated compensation system. It is strongly recommended to support this process technically, given the complex tasks and challenges involved in a change management process potentially leading to a merger of private and public institutions falling under different departments and having different historic origins, administrative and management systems.

**Tanzania**

Provide technical support to the Ministry of Labour to operationalize the new compensation system: Particularly Tanzania would benefit from technical assistance and lessons learned in neighboring southern African countries, when operationalizing its new compensation system—the Workers Compensation Fund. Technical support is strongly recommended to enable Tanzania’s current Labour Ministry to: (i) operationalize the new compensation system with emphasis on creating an up-to-date database of formally employed workers (including mineworkers); (ii) set up a system ensuring occupational health screening and benefit medical examinations, claims processing; and (iii) develop an active rather than reactive approach to mineworker compensation.

**Zambia and Zimbabwe**

It is recommended that the Ministry of Health (Zambia; OHSI) and the Ministry of Labour (Zimbabwe; NSSA) be assisted to develop capacity for operating mobile OH outreach service networks that will enhance benefit medical examinations/screening services to artisanal and small-scale mineworkers and to ex-mineworkers across the country.

**All countries**

Implement tracking and tracing strategies to reach ex-mineworkers and link them to compensation and other social benefits: As is happening in South Africa, it is recommended that Tanzania, Zambia and Zimbabwe develop policies and approaches to actively locate ex-mineworkers and offer them medical benefit examinations as required by law. Ideally, benefit medical examinations should be included in decentralized occupational health services, which would facilitate access of services for both current and ex-mineworkers. By combining with mobile/outreach services or through bundling into primary health care services, service coverage can be increased significantly. Basic knowledge of the potential work-relatedness of diseases or injuries and the steps to be undertaken in that case must feature in the education of health personnel. This includes knowledge about notification obligations and processes; but also about counselling and assistance to claimants.

Given the size of artisanal and small-scale artisanal mining (ASSM), particularly in Tanzania and Zimbabwe, adapted compensation models covering for loss of earnings after an injury or a disease arising from workplace exposures must be developed. The size of the workforce contracted in ASSM should allow for respective micro-insurance models.
**Rehabilitation**

All four study countries will be provided with OSSC under the Regional Global Fund TB in the Mines in Southern Africa Project. It is vital that the OSSC model has the right infrastructure and human resources to support good rehabilitation.

It is recommended that all countries should seek technical advice and support from rehabilitation specialists to reconfigure their rehabilitation centers and design appropriate pathways. Rehabilitation equipment is costly, but when establishing rehabilitation centers, it is necessary to make adequate investments in gymnasiums, rehab equipment, assistive devices, and vocational rehabilitation programs.

Centers should recruit staff with the right competencies, and must include or provide access to a medical doctor, a physiotherapist, an occupational therapist, a counsellor, nursing staff, assistants, orthotists and prosthetists. It is recommended that the governments and professional bodies of those clinicians working in the field of rehabilitation should have regulations to ensure good governance and training. Health profession councils and universities should also ensure that training is of a high standard; likewise, employers should have good supervision in place for new and junior staff.

**Human resources for occupational health**

With the growth in mining sectors and other industries in the southern African region in the past decade, the demand for qualified occupational health personnel has steadily increased. It is recommended that:

- Technical assistance be provided to the Ministries/Departments of Health of all four study countries to undertake human resources for occupational health assessments.
- Based on the findings, the Ministries/Departments should be assisted to develop a long-term strategy per country for the training of respective medical and nursing cadres in a collaborative effort of the Higher Education and Health sectors, the health Professions Councils and the Mining Industry.
- The Ministries/Departments of Health train health personnel operating in primary and secondary health facilities in mining areas to provide basic occupational health services in the short term. This training can be delivered by designing a post-graduate course of 10—12 weeks, supplemented with self-study and on-the-job-training to capacitate them to render minimum OH services.

**References**


CHAPTER 2

SOUTH AFRICA’S OCCUPATIONAL DISEASES IN MINES AND WORKS ACT

South Africa’s Occupational Diseases in Mines and Works Act (ODMWA) of 1973 is designed to address work-related lung diseases in controlled mines and works. It predates democracy in South Africa by 21 years. Since it was adopted, South Africa has acquired a Constitution, which is the basis of all law in the country. ODMWA needs to be extensively revisited for this reason alone. It is outdated, unfairly discriminatory, and not aligned with current government policy.

Under ODMWA, certain diseases relating mainly to the cardio-respiratory system are compensable, if in the opinion of the certification committee they are attributable to the performance of risk work, that is, work which exposes an employee to dust, vapors, gases, chemicals or other factors or working conditions which are harmful or potentially harmful. These “compensable diseases” are:

- Pneumoconiosis
- Tuberculosis contracted while the person was performing risk work, or with which the person was affected within 12 months of last performing such work.
- Joint conditions related to pneumoconiosis and TB.
- Chronic obstructive airways disease.
- Progressive systemic sclerosis.
- Any other disease which the Minister of Health, acting on the advice of a committee of medical practitioners, has by notice in the Gazette declared to be a compensable disease and which is attributable to the performance of risk work.

Although ODMWA predates the Constitution, it can be seen as seeking to give effect to numerous of the rights entrenched in the Bill of Rights, including the right to fair labor practices, the right to an environment that is not harmful to health and the right to social security. There is a need to ensure that ODMWA is consistent with more recent legislation which also addresses occupational disease.

The Compensation for Occupational Injuries and Diseases Act (COIDA) 1993 provides for the medical treatment and compensation of occupational diseases in all work environments not covered by ODMWA. The Occupational Health and Safety Act (OHSA) 1993 also has jurisdiction over some aspects of occupational disease.

The objectives of this report are to:

- Highlight the current strengths and weaknesses of ODMWA.
- Identify inconsistencies between ODMWA and other relevant legislation.
- Identify international best practice in occupational diseases in mines and works.
- Make recommendations for new legislation on ODMWA subject matter.

South Africa’s Occupational Diseases in Mines and Works Act (ODMWA)

ODMWA cannot be viewed in isolation, rather it is part of a legal matrix made up of South Africa’s Constitution and various laws. These include the Basic Conditions of Employment Act, the Labor Relations Act, the Mine Health and Safety Act, the Minerals and Petroleum Resources Development Act, COIDA, the Public Finance Management Act, the National Health Act and the Medical Schemes Act 131 of 1998.

South African legislation on compensation for occupational diseases was developed along two parallel lines to provide for two different categories of workers. One is concerned primarily with the interests of mineworkers, namely ODMWA and its antecedent legislation, while the COIDA, and its antecedent legislation, relates to the interests of all workers in industry, including commerce and services. The
legislative response to the diseases contracted by mineworkers began with the Mineworkers’ Phthisis Allowances Act of 1911. This set the tone for future legislation, creating a fund to which mine owners contributed to compensate mineworkers suffering from phthisis and related diseases. A board was appointed to administer the fund, with the power to grant an allowance, at its discretion, to affected mineworkers or any dependents. Subsequent legal milestones include the Silicosis Act of 1946, the Pneumoconiosis Act of 1956, and the Pneumoconiosis Compensation Act of 1962.

In 1973, ODMWA repealed previous legislation and consolidated the law relating to the payment of compensation in respect of certain diseases contracted by persons employed in mines and works. Section 39(1) provides for the establishment of a Medical Certification Committee for Occupational Diseases, to consider medical reports on a mineworker who works in a controlled mine and is found to be suffering from a compensable disease. Section 61(1) provides for the establishment of a Mines and Works Compensation Fund controlled and managed by a commissioner. Owners of a controlled mine or works are required to pay a prescribed levy to the Compensation Fund for each shift worked by an employee. Section 78(1) provides for the benefits to be awarded by the compensation commissioner. Section 94 provides for compensation to be paid by the commissioner to the mineworker who contracted a compensable disease. ODMWA was amended in 1993 to provide for the payment, by the owner of a controlled mine or a controlled works, of legitimate and proven costs incurred by or on behalf of the employee in his or her service, in respect of medical expenses necessitated by such a disease.

Today, ODMWA falls within the scope of the social protection section of the National Development Plan. Mining health and safety in South Africa is governed by the Mine Health and Safety Act 29 of 1996. This ensures owner responsibility for health and safety through codes of practice, training, identifying potential hazards, employing hygienists and founding methods of medical attention and recording. It safeguards employees’ right to refuse to work in or to move away from areas which are unsafe or potentially unsafe, creates the Inspectorate of Mining Health and Safety and establishes the Mine Health and Safety Council. Representatives of government, employees and employers’ organizations serve on these tripartite structures.

The inspectorate regulates the minerals sector, promotes health and safety and ensures efficient and effective service delivery. Its main functions are the provision of policy inputs for the establishment and application of mine and mine equipment health and safety standards, and ensuring an effective inspection service. The inspectorate is headed by the Chief Inspector of Mines, who also chairs the boards of the Mine Health and Safety Council and the Mining Qualifications Authority. The Mine Health and Safety Council advises the Minister of Mineral Resources on health and safety issues and promotes a health and safety culture in the mining sector, while the Mining Qualifications Authority is responsible for addressing the sector’s education and training needs. There are currently high levels of dissatisfaction among mineworkers in South Africa, as evidenced by unrest in mining communities, the Marikana Massacre, and almost continuous strike action. A paramount concern is the rising rate of TB, silicosis and other diseases. The South African government has estimated that the TB infection rates in the country’s mines are among the world’s highest.

The disease is latent within the communities in which the mines are situated. Mining conditions exacerbate and aggravate the underlying problem. In November 2006, the Department of Health published the Tuberculosis Strategic Plan for South Africa 2007-11, containing various recommendations and strategies for tackling the rising rate of infection within the mining sector. However, the TB incidence rate has continued to increase, despite preventive measures meeting international standards and WHO targets for detection and cure. According to the WHO Global Tuberculosis Report 2017, South Africa had about 237,045 new cases in 2016, with an incidence rate of approximately 781 cases per 100,000 of the population—a big leap from 338 per 100,000 in 1998.

The problems with occupational lung disease also occur in neighboring countries from which labor for South African mines has traditionally been drawn for more than a century. It is certain, given the size and age of the mining industry, that there are large numbers of former mine workers in southern Africa with previously
unidentified disease who should be compensated. Recommendations by the Department of Minerals and Energy in its Tuberculosis Control Programs of 2003 included the external review of TB control activities every five years; the inclusion of autopsy findings within annual program reviews, and review of policy suitability, staff training and community liaison.

A report of the Commission of Inquiry into the Compensation for Occupational Diseases by the Department of Mineral and Energy Affairs in 1981 found that there was no reason for the separation of mineral-related occupational diseases and other occupational diseases. Both ODMWA and COIDA provide for the management of permanent, irreversible, incurable conditions, while COIDA also provides compensation for treatable conditions. As ODMWA deals solely with incurable conditions, it provides lump sum benefits only, while COIDA provides wage-related monthly payments for permanent disablement assessed at over 30 percent.

The Commission of Enquiry also reported a government plan to merge ODMWA and COIDA into a new act to ensure better monitoring, reduce accidents and close gaps within social insurance. However, it was not implemented, for unknown reasons. This was despite problems such as claims being filed with incorrect departments, double compensation being paid, different standards between departments and lack of equity of compensation. The proposals included integrated inspection services and that the funds for compensation within the Department of Health (ODMWA) and the Compensation Fund (COIDA) be merged.

The prevention of occupational diseases has received increased attention since the Leon Commission of Inquiry (1994) and the Mine Health and Safety Act, 1996 (Act 29 of 1996), as amended. There has been a steady appreciation of the need to apply more resources to deal with occupational health matters. The 1995 Report of the Leon Commission of Inquiry into Safety and Health in the Mining Industry described mineworkers’ dismal occupational health experiences, including TB rates of 58 per thousand after 15 years’ exposure; 25 percent of the workforce presenting with asbestos-related disease, including lung cancer, after 20 years of exposure in an asbestos mine, and 50 percent of coal mineworkers developing coal miner’s pneumoconiosis after 40 years of exposure.

The Department of Labor’s Committee of Inquiry into a National Health and Safety Council in South Africa (the Benjamin and Greef Committee) recommended in 1997 the establishment of a statutory National Council to develop an integrated national occupational health and safety policy. Its recommendations included:

- Investigation into integration of the different compensation systems, as well as the use of compensation funds to promote prevention of occupational accidents and diseases;
- Investigation into the types of benefits provided by the existing compensation laws and the ability of employees to gain access to those benefits; and
- The development of strategies to enhance the administration of the compensation funds and to improve the level of awareness of employers and employees of their respective rights and obligations.

The Benjamin and Greef Committee was of the view that existing legislation and administrative structures were unable to meet the challenges of technology, the expectations of employees, the requirements for enhanced productivity and the obligations of the state. It said that failure to do so would result in occupational accidents and work-related ill-health continuing to take an immense toll on the country’s human and economic resources. The committee recommended that a national policy on occupational health, safety and compensation be developed as the first step to rectifying the situation.

In a report entitled, “Fulfilling Broken Promises,” the Yale Global Health Justice Partnership notes that the mineworkers’ compensation system in South Africa is under-funded. It states that levy calculations are

23 https://law.yale.edu/system/files/area/center/ghjp/documents/fulfillingbrokenpromises.pdf
consistently subject to industry influence and not directly tied to expert evaluations. The report claims that better levy-setting and improved collection and administration are needed to provide adequate compensation under the Constitution. It points out that the ODMWA compensation system has done little to alleviate the heavy impact of disease on mineworkers, former mineworkers and their families. ODMWA provides minimal benefits and does so only in a minority of eligible cases. For example, in one 21-month period, the consulting firm Deloitte found that of 28,161 claims accepted by the Medical Bureau of Occupational Disease (MBOD), the Compensation Commissioner for Occupational Diseases (CCOD) made pay outs in only 400. According to the research, administrative delays coupled with logistical hurdles prevent the system from functioning well and result in many qualified claims going unfiled or unanswered.

In his June 2014 State of the Nation Address, South Africa’s president emphasized the importance of improving the situation of mineworkers and mining communities. A complete revision of ODMWA is in keeping with the National Development Plan, the tenets of which include a social security system covering all working people, with social protection for the poor and groups such as children and people with disabilities, and affordable access to quality health care.

**Medical Assessments, Autopsy, and other Adverse Change Provisions in ODMWA**

ODMWA gives the Director of MBOD powers to enter any place where a person who works or has worked at a controlled mine is being medically examined, to attend any medical examination of such person and, with patient consent, examine him or her (or cause him or her to be medically examined by another medical practitioner). In practice, however, this is difficult, due to MBOD resource constraints and the number of medical examinations that need to be carried out for surveillance and diagnosis of occupational lung disease.

Under ODMWA, all mineworkers and ex-mineworkers are entitled to have their hearts and lungs removed after death to be examined for the presence of occupational disease. MBOD is responsible for implementing the medical aspects of the Act and for appointing medical professionals to carry out medical examinations, including heart and lung removals. The National Institute for Occupational Health (NIOH) is responsible for performing the post mortems on the heart and lungs after they are removed. NIOH sends the results to MBOD for possible certification. If MBOD certifies that the mineworker/ex-mineworker is suffering from a compensable occupational lung disease, the application is referred to CCOD for further processing.

However, there are problems around this process. Cultural traditions are often in opposition to the removal of these organs from the body. There are difficulties in transporting the organs to the MBOD office in Johannesburg from remote areas or neighboring countries. Very often the family does not even know that the deceased had a compensable disease. They also do not know that they have to send the heart and lungs to MBOD for testing in order to make a claim for compensation that might have been due to the deceased.

The system presents difficulty to people who are not functionally literate in English or Afrikaans, cannot easily access photocopiers and Commissioners of Oaths, lack bank accounts, live in areas with poor postal services, or cannot afford long telephone calls to enquire about their claims.

The number of autopsies conducted under ODMWA is falling, despite the potential benefits to families and medical science. Reasons include fear of mutilating the body, lack of knowledge about autopsy, lack of rapport between physician and the deceased’s family, lack of consensus among family members regarding the procedure and concern about funeral delays.

There is no distinction in ODMWA’s definition of “compensable disease” between ordinary TB and MDR- and XDR-TB. It is vital not only for employees and ex-employees but also for the communities in which they live, that these types of TB are identified. Medical costs are a huge burden on ex-employees subsequently diagnosed with an occupational lung disease. They are often unable to pay upfront for medical treatment before claiming a refund from their former employer. In such cases, state hospitals and other approved medical service providers should provide the medical services, paid for by the Compensation Fund.
The constitutionality of ODMWA is questionable. South Africa’s Constitution states in Section 9(1) that everyone is equal before the law and has the right to equal protection and benefit of the law. In Section 9(3) it declares that the state may not unfairly discriminate directly or indirectly against anyone. It is highly likely that as benefits under ODMWA are inferior to those under COIDA, ODMWA is in breach of the equality provisions in the Constitution.

Employees of controlled mines and works are treated separately and differently from other employees as far as occupational disease is concerned. This can be viewed as unfair and discriminatory. Other countries’ statutory compensation systems acknowledge the relative risks of different types of work. ODMWA provides statutory compensation for diseases contracted at “controlled mines” and “controlled works”. Not all mines and works in South Africa are controlled. This creates an inequitable situation due to the disparities in compensation between ODMWA and COIDA.

Employees of non-controlled mines and works are at an advantage, as they are covered by COIDA, under which the compensation payable is much higher. However, in practice, it is not certain whether these employees are in fact able to access benefits under COIDA and, whether this understanding of the legal position is shared by the Compensation Commissioner in terms of COIDA.

The belated realization of the mining industry’s contribution to the country’s TB epidemic, along with several internal issues, has recently focused the Department of Health’s attention on ODMWA. Poor financial management of the CCOD resulted in a series of negative audits. The ODMWA Compensation Fund itself was described as “technically insolvent” after an external audit in 2003. Administration of the CCOD has been repeatedly criticized in parliamentary hearings, eliciting admissions by the Minister of Health and the Director-General of CCOD that it was dysfunctional and that the department had mismanaged it. In 2012, the Minister placed the MBOD and CCOD under the line management of a chief director within the Department of Health.

ODMWA creates duplicate and confusing systems for occupational diseases that are also covered under COIDA. Occupational lung diseases are covered by both laws, but have different thresholds for compensability and the receipt of benefits. Under ODMWA, there is also inadequate surveillance and inspection of employees and former employees, due to weak linkages of electronic databases in the compensation offices and relevant health and safety agencies. A 2010 study by Maiphetlho and Ehrlich found that claimants confirmed to have received their award in less than half the claims processed by the CCOD. The average delay for the whole claims process was more than four years. A 2002 audit of compensation for post mortem certifications found a payment rate of only 7 percent. In 2011 the backlog of claims stood at around 13,000.

The recent reorganization of the line structure of the bureau and CCOD signals the department’s intent to deal with the problem. However, budgetary constraints remain. While levies on the mining industry can be increased to underwrite compensation payments, the administration costs of the bureau (including the costs of examining former mineworkers) and CCOD come from the Department of Health’s budget. This cost the taxpayer approximately 38 million Rand in 2011. The assumption of these costs by the state reflects successive pieces of compensation legislation accommodating the needs of the mining industry and pressures from mineworkers, particularly white organized labor. However, a case can be made for these costs to return to the Compensation Fund, paid for by employer premiums. The defrayment of administration costs from premium revenue is the norm for insurance funds, including the COIDA fund. The mining industry would have a greater stake in ensuring the efficiency of the bureau and CCOD if it were responsible for their financing. Such a move would also relieve the pressure on the public sector or on a future National Health Insurance fund to pay for medical benefit examinations.

While the organization of medical benefit examinations and the medical adjudication of claims fall within the core business of the Department of Health, the non-medical functions of administration and payment of
claims do not. More recent attempts to move the administrative function of CCOD to Rand Mutual Assurance Co. Ltd (which administers all mining industry occupational disease claims not covered by ODMWA and all mining occupational injury claims) have reportedly been shelved. Turning CCOD around will be a significant task for a department burdened financially and managerially by major reform initiatives in other areas of the public health care system.

Legal, financial and managerial reform of the ODMWA structures is long overdue. Shorter-term goals include:

- Provision of a rural infrastructure to increase access to medical examinations.
- A formal evaluation of the nature and effectiveness of the “190 service points” mentioned in the 2012-13 to 2014-15 Annual Performance Plan of the Department of Health.
- Negotiation with relevant agencies of cross-border arrangements for occupational lung disease detection and compensation, particularly in Lesotho and Mozambique.
- Measures to attract qualified staff to the bureau to ensure rapid turnaround of claims, promote vigorous management of CCOD and to tackle 13,000 backlogged claims.

The *South African Health Review* has argued that intermediate policy goals should be to shift the responsibility of financing the administration of the system to the Compensation Fund and to seriously consider outsourcing the administrative functioning of CCOD to the private sector. The single most contentious political and economic aspect of the system is the inequity between the financial benefits obtainable by various categories of workers under ODMWA and COIDA. This requires urgent high-level policy and legal reform.

**Benefits**
The compensation paid under ODMWA is a lump sum, the size of which has not been revised for many years and has not kept pace with inflation. Even had it done so, the amount, when measured against that payable in similar circumstances under COIDA, is inadequate.

Under ODMWA, there is no provision for payment of funeral expenses, or any lump sum or pension for dependents of a person who died of a compensable disease. The dependents can receive the lump sum that would have been payable to that person had he or she not died. However, where the person suffering from a compensable disease has already been paid the lump sum, the dependents get nothing, even if they are still children. Under COIDA, provision is made for the compensation of dependents, such as spouses and minor children.

ODMWA recognizes only two levels of disability for compensation, first degree (10-<40 percent) and second degree (40-100 percent). These ranges of grading are too wide to categorize workers in an equitable fashion. The Act recognizes only more than 10 percent impairment as compensable, but fails to define what less than 10 percent constitutes in terms of chest X-ray and lung function abnormalities. It pays out the benefits as a lump sum, rather than as pensions on a long-term, life-time basis. Through the National Institute for Occupational Health’s Pathology Section, ODMWA provides for post mortem benefits for mineworkers if an occupational disease is found, even if it was not the cause of death. However, these post mortem benefits should not be confused with benefits payable to dependents, as ODMWA does not provide for the latter.

ODMWA pays lump sum benefits based on the level of impairment and does not make any further pension provision. The threshold for compensation for lung function loss is 35 percent. All medical expenses including follow-up related to the treatment of the lung disease are paid by the mine owner(s). Aside from payment of 75 percent of wages (for a maximum of six months) for a worker with TB, the Act does not cover loss of earnings for absence from work as a result of other diseases.

**The Claims Application Process**
ODMWA processes are impractical and make life difficult for those suffering from a compensable disease. For instance, Section 36A provides that a person who incurs medical costs from a compensable disease can claim these costs from their employer, who is obliged to pay them. However, it is difficult for an individual ex-mineworker to deal with the relative might of a mining organization, and in many cases the employer no longer exists. Many ex-employees cannot afford to pay their medical expenses and claim them back. Another difficulty is the classification of certain types of work as risk work, when there is in practice insufficient occupational hygiene data available. Employees and ex-employees have difficulty accessing medical personnel and facilities for diagnosis. The autopsy provision for deceased mineworkers effectively puts compensation out of reach for already disadvantaged claimants, many of whom are not resident in South Africa and are unable to send the organs of the deceased to Johannesburg for autopsy.

The first requirement of CCOD is timely assessment of claims. The bureau code of conduct requires that it certify cases within six months of receipt of documentation and must inform claimants within 10 days of certification. In a 2010 review, the bureau’s efficiency had deteriorated significantly from a median response time of eight months during 1993-2000 to 13.5 months during 2001-05. The overall range was one to 46 months. Recent reviews suggest the claims turnaround time has been reduced to under six months, but a significant obstacle to sustaining this improvement is the difficulty of recruiting qualified medical staff at the remuneration level offered by MBOD. Other complaints about the bureau have included poor registration of claims, lost documents, and difficulty getting information on claims.

There is no prohibition in ODMWA on a mine worker suing an employer or ex-employer for damages as a result of contracting a compensable disease, even though he has already received compensation under ODMWA. This does not necessarily mean that every miner would succeed, however, because of the requirement under the law of delict to show negligence on the part of the mine.

Compensation System Financing

Compensation under ODMWA is underfunded. Levy calculations are not based on expert determinations of the amount of money necessary to fund the system equitably and sustainably. Statutory compensation systems should be properly and transparently funded by clearly defined contributions from employers, which are adjusted annually in line with changes in the cost of living. The funding system and decision-making should be independent of industry or trade union interference.

The mining industry is presently in decline, with the result that some employers no longer exist and are no longer available to finance medical aid for newly diagnosed ex-employees with compensable disease. Compensable disease has a long latency period and so may only be discovered many years after the employee has left the mine where he contracted it.

ODMWA results in employers not bearing the full cost of the burden of disease incurred by the mines, which is then transferred to the public health care system as a social cost borne indirectly by the taxpayer. It is not fully funded by employers, as the Department of Health administers it, diverting scarce resources from promoting occupational health for workers in other industries. The compensation system therefore contains no financial incentive for employers to tackle dust problems in the mines, as its administration is subsidized by the state. The Report of the Committee of Inquiry into a National Health and Safety Council concluded that the system of compensation under COIDA and ODMWA has not maximized its potential to promote prevention activities. It found that the ODMWA compensation system contributed significantly to poor control of health hazards in the mining industry.

ODMWA has not kept up with changes in disease patterns or medical science. There is now MDR and XDR tuberculosis, and the ODMWA definition of “tuberculosis” requires a person to have worked at least 200 shifts of risk work—an arbitrary and inappropriate qualification, as a person does not need to work 200 shifts before contracting TB occupationally.
Clinical Diagnosis and Medical Surveillance
A database of medical surveillance of the living workforce needs to be maintained to monitor their state of health and their development of occupational disease as it happens. It is unnecessarily bureaucratic and cumbersome to have a committee, particularly one with at least four members chaired by the Director of the MBOD, to certify an occupational lung disease. Individual health care practitioners are professionally competent to certify the presence of disease and should be given the authority to do so for the purposes of ODMWA. The requirement of post mortem examination of the heart and lungs to establish compensable disease is difficult to comply with, cumbersome and impractical.

In South Africa, surveillance of occupational exposures and diseases is weak despite efforts by the Department of Mineral Resources to maintain registers such as the South African Mining Occupational Diseases database, initiated in 1998. The Pathology Automation System (PATHAUT), an electronic database of approximately 100,000 autopsies of deceased mineworkers dating back to 1975, is an exception. PATHAUT is under the control of the National Institute of Occupational Health. It provides a rich data source for research and monitoring disease trends. However, PATHAUT is not enough. It serves only as a record of those who have died.

Fragmentation of Legislation – Compensation for Occupational Injuries and Diseases (COIDA), Act 130 of 1993
Although there are provisions in ODMWA and COIDA that interlock, the two statutes remain distinct. COIDA pays more comprehensive benefits than ODMWA. Benefits under COIDA include compensation for temporary total and temporary partial disability due to an occupational injury or disease, a disability pension where the disability exceeds 30 percent, and the compensation of dependents where the employee has died as the result of an occupational injury or disease. A constant attendance allowance is payable under COIDA where an employee is unable to perform the essential actions of life without ongoing care.

It also makes provision for the payment of medical aid by the Compensation Fund, the employer or a mutual association, for up to two years from the date of commencement of an occupational disease. Under COIDA, the Director-General may pay out of the compensation fund such amount as he or she may deem reasonable, within limits, for funeral costs, or direct the employer to pay such costs.

ODMWA allows only for the payment of lump sums to employees and ex-employees. There is no compensation payable to dependents except the compensation due to the employee or ex-employee himself, if not collected before death. Under ODMWA there is no compensation for loss of earnings due to temporary total disability, nor for the payment of funeral expenses.

Table 2.1 compares the requirements and benefits under COIDA and ODMWA.
Table 2.1. ODMWA compared to COIDA

<table>
<thead>
<tr>
<th>ODMWA</th>
<th>COIDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administered by the Department of Health</td>
<td>Administered by the Department of Labor</td>
</tr>
<tr>
<td>Compensation payable in lump sum form only</td>
<td>Compensation payable as lump sum or pension depending on the degree of disability. Lump sums for disability less than or equal to 30 percent. Pensions for disability over 30 percent.</td>
</tr>
<tr>
<td>Medical screening for occupational disease is required</td>
<td>No medical screening for occupational disease</td>
</tr>
<tr>
<td>Lifelong right to benefit medical examination at no cost to employee</td>
<td>No equivalent provision (medical examination only covered if claim is successful)</td>
</tr>
<tr>
<td>No compensation for temporary total or partial disability except payment of 75 percent of wages lost up to period of six months (TB only)</td>
<td>Compensation for temporary partial or total disability is payable. Payment for temporary total disability for a period of up to 12 months (extendable to 24 months) equivalent to 75 percent of employee's earnings</td>
</tr>
<tr>
<td>No funeral expenses payable</td>
<td>Funeral expenses payable</td>
</tr>
<tr>
<td>No payments of compensation to dependents for death of breadwinner from occupational disease. They may only collect the compensation that would have been payable to the employee/ex-employee if not yet paid</td>
<td>Pension payable to dependents of a person who died from an occupational disease</td>
</tr>
<tr>
<td>Compensation payment for permanent disability not linked to employee’s earnings</td>
<td>Compensation payment for permanent disability linked to employee’s earnings</td>
</tr>
</tbody>
</table>

Compensation under ODMWA is inferior to that payable under COIDA. A person whose disease is certified as a compensable disease loses all the benefits of COIDA and receives much less under ODMWA. The Constitutional Court has observed that the purpose of this is obviously to reduce the burden on the COIDA fund by converting an occupational disease into a compensable disease. This means that the person benefits to a considerably lesser degree from another fund to which the employer makes a (much smaller) contribution, because of the smaller benefits payable. The savings to the employer, arising out of the redefinition of the disease, amounts to a reduction in the contribution to the COIDA fund, which exceeds the lesser compensation under ODMWA. An employee who has a claim under ODMWA must be excluded from COIDA. The drastic reduction in his compensation is obligatory. It is therefore no surprise that ODMWA is silent on the issue of common-law liability.

COIDA is far more comprehensive in its approach to occupational lung disease than ODMWA. With its broad list of respiratory diseases, it can and does cover mineworkers for occupational lung disease where they are not covered by ODMWA. This is, however, problematic due to the inferiority of the benefits under ODMWA when compared to COIDA. The discrepancies in compensation between ODMWA and COIDA are unconstitutional, as the Constitution states that everyone is equal before the law.

Provision of Services across Provincial and Country Borders
Migrant workers come from countries surrounding South Africa to work in the mines. When they return home with occupational disease, they take the associated problems back to their own communities. Workers also travel from the nine provinces of South Africa to mines and works in other provinces. There is a large burden of undetected lung diseases in former silica-exposed mineworkers now living in labor-sending areas. The high silicosis rates in former gold mineworkers from labor-sending areas illustrate the problem.
The strong association between silicosis and TB in South Africa, combined with the HIV/AIDS epidemic, is cause for concern. There is an increasing incidence of TB with increased severity of silicosis in South African gold mineworkers. Research by Cowie suggests that one quarter of mineworkers with silicosis will develop TB by 60 years of age. This was before the surge of the HIV/AIDS epidemic. In addition, the International Agency for Research on Cancer has classified silica dust as a cancer-causing agent.

Combined with significant levels of migrant labor and the high HIV/AIDS infection rate, the interaction between inadequate silica dust control, high rates of silicosis, HIV/AIDS and TB (including the multi-drug resistant forms) presents major challenges for occupational and public health services in the region. The South African government estimates that the TB incidence rates on gold mines are probably the highest in the world. The TB burden on South African mines has had a noticeable impact on neighboring countries because of migrant labor. A recent study showed that in Lesotho, close to 40 percent of adult male TB patients in three of Maseru’s main hospitals were working, or had formerly worked, in South African mines. It is clear that the public health threat of TB in Lesotho cannot be adequately addressed without dealing with the issues around TB control in migrant Basotho mineworkers and their families—both in the South African mines and in their communities in Lesotho. Cross-border management of TB involves special policy considerations which must be collaboratively determined and implemented by stakeholders in both countries. To date, there has been no coordinated action between Lesotho and South Africa on this issue.

More than 90 percent of reported cases of occupational lung disease in South Africa are attributed to the mining industry. It is important to address the problem of maintaining contact with migrant workers once they have left their employment, in order to identify and treat those who may have developed a compensable disease.

There is a need to establish a standard, robust system of referral for mineworkers and former mineworkers with TB, silicosis and other occupational lung disease. There is also a need to establish working relationships with provincial and foreign governments to ensure continuity of health care and medical surveillance of employees and ex-employees of the mines.

Migrant mineworkers can be highly mobile while undergoing care and treatment. Some mining companies with on-site treatment facilities provide patients with referral cards, but these are not standardized, are often incompletely filled out and do not capture all the essential information needed for harmonization of care. There is also a lack of cross-border communication between health care providers in Lesotho and South Africa. This lack of continuity can result in sub-optimal care and treatment, for example, the administration of anti-TB drugs that the patient has previously taken and failed to respond to. In addition to being a threat to the patient’s health, this is also an unnecessary waste of resources. A 1997 survey among Botswanan men formerly employed in the South African mining industry concluded that former mineworkers in Botswana have a high prevalence of previously unrecognized pneumoconiosis indicative of high exposures to fibrogenic respirable dust. Their pneumoconiosis went unrecognized because they had no access to surveillance after employment. Community-based studies of former mineworkers are essential to fully evaluate the effects of mining exposures. The findings indicate a failure of established measures to prevent or identify pneumoconiosis while these mineworkers were in employment. They also show that few of the social costs of occupational lung diseases are borne by mining companies through the compensation system.

Oscillating migration has diluted pressure from communities and organized labor on mine management to reduce dust levels and control disease. It has enabled mining companies to limit disease-associated costs, thereby reducing the financial incentive to control dust and disease. Policies are needed to assure that ex-mineworkers, in particular, have access to health care and compensation services. There is a clear need for regional and national policies that acknowledge the economic value of migrant workers and strengthen health services where migrant workers are employed or live, and in labor-sending areas.

An ILO paper reports that apart from the annual use of injury data for insurance purposes, there is little consistent or comprehensive monitoring globally of trends in occupational health. At the workplace level,
monitoring of occupational health practices and outcomes is poor. Most companies do not carry out environmental monitoring (Sitas et al 1988), doctors do not collect comprehensive occupational histories (Zwi and Ehrlich 1986) and occupational health services do not carry out systematic tests of occupational disease. In many companies, inspections are infrequent or absent, and recording or reporting of injury is unsatisfactory, missing or out of date. In southern Africa, for example, there is no assessment of the public health burden of occupational injury and illness. This information has to be pieced together from ad hoc surveys, with huge gaps.

A more comprehensive and accurate surveillance of occupational disease is needed, which requires better professional training and deployment to ensure access to adequately staffed and equipped occupational health services, and that public health practitioners recognize occupational disease. Studies in South Africa and Botswana have indicated that there are thousands of undetected or unreported cases of occupational lung diseases in former mineworkers in the rural areas of southern Africa (Davies 1993). Surveys have shown that doctors in rural areas have little knowledge of chest and respiratory occupational diseases and many cases are diagnosed and admitted in error as TB cases. A 1987 study by Cowie and Van Schalkwyk of migrant labor to the Orange Free State gold mines noted that the available methods for estimating silicosis in workers lead to underestimates of the real level of disease. Several studies present a limited but powerful picture of occupational lung disease in excess of 25 percent in migrant and former mine-workers to South African gold mines 15-25 years after exposure.

Under ODMWA, provision should be made for arrangements with foreign states regarding compensation for ex-employees outside South Africa who contracted occupational lung disease while working in the country (similar to the provisions in Sections 23 and 94 of COIDA). A few Southern African Development Community (SADC) countries provide for benefit medical examinations at government hospitals (e.g. Botswana and Lesotho). Alternatively, the claimant is directed to the nearest South African government hospital providing the service. The South African government should forge concrete relationships with health authorities in labor-sending countries and agree on a single regional protocol for dealing with ex-employees suffering from compensable disease. Bilateral agreements between South Africa and each of the labor-sending countries are likely to be less effective than a single legally binding regional protocol, at the level, for example, of SADC.

As well as protocols, SADC makes declarations such as the 2012 Declaration on Tuberculosis in the Mining Sector. This committed member states to a vision of zero new infections, no stigma and discrimination, and no deaths resulting from TB, HIV, silicosis and other occupational respiratory diseases. In this declaration, member states reaffirmed their commitment to improve health and safety practices and standards in the mining sector, to address TB in accordance with previous SADC protocols on issues such as mining, social rights, and migrant and occupational health.

International Best Practice
Helpful insight can be drawn from the experience of other countries concerning international best practice in the area of occupational diseases. The German case makes clear that prevention is better than cure. It is vital to ensure adequate programs of dust control in the working environment.

If such programs are successful, silicosis can be entirely prevented. In 2006, the Mine Health and Safety Council published “South African Mining Industry Best Practice on the Prevention of Silicosis”. There is sufficient information available on the prevention of silicosis and sufficient evidence from other countries that prevention measures work. It is simply a question of putting prevention measures into practice.

In many other countries, there is provision for the medical treatment of employees with occupational diseases, as well as surveillance of the workforce to help detect such diseases early. Although ODMWA provides for medical screening, much could be done to improve its implementation. Internationally, there has been a marked trend towards establishing a single authority with responsibility for determining an overall health and safety policy and harmonizing standards. The best-known is the British Health and Safety Executive, established by the 1974 Health and Safety at Work Act. Most Canadian and Australian
jurisdictions, as well as Continental European and Scandinavian countries, have a single institution with ultimate responsibility for determining OHS policy, as do Zimbabwe and Namibia.

In certain jurisdictions, a single institution has responsibility for both prevention and compensation. However, there is evidence to suggest that a close institutional linkage between prevention and compensation agencies can improve prevention by integrating policy and decision-making, improving the quality of information to target occupational health problems and making compensation assessments responsive to employers’ performance in occupational health and safety. Financial sanctions imposed through the compensation system are one of the most effective incentives for improved employer performance in occupational health and safety.

Compensation is payable in periodic payments rather than in a lump sum in most countries. A significant research base indicates that claimant outcomes are demonstrably better under periodic payments rather than a lump sum. Most lump sum recipients spend their award quickly (within five years), and a large majority of claimants become reliant on social security disability benefits. Potential lump sum awards can also have significant secondary behavioral consequences, as claimants extend their time on periodic benefits during waiting periods or in anticipation of a settlement. Funeral expenses are also payable in many countries as part of compensation for death due to an occupational disease (as is the case under COIDA).

Most countries provide for some form of medical benefit, so that access to health care services for occupational diseases does not depend on whether the employee or ex-employee has the money to pay up front and then claim the expenses back later. Most countries also make provision for some form of compensation of an employee or ex-employee’s dependents in the event of death from an occupational disease.

In some European countries, a fee is paid to a medical practitioner for reporting an occupational disease. A similar system may be a good way of getting doctors in South Africa to be more aware of occupational diseases and better at reporting them.

Many countries do not have separate agencies for dealing with occupational diseases in mines, but have instead a general workers’ compensation system which includes mineworkers. However, it has been argued that there are benefits to having separate agencies that focus on specific working environments and their occupational diseases. In the USA and Germany, mineworkers are treated differently and the USA has the Black Lung Fund from which mineworkers can claim compensation for pneumoconiosis. However, both Germany and the USA have other social security systems that are complementary to the special arrangements. The fact that they have resources dedicated to mineworkers must be seen in the context of their broader social security systems.

Conclusions
The major reforms needed to ODMWA are identified below, in medium- and long-term categories. Not all can currently be addressed, but there is an urgent need to modernize and eliminate inefficiencies in the existing ODMWA compensation system.

Systems, Structure and Governance
The current CCOD and MBOD governance structures need to be overhauled and aligned with the Public Finance Management Act (PFMA). They should be absorbed into a new, single national public entity, to clarify lines of accountability and reporting, as well as operational and financial structures.

The organizational structure used by the South African Revenue Services (SARS) is recommended as simple and straightforward with clear lines of accountability. The new ODMWA would create a commission, with medical and other experts appointed to carry out technical functions. It would be headed by a commissioner under whom both the offices of the current CCOD and MBOD would fall, and who would play the role of CEO and accounting officer.
Given South Africa’s high levels of unemployment, return-to-work programs should be considered. ODMWA’s current provisions for fitness monitoring should be revised accordingly. Until restructuring can be implemented, the efficiency of administration can be enhanced by delegating aspects of the Minister’s powers under the ODMWA to the Director-General Health, the Director of the MBOD and the CCOD in terms of section 123 of ODMWA.

The Public Service Act contains two mechanisms for restructuring government departments: a government component, which is a separate institution linked to a department; and a specialized service delivery unit which operates within a department. A government component and a specialized service delivery unit may only be established after a comprehensive feasibility study has been conducted in accordance with Part A of Chapter 6 of the Public Service Regulations, 2001.

Benefits
The compensation payable under ODMWA should not be less than or inferior to that payable in respect to occupational diseases under COIDA. This means that a substantial revision of the financing of ODMWA, the Compensation Fund and the new CCOD and MBOD will have to be undertaken. Actuarial and other expert research is needed to establish the nature and extent of levies to be paid by controlled mines and works to the Compensation Fund. The benefits currently payable under ODMWA should be set at more realistic levels in the medium term. The alignment of ODMWA benefits with COIDA benefits is likely to be a longer-term project, as the financing of these benefits should be actuarially calculated and built into the system of levies under either COIDA or ODMWA.

The abolition of the right to claim benefits under ODMWA and to institute legal proceedings for a common law claim against an employer or former employer should be considered in the longer term. While ODMWA’s benefits remain inferior to those of COIDA, it will be difficult from a constitutional perspective to justify the abolition of a common law claim for compensable disease in light of the judgment of the constitutional court in Mankayi v Anglogold Ashanti Ltd 2011 (3) SA 237 (CC). The decision in this case may well provide some added incentives for the mining industry to support amendments to ODMWA that improve the extent and level of compensation paid for compensable disease.

Compensation System Financing
As well as compensation, liability for medical expenses due to compensable disease and who should bear it need careful consideration following the government’s decision to establish national health insurance in the coming years. Occupational diseases have a long latency period and the mining industry is in decline. This means that in the future there are likely to be more ex-employees and fewer ex-employers to carry the burden of their medical expenses. It could be argued that if CCOD were to be absorbed in a merger of ODMWA and COIDA, the medical expenses of ex-mineworkers could be subsidized by employers from other sectors. However, it is not clear whether this would be desirable from a policy perspective.

Consideration should be given to declaring all mines as controlled mines, i.e., all mines (as well as smelters and similar beneficiation plants) should be covered by ODMWA. The National Health Act’s ban on free primary care in the public health sector for mineworkers and ex-mineworkers with a compensable disease needs reconsideration. Health services for ex-employees resident in surrounding countries who have worked in South African mines also need to be arranged with those countries’ governments.

Clinical Diagnosis
The processes for obtaining a clinical diagnosis of a compensable disease should be simplified and made more accessible. Medical practitioners should be authorized to certify employees and ex-employees as having compensable disease. The Certification Committee should be abolished or replaced by a more expedited and simplified procedure. This would require legislative amendment. However, pending the enactment of such legislation, the process of certification for determining an entitlement to compensation could be speeded up by appointing a medical doctor as deputy director in the MBOD who would be able to chair the Committee in the absence of the Director as well as one or more alternate members for each member of the Committee.
Alternatives must be found to reduce or even eliminate the need for the post-mortem examination to diagnose a compensable disease. For instance, more effort should be devoted to mobile medical units in South Africa and labor-supplying countries to facilitate clinical diagnosis. Communication on ODMWA to medical practitioners, occupational health professionals and employees concerning medical surveillance and the existence of the compensation system could also reduce the need for post-mortem examination of the heart and lungs.

Claims Application Process
The process needs to be simplified. It should be adapted to cater for people in remote areas who may not be literate or have access to phones, fax machines and email.

Recommendations
A change of policy is needed to adopt the recommended medium- and long-term solutions to address the challenges surrounding ODMWA. The Act is outdated, inefficient, and inconsistent with South Africa’s Constitution. It needs rewriting to align it with current thinking on compensation for occupational lung disease and South Africa’s post-apartheid legislative framework. Issues involving the quality of life of mineworkers and the communities in which they live have caused unrest and unhappiness in this sector of the population in recent years. It is critical to address weak points such as ODMWA to demonstrate the government’s willingness to address the challenges facing mineworkers.

In the medium term, it is recommended that ODMWA be revised to address as many as possible of the difficulties identified in this report. However, it may be possible to address some of the difficulties only in the longer term by a merger of ODMWA and COIDA.

Medium-term recommendations
- Create a single public entity under ODMWA.
- Restructure CCOD and MBOD in line with the PFMA and SARS, to clarify and improve lines of responsibility and accountability.
- Improve financing of ODMWA structures and compensation payable under ODMWA.
- Improve medical surveillance systems and communication between state agencies under ODMWA and MHSA.
- Institute better data collection and management capacity under ODMWA.
- Create mechanisms for cross-border solutions for employees and ex-employees suffering from compensable diseases.
- Create mechanisms for collaboration with provincial and local health authorities.
- Streamline processes for clinical diagnosis and certification.
- Align ODMWA with the National Health Act and medical schemes legislation to ensure that the parties responsible for medical expenses under ODMWA pay them.
- Set more realistic compensation levels.
- Create a sustainable Compensation Fund and accelerate the processing and payment of compensation.

Long-term recommendations
- Create a unitary system of medical surveillance and compensation for occupational injuries and diseases for all employees and ex-employees.
- Bring benefits for occupational lung disease in mines and works into line with those under COIDA.
- Create sustainable funding mechanisms for medical expenses arising from compensable disease where employers no longer exist.
- Eliminate common law claims for compensable disease.
Specific Recommendations relating to the Compensation Fund

These recommendations should be considered in the context of a notional partition of the Compensation Fund into three sections as follows:

- **Fund A** – This consists of current mineworkers.
- **Fund B** – This consists of the reported claims which have not yet been settled.
- **Fund C** – This consists of ex-mineworkers whose whereabouts are unknown, and who are eligible for compensation but have still not submitted their claims.

The notional partition divides the Fund into three sections to represent different interest groups. Fund A represents current mineworkers and it should get employers to fund it because they still have an economic interest in doing so. The employers no longer have an easily identifiable economic interest on Fund B and C. There is an urgent need to capitalize Fund B to ensure that there is enough money to settle claims which have already been reported. An awareness campaign to encourage claimants on Fund C to come forward and claim will also be required. Fund C will also have to be capitalized but not as urgently as Fund B.

**Conduct an actuarial valuation to determine the liabilities of each of the three Funds**

Allocate assets to each Fund in proportion to its liabilities. Allocate all future levies to Fund A because the members of Fund A are still employed and still at risk, thus a continuing levy is required to fund the liability currently accruing to be paid in future.

**Develop a plan for paying claims which have been reported on Fund B**

This should allow for claim settlement expenses. It is recommended that claims be settled over the next two years if possible. Allow for re-opening of first degree claims which will develop into second degree claims. Develop a cash flow model based on the plan above to help understand how the cash flow requirements of the Fund will emerge over the period during which claims will be settled. Ensure claims do not overrun the assets available to pay claims. Secure funding to pay claims and expenses. The funding must be in place urgently since the claims have to be paid urgently.

**Develop a plan for increasing awareness and paying claims in respect of Fund C**

This is key before embarking on an awareness campaign to encourage former mineworkers to come forward and claim. Build a model on the reporting and claim settlement patterns for this cohort of claims and develop a cash flow model based on the expected reach of the awareness campaign, the rate at which claims will be reported once the awareness plan has been implemented and the expected settlement patterns. The plan should allow for the costs of the awareness campaign, the costs of tracing ex-mineworkers and claim settlement expenses. Secure funding to pay Fund C claims.

**Review the levy basis for Fund A and negotiate a levy increase implementation time table**

Benefits are based on salary and it makes sense to express the levy as a percentage of salary to provide for an automatic levy increase in line with the salary driven benefit increases. The levies for each year should be based on the claims that will arise from that year allowing for investment returns for the period between collecting the levy and date of payment of the claim. Allow for the expenses of running the Fund and the provision of services. Incorporate other risk factors in setting the levies such as the mix of occupations involved, which are an indicator of the amount of time a miner is exposed to risk, turnover, which is a measure of the extend of the intensity of the exposure, materials handled and processes followed which is a measure of the extent of exposure to harmful processes and dangerous substances, and employer’s risk management controls.

**Explore the affordability of different benefit structures for active mineworkers**

The goal would be to pay benefits that are the same as COIDA. There are effectively two compensation regimes in the mining industry, with the bigger and more dominant compensation fund run under COIDA paying better benefits than those paid under ODMWA. Draw up a strategy for improving benefits on ODMWA to the level of benefits on COIDA since uncontrolled mines are already enjoying the COIDA benefits regime anyway.
Develop and implement an appropriate investment strategy for Fund A
Implement regular asset/liability investigations to assist in understanding the Fund’s liability profile and its ideal Fund investment strategy from time to time. Put into place structures for implementing the investment strategy and monitoring the investment performance of the assets chosen and their continued suitability given the evolving nature of the Fund’s liabilities over time.

Review and Improve actuarial and financial governance structures
This will facilitate setting up appropriate committees and mechanisms to oversee specialist financial functions on Fund A such as a risk committee to oversee operational and financial risk management functions, an audit committee to oversee accounting and audit functions, an investment committee to oversee the investment and management of assets, a solvency committee to manage the Fund back to financial soundness, viability and long term financial sustainability, a claims Committee to oversee the verification and payment of claims, an administration committee to oversee the quality, accuracy and completeness of the data, and an actuarial committee to oversee the setting up and management of internal actuarial controls such as setting levies, actuarial valuations, asset liability modelling and expense analysis.

Develop documented internal guidelines setting out the strategies, policies and philosophies
These guidelines will underpin the running of Fund A and include: (i) actuarial valuation guidelines to set the asset and liability valuation methods, assumptions and policies and the required free reserves to ensure continued solvency; (ii) a compensation basis and benefit review philosophy to set out the long term compensation objectives and a framework for regular benefit reviews to keep benefits current; (iii) a statement of the investment policy to say how the investment strategy will be implemented; (iv) a pricing and levy review philosophy which includes the events that can trigger a levy review, the methods that will be used to set levies and the implementation process.

Provide for the expenses of running the Fund’s operations in the levies and regularly analyses and allocate the expenses based on the results of the expense analysis
Align expenses and the incentives structure on the Fund in line with the desired outcomes. Analyze the incentives to ensure that the nature of incentives set on the Fund whether by design or by default are in line with the Fund’s strategic objectives and desired outcomes.

References


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CHAPTER 3

ACTUARIAL ASSESSMENT OF THE FINANCIAL SOUNDNESS, VIABILITY AND LONG-TERM SUSTAINABILITY OF THE SOUTH AFRICA COMPENSATION FUND FOR OCCUPATIONAL HEART AND LUNG DISEASES IN THE MINES AND WORKS IN SOUTH AFRICA

The South African Occupational Diseases in Mines and Works Act, No. 78 of 1973 (ODMWA) provides for the establishment of a Compensation Fund (“the Fund”). The Fund assumes all liabilities for compensation for occupational heart and lung diseases suffered by people who work in Controlled Mines. The scheme is funded by a levy on “Controlled Mines” which is earmarked to pay compensation claims and the cost of actuarial valuations only. “Controlled Mines” are mines which have been declared as such by the Minister of Health.

The operations of the Fund are fraught with challenges: First, the benefits under the Fund are not inflation indexed. Second, the payment of lump sums benefits under ODMWA creates potential long-term problems, since beneficiaries may well have to turn to and become dependent on state social assistance when the lump sum benefit has been exhausted. Third, the Fund’s assets are all invested in cash. Most of the diseases covered under the Act incubate over a very long time and it is not unexpected for a levy paid in a given year to only be required to pay claims twenty or even more years later. There is a very wide investment horizon in the interim. Compensation by its very nature results in an expectation of inflation adjusted real benefits over time. Investment returns are therefore a very important link between levies and the eventual benefit payment. Finally, the Fund has generally not been able to attract and retain the higher level financial and technical skills required to enable it to discharge its mandate effectively.

There is an actuarial dimension to the operation of the Fund under the direction of a Compensation Commissioner for Occupational Diseases (CCOD) which must be understood in order to set up a framework for its management.

Objectives
The objectives of this assessment were to:

Review the financial soundness, viability and long term financial sustainability of the Fund: The assessment of the financial soundness, viability and long term financial sustainability of the Fund will be done using a framework that looks at three dimensions. These are whether the Fund has enough assets to meet its accrued liabilities, the adequacy of levies to pay for on-going liability accrual and whether the assets that the Fund invests in are appropriate to its liability profile. The assessment will also consider other factors such as how financially significant decisions have been handled in the past.

Review the Current Benefit Structure and make recommendations on possible benefit improvements and regular inflation adjustment of the benefits. The mining industry currently has two different compensation regimes under ODMWA and COIDA. Ideally the two regimes should provide similar benefits but the cost of improving ODMWA benefits to match those provided under COIDA is large and may not be affordable. The report will also make recommendations on mechanisms to ensure that benefits are reviewed regularly to keep them current and relevant to the time.

Review the Risk Management and Financial Governance Structures and make recommendations on how to set up structures to manage actuarial and financial risks. This will be done by comparing the structures of the Fund with the financial structures and processes used by similar funds in South Africa.

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Review the Investment and Asset Liability Modelling processes followed by the Fund and discuss ways in which the Fund can go about setting up an investment strategy, set up a framework for asset liability management and manage investment risk. The report also makes recommendations regarding the need for investment governance structures.

Review Current Revenue Model and suggest different ways in which the process of setting levies could be strengthened and make recommendations on how the Fund can go about investigating the suitability of different levy and expense models. It also makes recommendations on how to set up a framework for regularly reviewing the levies to ensure that they are commensurate with the benefits and expenses payable by the Fund. The report must be read in the context of a mining industry where profits are not as high as they used to be in the past and with employment numbers that have been declining over the years. Each generation of mineworkers must pay its way as it will be difficult to manage generational subsidies when both the membership and profitability are declining. Occupational heart and lung diseases incubate over long periods of time and the reporting and claiming payment processes also take some time.

Findings

Financial soundness, viability and long term financial sustainability
The Fund is not in a sound financial condition. It does not have adequate assets to meet its liabilities, its levy basis is not financially sound and its investment strategy is inappropriate to the nature of its liabilities. The actuarial and financial framework within which the Fund operates is not strong enough to ensure that the Fund remains financially sound, viable and sustainable in the long term. The Fund has no mechanisms for dealing with sudden financially significant developments such as a collapse in the market value of assets or substantial increase in liabilities as a result of large salary increases.

Actuarial and Financial Framework
There is no guidance on the methods and assumptions which can be used to value the assets and liabilities. Further, there is no requirement to link the asset valuation methods and assumptions to the ones for the liability valuation to ensure that they are consistent with each other. It is not clear what probability of ruin the Fund would be comfortable with, and it is entirely possible that the Fund could be declared solvent with any probability of ruin between 50 percent and 100 percent. It is also not clear what level of free assets the Fund requires in order to ensure a sufficiently comfortable level of protection for member benefits. There is no guidance on the assets the Fund can be invested in other than cash, and the qualifications and experience required of the statutory actuary do not adequately ensure that he/she is sufficiently qualified and experienced to do the statutory actuarial valuation.

Solvency and Adequacy of Available Assets to Meet Accrued Liabilities
The Fund settled 100,000 claims for about R1.5 billion (US$125 million) historically. The average historical claim amount is therefore about R15,000 (US$1,250) and it has assets of R2.8 billion (US$233 million). It is estimated that there are between 600,000 and 800,000 claim files in the CCOD/MBOD system. An estimated liability in respect of the claims backlog of between R6 and R9 billion (US$500 and US$750 million) would be ventured. About 1,000 claims are reported on a monthly basis and there are additional liabilities in respect of current mineworkers and ex-mineworkers, additional expenses required to effect an acceleration of payments in respect of the claims backlog which are all not known. The Fund’s liability could be as large as about US$ 890 million (R12 billion).

Adequacy of the Levies and Revenues to Meet Accruing Liabilities
The Fund collects levies amounting to about US$ 18.5 million (R250 million) per annum from controlled mines on a monthly basis. The basis of the levy is a fixed amount per commodity mined, per risk shift per person. Preliminary assessment of this levy suggests that it may not be enough to offset the accruing liabilities. There is a risk that the Fund could be caught in a cash flow underwriting trap where levies are set based on the outgo now, without considering the late reporting patterns, latent and re-opened claims.

 Appropriateness of the Assets
The Fund’s liabilities are long term and some of them are real as they are based on salary. The assets held by the Fund are therefore not appropriate to its liability profile. There are no real assets such as equities or property in the Fund’s asset portfolio to match the salary linked liabilities. The Fund does not have investment expertise.

Financially Significant Changes
There is no framework for dealing with financially significant changes. The extension of benefits to black mineworkers in 1993 was done without any consideration for the liability it implied. The minister may, under the ODMWA, declare a new disease compensable or any work site a risky site but there is no framework for funding the liability implied.

Broader Actuarial Financial Governance Issues
The types of risks undertaken by the Fund would be better suited to a statutory actuarial valuation at least once a year. The role of the statutory actuary is not continuous but subject to appointments whenever an actuarial valuation is required. This does not ensure continuity and consistency in the Fund’s actuarial approach. The Fund is not subject to independent regulatory supervision and it currently does not have to comply with the requirements of the short-term insurance act.

Risk management and financial governance structures
The Fund has no structured and documented risk management strategy, policy or philosophy. There is no overriding financial risk management and operational philosophy to ensure consistency in all the Fund’s operations. The last statutory actuarial valuation was done in 2003 and its last approved audit was done in 2010, despite the fact that the legislation requires it to do so more frequently. The Fund would not be able to make any financially significant decisions without up to date actuarial valuations and audited financial statements.

Financial Committees
The Fund has no internal actuarial or financial structures, which are critical to sound financial management and governance. There are no subcommittees or external independent experts to assist the Fund in overseeing specialist actuarial and financial functions.

Strategies, Policies and Philosophies
These are no documents which spell out the actuarial and financial objectives of the Fund and the methodologies that will be used to accomplish them. It is not clear how the Fund prioritizes the allocation of resources or how it aligns its key activities to ensure that they pull in tandem.

Revenues of the fund
Levies and Revenues
The Fund has no internal actuarial and financial structures which are critical to sound financial management and governance. There are no subcommittees or external independent experts to assist the Fund in overseeing specialist actuarial and financial functions.

Measures of Exposure
The current measure of exposure, in person years, is not appropriate because it does not capture the claim risk or the claim amount that will be made if a claim were to happen.

Risk Factors
Risk Factors affect either the risk of a claim happening or the amount that would be paid if a claim happens. The basis for setting levies does not take into account all the risk factors that could possibly affect the claims experience.
**Rating Factors**
Rating factors are the risk factors which are directly used in setting the levies. All mines which mine gold for instance pay the same levy per risk shift per person notwithstanding variations in the underlying risk, safety standards and attitude to risk.

**Benefit structure**
A Compensation Fund should be able to identify each kind of loss for which compensation will be availed. There should be an objective measure of compensation for each kind loss that can be envisaged. There is no clear understanding of what constitutes a reasonable, justifiable and defendable compensation for each kind of loss and the benefits are inferior to those offered by COIDA. Mineworkers who work in uncontrolled mines already enjoy better compensation benefits under COIDA. The benefits paid are not regularly adjusted to ensure that they remain current and the maximum and minimum benefit levels have since fallen out of step with prevailing salary levels.

**Needs Analysis**
There is no regular needs analysis done to determine the appropriate compensation levels for each kind of loss suffered. The Fund compensation levels do not currently meet the reasonable expectations of the members in the sense that the benefits paid are not benchmarked to relate to the loss suffered in any way.

**Comparison between COIDA and ODMWA Benefits**
The benefits offered by ODMWA are far inferior to those offered by COIDA in many ways. For example, COIDA aims to pay an income of 75 percent of current salary to a member whether temporarily or permanently disabled whereas the Fund pays only a lump sum which is about fifteen times and thirty-five times the monthly salary for first and second-degree disability respectively. Since the diseases covered under ODMWA are more severe, one would have expected benefits to be better than those under COIDA if not comparable.

**Inflation Adjustments**
The Fund does not adjust benefit payments on an annual basis to ensure that they remain relevant to the times. For example, the current benefits regime was last reviewed in 2009 and has since fallen behind current salary levels.

**Minimum and Maximum Benefits**
The maximum salary used in the calculation of benefits has fallen behind the actual earned salary over the years. The maximum salary which applies to the calculation of benefits is R2,300 per month compared to the current average miner’s salary which is of the order of R8,000 per month. The maximum and minimum benefits have fallen behind as a result.

**Review of the investment strategy and asset liability modelling**

**Investment Strategy**
The Fund does not have any investment strategy or guidelines as to what assets it should invest in and there are no measures in place to monitor deviations from the theoretically ideal investment strategy.

**Asset/Liability Modelling**
The Fund does not continuously do regular asset/liability modelling studies to determine whether the assets in which it is investing remain suitable given their liabilities. The Fund does not currently actively manage its liquidity position based on projected cash flow models of the relationship between its income and outgo.

**Investment Performance Management**
The Fund currently only invests its current assets in cash, ignoring any other assets. There are no skills and capacity in-house to invest into any other asset classes other than cash. The Fund does not do any regular performance measurements on its assets portfolio and there is no long-term investment benchmark against which the performance of the Fund’s assets must be measured.
Expenses
The expenses of running the Fund are paid by the government. It is not always possible to align the Fund’s business priorities with the government’s funding priorities. It is important that expenses are financed in a way that does not undermine the Fund’s obligations to its beneficiaries and accountability to all its stakeholders. The Fund’s priorities are based on its obligations to its beneficiaries and accountability to all its stakeholders, including the government. It is important that the funding of these priorities be allocated to those who are most interested in seeing them accomplished.

Expense Analysis
The Fund does not do any regular expense investigations to understand the nature of its expenses. The Fund does not have an expense allocation basis which ensures that there is a fair and equitable way to allocate expenses between different stakeholders.

Expense and Allocation Basis
Financing and allocation of expenses must be aligned with desired outcomes. Expense allocation must be fair, equitable and defendable.

Conclusions
The main conclusion from the foregoing discussion is that the Fund is not in a sound financial condition based on the fact that it fails to meet any of the three tests: namely the adequacy of its assets to meet its accrued liabilities, the adequacy of the levies paid in each year to meet the costs of claims which are expected to arise from the same year and the appropriateness of the investment strategy given the nature of its liabilities and the fact that they are paid after a very long time and are subject to both salary and general inflation.

The biggest stumbling block with regards to the Fund meeting its accrued liabilities is the claims backlog which must be settled urgently. The component of the deficit relating to the backlog based on the above discussion must be availed urgently to facilitate the settlement of claims. Unfortunately, the amount is so large that it may not be possible to accommodate it in the current levy system.

The Fund’s actuarial and financial governance structures are not effective. This is because in some instances they do not exist at all and in the instances where they exist, they are grappling with the complexity of the issues.

Recommendations

Financial soundness, viability and long-term sustainability

Actuarial and Financial Framework
The Fund should develop actuarial valuation guidelines to ensure consistency in the actuarial valuations from one year to the next and subject itself to the Short-Term Insurance Act and the regulation of the Financial Services Board (FSB). The valuation guidelines should ensure consistency between the method used to value the liabilities and the method used to value the assets. The statutory actuary is to set free reserves based on the solvency requirements of the short-term insurance act and any guiding publications of the Financial Services Board. The qualifications and experience of the statutory actuary should be the same as that required in the Short-Term Insurance Act. There should be actuarial guidance on what assets are acceptable in the solvency valuation and how the assets of the fund can be invested.

Solvency and Adequacy of Available Assets to Meet Accrued Liabilities
The Fund should do an actuarial valuation to determine its liabilities and allocate the assets in proportion to the liabilities in each of the three Funds identified above. The Fund should:
• Negotiate a levy increase to fund any deficit which may arise on Fund A and to meet shortfall in the levies being paid in respect of the cost of the liabilities that are currently accruing in respect of current active mineworkers in Fund A.
• Develop a plan for paying the outstanding claims in Fund B allowing for all claim settlement expenses and ensuring that all reported claims are settled over the immediate future, say two years.
• Allow for re-opened claims based on further escalation of first degree claims into second degree claims and develop a cash flow model based on the plan recommended above to help understand how the cash flow requirements of Fund B will emerge over the next few years.
• Secure funding to pay all the claims in Fund B including the re-opened claims. The Funding will have to be in place urgently since the claims must be settled over the next few years.
• Determine the liability in respect of Fund C and develop a plan for increasing awareness among ex-mineworkers, and build a model for the reporting and claim settlement patterns for this cohort of claims.
• Develop a cash flow model based on the plan recommended above to help understand how the cash flow requirements will emerge over the next few years.
• Secure funding to pay Fund C claims as they arise.
• Set up temporary structures to run Fund B and C, if necessary.

Adequacy of the Levies and Revenues to Meet Accruing Liabilities
The Fund should determine the levies required to keep Fund A solvent based on the deficit which may arise in Fund A and the levy required to fund costs of accruing liabilities. A mechanism for regularly negotiating both levies and benefits should be established.

Appropriateness of the Assets
Based on the results of an asset/liability exercise commissioned to understand the Fund’s liability profile, a long-term investment strategy should be drawn up for Fund A. A cash flow management strategy based on Fund A’s income and outgo should also be developed.

Dealing with Financially Significant Changes
The Fund should set up an infrastructure for dealing with financially significant changes, for example a change in the level of benefits triggered by a large salary increase or crush in financial markets, the emergence of new risks which did not exist before or new occupational disease. The mechanism for dealing with financially significant issues should also include a solvency management structure and processes which ensure that all actuarial and financially significant events are identified early and corrective financial remedies are implemented in a timely manner.

Broader Actuarial Financial Governance Issues
The types of risks which the Fund undertakes would be better suited to a statutory actuarial valuation at least once a year in line with the requirements of the Short-Term Insurance Act. The Fund should create a continuous statutory actuarial role and should define the actuarial qualifications and experience of its statutory actuary to ensure that he/she is sufficiently qualified and experienced to do the statutory actuarial valuation of the Fund. The appointment of the statutory actuary should be subject to the approval of the Financial Services Board and there should independent outside regulatory supervision through voluntary registration with the Financial Services Board. The experience of the Road Accident Fund would be useful.

Risk management and financial governance structures
The Fund should set up a structured risk management strategy and policies and implement an actuarial and financial risk management philosophy to underpin all its operations. There should be structures to ensure that all actuarial and financially significant decisions are taken within the context of a financially sound framework with appropriate checks and balances to ensure financially sound outcomes at all times. In setting up these structures, the Fund should be guided by principles and examples used by similar South African Funds such as the Unemployment Insurance Fund (UIF), the Compensation Fund, set up under COIDA, and the Road Accident Fund (RAF). For example, both the UIF and the Compensation Fund are run by Boards which consist of all their stakeholders such as government, labor and employers. They have
sub-committees consisting of board, management and independent external experts to oversee specialist financial functions. All three funds have a higher degree of autonomy and are better able to attract all the skills that they need. The RAF goes further as it voluntarily makes itself subject to the South African short-term insurance legislation and the independent regulatory jurisdiction of the FSB.

**Business Units**
The Fund should review its business units and restructure them in line with the required business and financial outcomes, considering the long-term nature of its financial obligations and the international nature of the distribution of its beneficiaries. The business units should be subordinated to the right subcommittees and financial governance structures to ensure that the resulting structure can identify potential action points. The Fund should ensure that all technical functions report into the correct business units and that the reporting structures are financially sound, viable and re-enforce long term financial sustainability.

**Subcommittees**
Set up appropriate actuarial and financial governance structures to oversee specialist financial functions on Fund A such as; (i) an audit committee to deal with accounting and audit issues; (ii) a risk committee to oversee all risk management functions whether operational or financial; (iii) an investment committee to oversee all the investment functions and to determine the investment strategy which is appropriate for the Fund, direct the investment of assets and monitor the performance of assets; (iv) a finance committee to oversee, manage and control its budgets and finances and decide on the priorities for the allocation of resources; (v) a claims committee to oversee the settling of the claims backlog and all issues to do with the reporting, verification and settlement of claims and continuously seek to expedite the claims settlement process; (vi) an administration committee to oversee issues related to the quality, accuracy and completeness of data; and (vii) an actuarial committee to oversee actuarial functions such as setting levies, actuarial valuations, asset liability modelling and expense analysis.

**Financial Strategies, Policies and Philosophies**
The Fund should set up and document guiding strategies, policies and philosophies to inform operations such as; (i) an investment strategy to set out its investment objectives, controls and monitoring mechanisms; (ii) an investment policy statement to set out how it will implement, review and monitor its investment strategy to ensure that it remains appropriate to the Fund’s underlying liabilities and how it goes about making sure that its investment objectives are met and the benchmarks which will be used to check this; (iii) a solvency strategy to set out mechanisms for dealing with sudden unexpected deficits caused by unfavorable movements in the market value of assets or changes in salaries which impact on liabilities and therefore negatively affects the solvency of the Fund; (iv) a compensation strategy which sets out the long term compensation objectives of the fund and mechanisms and benchmarks for aligning compensation levels to the desired long term objectives; (v) a benefit increase philosophy which sets out a framework for regular benefit reviews; (vi) benchmarking mechanisms for checking that benefit levels remain current and relevant based on prevailing salary increases and inflation indices; (vii) a pricing strategy which sets out the framework for regular and timely levy reviews, the conditions which trigger levy reviews, the methodology and controls for setting the levies and the new levy regime implementation process and the mechanisms that for funding sudden unexpected deficits which could arise from time to time; and (viii) documented business processes which set out the key financial activities of the Fund and clearly identifies key action points and assigns responsibilities for resolving any problems that could arise.

**Revenues and Cash Flows of the Fund**
There should be a properly constituted and skilled forum for negotiating levy increases with mining companies which sits regularly to deliberate on the adequacy of levies to finance on-going liability accrual and any additional levies which may be required to finance deficits that may arise. The Fund should negotiate the funding of its expenses to finance the operations of the Fund based on sound business and financial principles and any ensure that sudden changes in the market value of assets or sudden changes in liabilities are identified early and corrective measures taken. The current financial condition of the Fund may require it to negotiate alternative ways of funding the deficit as it may not be possible to accommodate
the current deficit under the levy system. In order to raise the money to pay for the claims in Fund B in two years, the levy would have to increase by at least 24 times. This may not be affordable.

**Actuarial and Financial Framework**

The Fund should review the levy basis because levies which are fixed in monetary terms where some of the benefits are salary related are not financially sustainable. Changes in salary should trigger an increase in the levy required to finance salary related liabilities. It makes financial sense to base levies on salaries to automatically link increases in the cost of funding salary related benefits to salary related increase in levies thus mitigating the salary strain risk. Levies paid in any given year should be based on claims expected from that year allowing for the expenses of running the Fund and investment returns. The current trend of decreasing mining profits and employment numbers means that any prior liability which is not funded properly will then fall, dwindling on subsequent generations and revenues. The profitability of the industry and employment numbers are both shrinking which means that the levy burden will become increasingly unaffordable over time. The levy basis should also allow for the investment returns which are expected to be earned on assets of the Fund based on the Fund’s investment objectives and expected returns. The claim frequency should take into account latent claims and re-opened claims as there is a possibility that some of the first degree claims will develop into second degree claims, leading to further payments. There should be mechanisms for raising special levies from time to time to deal with sudden and unexpected deficits. Levies should be adjusted regularly.

**Measures of Exposure**

Base the levies in Fund A on a measure of exposure which reflects the risk and is consistent with the benefits basis, such as salary. Ensure that there is sufficient variety in the risk factors that are used to set levies so that each mine pays levies on a basis that is consistent with the risk that it brings to the Fund.

**Risk Factors**

The Fund should be aware of other risk factors such as occupation, turnover, materials handled and processes followed, employer’s risk management controls etc. in the setting of levies. Levies should be different from one mine to the next and from one employer to the next.

**Rating Factors**

In developing a levy basis, the Fund should settle for a simplified rating basis which is consistent with its pricing objectives but does not compromise the accuracy of the levy basis.

**Regular Modelling**

Implement regular asset/liability investigations to assist in reviewing the Fund’s investment strategy. The relationship between the assets and liabilities of the Fund should be reviewed regularly to ensure that the investment strategy remains relevant to the times.

**Develop Internal Investment Skills and Capacity**

Develop skills and the capacity to manage and invest in asset classes other than cash. The Fund should also develop internal capacity to ensure that it can do regular asset/liability modelling studies to determine whether the assets in which it is investing remain suitable given that its liabilities will be evolving over time. The Fund should also develop a capacity to actively manage its liquidity position based on models of the relationship between its income and outgo. Regular cash flow projections are required to do this.

**Investment Performance Management**

The Fund should ensure that there are structures to regularly monitor the performance of its assets portfolio against pre-determined appropriate investment benchmarks. The investment benchmark against which the performance of the Fund’s assets can be measured should consider the relevant long-term investment objectives, the investment strategy and the nature of assets that the Fund invests in.
**Review the Benefit structure**
The Fund should develop a compensation basis which is considered adequate, reasonable and justifiable and work towards implementing and maintaining such a basis. A compensation basis is based on a proper analysis of all the losses that could be suffered by a member and deciding on the approach to compensation based on what is considered a fair and justifiable benefit. The Fund should over time aim to pay benefits that are comparable to those payable under COIDA. The fact that some mines already fall under COIDA means the country has two benefit regimes which pay significantly different benefits in one industry. The benefits paid by the Fund should be regularly adjusted to ensure that they remain current and relevant.

**Needs Analysis**
There should do a regular needs analysis to compare the losses suffered by the members and match that to the compensation levels. This will help ensure compensation levels are in line with the expectations of mineworkers and their beneficiaries. It is important for the Fund to ensure that compensation levels do not move out of step with expectations of claimants.

**Benchmarking Benefits with COIDA**
The much bigger Compensation Fund which runs under COIDA has a greater influence on what is considered adequate compensation. The two benefit regimes mentioned above would imply that the Fund will be expected to provide benefits similar to COIDA, especially given the fact that it covers the more severe occupational diseases. The costs of improving benefits to match COIDA are quite substantial. It could be more practical to consider benefit improvements only in respect of Fund A over the longer term while maintaining the current benefits regime in respect of Fund B and C. Care should be taken to avoid litigation.

**Compensation Basis**
The Fund should take the time to develop a justifiable and easily defendable compensation basis and philosophy based on assessing the types of losses that could be suffered by a member in different circumstances and the compensation level for each condition.

**Inflation Adjustments**
Adjust benefits for inflation annually based on its financial condition and the benefits that it can afford. The need for inflation adjustments should be built into the legislation and policy framework.

**Financial and Technical Skills**
Improve capacity in skills such as accounting, investment and asset management and finance. A skills audit to evaluate what skills are required to run optimally would be beneficial. Review the organizational structure to set up business units and salary structures which ensure that the Fund can attract these skills. Review remuneration policies and incentives structures to ensure that retaining the higher skills necessary for optimal performance is possible. The Fund should align its incentive structures with proper business outcomes and ensure that they are driven by qualified people.

**Expenses**
The Fund should amend its expense financing to ensure that it pays its own expenses based on its obligations to its beneficiaries and the expectations of its stakeholders. In particular, dealing with the current claims backlog will require an expense financing plan which takes into account the urgency and immediate requirement to settle claims quickly. The Fund should regularly analyze and allocate expenses equitably, and accountability structures need to be re-aligned with any changes in the expense financing.

**References**
CHAPTER 4
AN ASSESSMENT OF DISABILITY AND REHABILITATION SERVICES FOR EX-MINEWORKERS IN FOUR SOUTHERN AFRICAN COUNTRIES

For over a century, South Africa’s mining sector has been an integral part of the southern African economy. It employs about 500,000 workers and has a legacy of about 2 million ex-mineworkers, attracting labor from across the SADC as well as from all provinces throughout South Africa. People working in the mines have a high risk of injury due to the physical, strenuous and hazardous nature of their work. Depending on the role of the mineworker, the risks can multiply and the results of accidents can often be catastrophic and life-changing. Injuries can include loss of a limb, head injuries, hearing and visual impairments. These injuries can result in disability, which impacts all aspects of the persons’ daily life. Rehabilitation depends on the nature of the injury.

Historically, there has been a fragmented response to services for ex-mineworkers in southern Africa at multiple levels: across government departments, across borders, and across the sector (Department of Labor: 2014). The paucity of literature relating to the experiences, challenges and needs of ex-mineworkers with occupational injuries makes it difficult to identify gaps in knowledge and awareness relating to the topic. This raises the concern that those with occupational injuries may be a forgotten population, but they cannot be ignored.

This project sought to increase knowledge, awareness and understanding of the plight of injured ex-mineworkers by conducting a rapid assessment of the situation of this population and their access to services and compensation.

The key activities and strategies to achieve these objectives are shown in Table 1.1 below.

Table 4.1: Development Activities and Approach

<table>
<thead>
<tr>
<th>Activity</th>
<th>Methods</th>
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</thead>
<tbody>
<tr>
<td>Activity 1</td>
<td>Identify the number and location of ex-mineworkers with disabilities and categorize the different types of their injuries in the four countries compared with the rehabilitation facilities available to them.</td>
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<tr>
<td></td>
<td>• Context analysis and understanding</td>
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<tr>
<td></td>
<td>• Literature review</td>
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<tr>
<td></td>
<td>• Review of policy and legislation</td>
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<tr>
<td></td>
<td>• Review of the organization, management and infrastructure relating to injured ex-mineworkers.</td>
</tr>
<tr>
<td></td>
<td>• Review of databases relating to the number and location of ex-mineworkers</td>
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<td></td>
<td>• Identification of rehabilitation facilities in the 4 countries</td>
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<td></td>
<td>• Generation of geographical heat maps</td>
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<tr>
<td>Activity 2</td>
<td>Survey a sample of injured ex-mineworkers and understand their needs and challenges including the acceptability and accessibility of compensation and rehabilitation services.</td>
</tr>
<tr>
<td></td>
<td>• Literature review</td>
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<tr>
<td></td>
<td>• Tool design – questionnaire and focus group</td>
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<tr>
<td></td>
<td>• Stakeholder and contractor engagement</td>
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<tr>
<td></td>
<td>• Administration of questionnaire</td>
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<td></td>
<td>• Conducting focus group</td>
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<td></td>
<td>• Analysis of data</td>
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<tr>
<td>Activity 3</td>
<td>Carry out specialized disability assessments among a sample of ex-mineworkers in the four targeted countries.</td>
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<tr>
<td></td>
<td>• Complete detailed disability assessments on a sample of approximately 20 ex mine workers in each country to better understand their levels of disability because of their injuries from working on the mines.</td>
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<tr>
<td></td>
<td>• Screen approximately 30 ex-mineworkers with hearing loss in each country to understand if they show signs of noise induced hearing loss from working on the mines.</td>
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Activity 1

To understand health and function in context, the World Health Organization (WHO) established the International Classification of Functioning, Disability and Health (ICF) that has assisted in describing health and disability at both individual and population levels (Figure 4.1). The ICF was officially endorsed by all 191 WHO Member States on 22 May 2001 as the international standard to describe and measure health and disability.

Figure 4.1: Definitions of Disability
The ICF is operationalized through the WHO Disability Assessment Schedule (WHODAS 2.0), which was developed through a collaborative international approach with the aim of developing a single generic instrument for assessing health status and disability across different cultures and settings. Table 4.2 details how disability was classified in this study.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Brief explanation</th>
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<tbody>
<tr>
<td>Mild disability</td>
<td>Some minor difficulty with Activities of Daily Living (ADLs)</td>
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<tr>
<td>Moderate disability</td>
<td>Dependent in 35%+ of Activities of Daily Living</td>
</tr>
<tr>
<td>Severe disability</td>
<td>Bed Bound or dependent for 70%+ of Activities of Daily Living</td>
</tr>
</tbody>
</table>

There are approximately one billion people living with disabilities globally. This means at least 15 percent of persons in the world daily face barriers that impede their full participation in an integrated society; a physical disability is the most common impediment. Eighty percent of these individuals reside in low to middle-income countries. The 2011 Census of South Africa looked specifically at the profile of persons with disabilities and found that approximately 10 percent of the population in the country experienced some form of disability. The census and the Framework and Strategy for Disability and Rehabilitation in South Africa 2015 and 2020 both noted that disability percentages increase with age. This can pose a challenge in identifying whether ex-mineworkers are disabled because of age-related deterioration, prolonged exposure to mining or a combination of the causes.

**Rural Contexts and Impact of Poverty on Disability**

Healthcare can neither be universal nor equitable if it is less accessible to some sections of society. This affects a large proportion of the disabled population who already live with a disability and the many more at risk due to health conditions and environmental factors, particularly those living in conditions of poverty and where access to general health services is poor.

Disability and poverty perpetuate and reinforce each other. The relationship between disability and poverty is complex, bi-directional, context-dependent and residing in multiple mechanisms. Disability arises from an interaction between a person with impairment and their environment. Depending on the nature of this interaction, there may be a resultant participation restriction or exclusion from valued roles in society that
may be exacerbated by poverty. Most mineworkers assessed in Activities 2 and 3 hailed from rural contexts. Rural underdevelopment and poverty contribute to poorer social determinants of health and a higher burden of disease. Disability is often viewed as a cause and consequence of poverty. Poorer people and people living in poorer contexts are more vulnerable to disability because of the multiple barriers to mobility, activities of daily living, and social participation. The barriers of having to travel long distances in rough and difficult terrain to access amenities, lack of transport running water, sanitation and electricity, predispose minor impairments to be far more significant. This cycle of poverty, ill health and disability is presented in Figure 1.3.

**Figure 4.3: Cycle of poverty, ill-health and disability**

![Figure 4.3: Cycle of poverty, ill-health and disability](image)

**Status of Disability and Rehabilitation regulations in the 4 Study Countries:**

In addition to specific policies sourced from each country, the African Disability Year Books served as the primary documents in determining the status of disability and rehabilitation in the four countries. The following thematic tracks were identified and are reported in Table 4.3:
• Identification of the status of the United Nations CRPD in the specific country
• Disability statistics
• Ministry responsible for disability and rehabilitation
• Legislation that includes disability and rehabilitation
• Policies and procedures that address disability and rehabilitation
### Table 4.3. Status of Disability and Rehabilitation Services

<table>
<thead>
<tr>
<th></th>
<th>LESOTHO</th>
<th>MOZAMBIQUE</th>
<th>SOUTH AFRICA</th>
<th>SWAZILAND</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ministry</strong></td>
<td>The Department of Disability Services in the Ministry of Social Development</td>
<td>Ministry of Health and Ministry for Women and Social Action</td>
<td>Department for Women, Children and People with Disabilities</td>
<td>National Disability Unit</td>
</tr>
<tr>
<td><strong>Statistics relating to Disability</strong></td>
<td>2002: 4.2% of the total population with disability. 2009: 3.7% of the total population with disability.</td>
<td><strong>2007 Census Data</strong> 475,011 people with disabilities 2.5% of the population.</td>
<td>Note: 2001 Census and 2011 Census are not comparable due to the change in approach in the disability-related questions. <strong>2001 Census Data</strong> 2,255,982 people with disabilities. 5% of population have a disability. <strong>2011 Census Data</strong> 2,339,000 people. 5.2% of population have a disability.</td>
<td>171,347 people with disabilities 16.8% of total population. Prevalence of disability in Swaziland is higher than the average found in other developing countries (which is at 10% of the total population). 82% of people with disabilities live in rural areas.</td>
</tr>
<tr>
<td></td>
<td><strong>Prevalence of disability in Swaziland is higher than the average found in other developing countries (which is at 10% of the total population).</strong> 82% of people with disabilities live in rural areas.</td>
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<tr>
<td><strong>Ministry responsible for disability</strong></td>
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</table>

*Note: 2001 Census and 2011 Census are not comparable due to the change in approach in the disability-related questions.*
| Section 33 | Provides for rehabilitation, training and social resettlement of persons with disabilities. |
| Article 37 | Citizens with a disability shall fully enjoy the rights enshrined in the Constitution. |
| Article 125(1) | Persons with disabilities shall have a right to special protection by family, society and the state. |
| Article 125(3) | States that the state shall promote the creation of conditions necessary for the economic and social integration of the disabled. |
| Article 125(5) | States that the state shall encourage the establishment of associations of the disabled. |
| Article 95 | States that all citizens shall have the right to assistance in the case of disability or old age, therefore, the state shall promote and encourage the creation of conditions for realizing this right. |
| Section 9(1) | Provides for equal protection and benefit of the law, and a right to non-discrimination to everyone. |
| Section 9(3) and 9(4) | Are the only sections which directly address disability in the Constitution. |
| The South African Bill of Rights | Applies to 'everyone' and therefore most of these rights would also be applicable to and include persons with disabilities. |
| Section 14, a clause on the fundamental rights and freedoms of the individual, provides for disability in 14(1)(e) and in 14(3) prohibits discrimination based on disability. |
| Section 20 | Provides for equality before the law. |
| Section 30 | Provides for the rights of persons with disabilities to respect human dignity and enact laws for the protection of persons with disabilities. |

| Policies and Programs for Disability |
| National Disability and Rehabilitation Policy (NDRP) 2011 |
| National Strategic Development Plan 2012/13-2016/17 |
| National Disability Strategy for People with Disabilities in Public Service |
| Access to vocational training: |
| The Ministry of Labor, through the Institute for Employment and Professional Training provides training which enables people with disabilities to acquire specific skills and thus become self-employed. |
| The National Rehabilitation Policy of 2006 |
| The Department of Social Development policy guidelines on residential facilities (minimum norms and standards for residential facilities for the disabled). |
| The Integrated Transport System, which provides universal accessibility on municipal bus services. |
| Standard design guidelines (Universal accessibility standards) passenger rail environment (March 2008). |
| Swaziland National Sports Policy |
| National Social Development Policy |
Rehabilitation
Rehabilitation is a process involving a multi-professional team of healthcare workers focused on an individual’s ability to be reintegrated into society. For optimal rehabilitation, health practice needs to be structured within an integrated service delivery framework that addresses many core principles. Rehabilitation promotes and restores independence in all aspects of daily life following an injury. As well as promoting an individual’s independence and rights, rehabilitation promotes participation in society so that an injured worker can play an equal role as those fully healthy in their communities; continuing to work and supporting families, extended families and thereby contributing to the economy and their social security. Rehabilitation should ideally occur within the context of the physical and social environment. Variation exists between the four countries in terms of provision, access and acceptability of rehabilitation in general, let alone anything specific to ex-mine workers. Rehabilitation facilities exist, but they are not always easily accessible and are also limited by the lack of equipment needed to carry out the rehabilitation. Included in these challenges is the dearth of rehabilitation specialists available to complete the core rehabilitation team.

The impact of a health condition or disability is experienced differently by everyone, and is influenced by a variety of factors. The ICF is therefore expanded beyond the limited medical view that focuses on impairment as the only cause of disability that necessitates the need for rehabilitation.

Rehabilitation services currently available to mineworkers who have sustained an injury
For mineworkers who sustain an injury, timely and appropriate rehabilitation has been shown to improve health outcomes and enable them to manage the resulting disability. Rehabilitation reduces the negative impact of long term sickness, further promoting participation in society as well as the individual’s independence and rights. Vocational rehabilitation for mineworkers has also been shown to aid in the return to work or suitable alternative employment, which in turn also has socio-economic and health benefits. While today most large-scale mines comply with national OHS legislation, there is variation in the provision of rehabilitation to injured ex-mineworkers that leads to inequity in the quality and access of services.

Broadly speaking, rehabilitation for mineworkers occurs as follows:

- **Acute rehabilitation** is largely done in acute hospital settings following injury and in parallel to the injured mineworker becoming medically fit. The mines in South Africa have historically had hospitals which cater to mine employees. However, this has now almost completely changed, with these services, including rehabilitation, being outsourced.

- **Post-acute rehabilitation** may, depending on extent of injury and need, be undertaken in a rehabilitation facility or as an outpatient. This task is predominantly outsourced nowadays and it is generally acknowledged that the quality, monitoring and control of this type of rehabilitation is lacking. This is worrying as the right type, amount, quality, location, and timing of rehabilitation greatly improve an injured mineworker’s ability to return to employment.

- **Vocational rehabilitation** often occurs at this point, involving assessment against job profiles; rehabilitation to return to existing work roles, work-hardening or re-skilling. For injured mineworkers, the outcomes of vocational rehabilitation programs can take one of the following paths:
  - Return to original mining job, but role modified to suit worker capability—reasonable adjustments to either the job role or the environment.
  - Return to a different mining job following rehabilitation and training
  - Recommendation that an individual is no longer fit to do any job on the mine, followed by advocating for compensation and adaptation to the individual’s home environment, if required, and the supply of appropriate assistive devices. It has been noted that reskilling to a job that is unrelated to the mines is at the discretion of the mine’s human resource department. However, it is unclear to what extent this occurs, whether it is monitored or controlled, and what the outcomes are.
• **Ongoing rehabilitation** to address any deterioration in conditions or injuries which may reduce levels of independence. Depending on need, ongoing rehabilitation should occur within the context of the physical and social environment and as such is mainly domiciliary based. This can include adaptation to the home environment, provision of equipment as a compensatory approach to increase independence, and reintegration into everyday life. This may involve, for example, the provision/maintenance of equipment such as artificial limbs or hearing aids, and presents itself as an ongoing need. It is this aspect that is the focus of the rehabilitation for ex-mineworkers in this study.

### Noise-Induced Hearing Loss

Noise is one of the most hazardous exposures for mineworkers. Globally, over 360 million people have hearing impairments, with approximately 80 percent in low-and middle-income countries (WHO, 2015). Unfortunately, noise-induced hearing loss (NIHL) has been inadequately reported in professional literature with data on the prevalence of hearing loss in mineworkers greatly lacking. In southern Africa, research on prevalence rates of NIHL in mineworkers has been conducted in countries like Tanzania, Zimbabwe, Namibia, Ghana and South Africa. In South Africa, the mining industry is regulated by the many standards and legislated guidelines regarding noise and noise-induced hearing loss management. Notably, mineworkers are covered under the Mining Health and Safety Act but may also be referred to within the Occupational Safety and Health Act. Significantly, mineworkers from countries such as Swaziland, Mozambique, Botswana and Lesotho are specifically covered under several legislative frameworks, such as those by the departments of labor and health to provide compensation, health and rehabilitation services, especially to mineworkers.

In the mining industry, noise competes as a hazardous agent with respirable dust (respiratory disease) and repetitive trauma (Roberts, Sun & Neitzel, 2016; Donaghue, 2004). In some countries, like the USA, the prevalence of hazardous noise exposures in the mining sector is so great that mineworkers report more hearing problems than any other type of worker (Matetic, Randolph & Kovalchik, 2010). However, consider how hearing loss, an insidious, slowly occurring disability, is viewed relative to the highly visible and immediate disabling effects of physical injuries for example, a hand crushed in a machine. The relative invisibility of noise effects on mineworkers’ hearing has been skewed by various factors. For example, political ideologies have resulted in research that marginalized and/or ignored noise-induced hearing loss in black African mineworkers by focusing on white mineworkers (for example, see Hessel & Sluis-Cremer, 1987). Furthermore, noise has been studied, rather simplistically, as a single hazardous agent (Pillay, 2001). This is despite the known accumulative effects noise has on the body when combined with exposures to agents like chemical vapors and vibration (Morata, Themann, Randolph, Verbsky, Byrne, & Reeves, 2005). The sum effect of such thinking has led to ex-mineworkers not benefiting from newer laws and practice standards in occupational health and safety that emerged in the last few decades.

Critically, due to changes in the legislative landscape, ex-mineworkers who have left the mining sector would have been under a different set of legislation, especially in South Africa, with significant amendments occurring in, 2003 and 2013, for example. Currently noise exposure levels in an 8-hour working day should not exceed the occupational exposure limit (OEL) of 85 A-weighted decibels (dBA). It is generally accepted, while debated, that noise between 80 dBA to 90 dBA becomes dangerous to the auditory system.

That most mine workers are exposed to hazardous noise levels is an incontestable circumstance. Unfortunately, NIHL has been inadequately reported in professional literature with data on the prevalence of hearing loss in mine workers greatly lacking. According to Dr. A. L. Edwards, a leading South African audiologist who has conducted NIHL studies in mining, there are approximately 15 audiologists who provide clinical, mainly diagnostic services to the mining industry (personal communication: 12th November 2016). These audiologists are in Rustenburg, Witbank and Welkom and are there are also a group of audiologists who work directly for the mines, with a smaller group of audiologists to whom mining companies may make direct referrals. The number/availability of this workforce needs to be considered in relation to the fact that currently there are approximately 500,000 mineworkers and an additional two million ex-mineworkers, many of whom are migrant workers from within and outside South Africa.
Injuries resulting from working in the Mine

There is a paucity of literature on specific injuries that mineworkers in southern Africa experience. Most mention physical injuries but do not mention specific diagnosis while occupational illness is more thoroughly explored. In Zimbabwe, mineworkers reported injuries on the arms, leg, head and the trunk. Additionally, there are head injuries due to falling objects and back injuries due to heavy lifting that is part of the job requirements. In South Africa, back and lower limb injuries are most common. In Ghana and Zimbabwe, mineworkers who worked in small gold mines reported spinal cord injuries, fractures, crush injuries, lacerations and punctures. Appendix 3: Categorization of Injuries by Data Source, reveals that across most of the datasets (MBOD; DoL; RMA and ECF Fieldwork) the main categories of injury are those to lower limbs; upper limbs, multiple injuries, NIHL and Spinal Cord.

In South Africa, falling of ground, transport incidents, general mining accidents (inhaling dangerous fumes, being struck by an object and falling from heights) and general conveyance accidents result in most of the injuries reported. Falls of ground is a term describing unexpected movement of rock mass and gravity and/or pressure, strain or rock bursts which results in uncontrolled release of rock.

Only two studies, one in South Africa, highlighted the psychological trauma experienced by mineworkers, which includes Post Traumatic Stress Disorder. The data from the Department of Mineral Resources between 2003-2013 on fatalities and injuries is highlighted in Figure 4.4, demonstrating that health and safety in the mining industry has generally improved.

Figure 4.4: Department of Mineral Resource; Fatalities and Injuries 2014

Policies related to Disability and Rehabilitation related to Mineworkers

South Africa, Lesotho, Mozambique and Swaziland are signatories on the United Nations Convention of Rights of Persons with Disabilities (UNCRPD) and have protection of the rights of people living with disabilities (PLWD) in their constitution. Through policies, articles in their respective constitutions, and the country’s acceptance of the UNCRPD, provision for protection of the rights of people with disability is assured and aims to provide persons with disability with access to healthcare and rehabilitation services.

Despite the evident intent to provide PLWD access to rehabilitation, there appears to be a gap between the conceptualization and implementation of the policies in the study countries. In addition, South Africa has a
Mining Health and Safety Act, whereas the other countries have mining laws which do not deal with the rights of injured mineworkers.

**Experiences of persons with disabilities within the Southern African Context**

National census data on the prevalence of disability in South Africa, Lesotho, Mozambique and Swaziland was perused. In 2009, 3.7 percent of the Lesotho population had a disability, with 2.5 percent of the Mozambique population indicating that they experienced some form of disability in the 2007 census. South Africa reported that 5.2 percent of the population voiced having a disability in the 2011 census, while Swaziland has the highest reported population with disability at 16.2 percent. No explanation of the variance in number of persons with disability was given in the literature, which had documented evidence of strong links between disability, poverty and physical contextual factors. These factors negatively impact the engagement of PLWD in daily life tasks and further compound their exclusion from social and economic opportunities, with an increased risk of contracting non-communicable diseases.

PLWD are also more vulnerable to physical, sexual and psychological abuse, and they are often easily exploited. Social marginalization and material deprivation add to the limited access to education, as do infrastructural challenges such as poor roads, costly transport, inaccessible terrains and poor access to health services.

**Number and Location of Injured Ex-Mine Workers**

Identifying the number and location of ex-mineworkers and categorizing their disability is challenging due to a paucity of literature and statistics relating to the ex-mineworker population. From the limited available dataset from the four countries, the heatmaps clearly show the density and distribution of the ex-mineworkers set against a network of mainly public services, or those relevant to injured ex-mineworkers, which could be accessed by them. This shows that there is a footprint of service centers that can be accessed by injured ex-mineworkers, but the degree to which it meets their needs is unknown. Below are a set of heatmaps which describe the location of disabled ex-mineworkers (from limited available data) and corresponding rehabilitation facilities. With regard to the Combined Dataset (Figure 4.5):

- This heatmap shows the distribution and density of the injured ex-mineworkers from the combined data received (MBOD; DOL; RMA and ECF fieldwork).
- The larger sized dot indicates areas where there is a higher density.
- Areas with the highest density are: Eastern Cape, Free State, Northwest, and Gauteng provinces in South Africa, and Lesotho, followed by Mozambique and Swaziland.
- The map was plotted by nearest town/village to where the ex-mineworker lived, as the datasets were unreliable in terms of exact address, but all had a town.
- The towns were geocoded by the ECF team to plot on the maps.
Figure 4.5: Combined Datasets

Figure 4.6: Heatmap Combined Data with Rehabilitation Facilities
The above map of the combined datasets (Figure 4.6) shows the density and distribution of the injured ex-
mineworkers across the four countries; the symbol indicates the rehabilitation facilities where the ECF fieldwork occurred. Most of these sites offer some form of rehabilitation that can be accessed by the injured ex-mineworker. However, further analysis needs to be completed to determine the true extent of the rehabilitation facilities’ ability to meet the injured ex-mine workers needs identified by this study. Reports from key informants about the rehabilitation facilities within the four countries is highlighted below to complement understanding of the rehabilitation services available.

**Access to Rehabilitation and Services offered within Sub-Saharan Africa**

The desktop review yielded data mainly from South Africa, with only three papers from other regions being sourced. The findings suggest that despite having primary health care clinics in South Africa, people with a disability still have difficulty accessing rehabilitation services. Further, there are considerable challenges posed by the services currently offered such as lack of communication between service-providers, and lack of intersectoral partnership between various government sectors and nongovernmental organizations.

The literature suggests that there should be intersectoral collaboration, teamwork between health professionals, good communication, and consultation with the community regarding services required to ensure that rehabilitation service delivery meets their needs. Additionally, people with disability should be empowered and aware of their rights in terms of their country’s respective constitution and policies.

It was also identified that there needs to be a stronger focus on community-based rehabilitation, primary health care, and services delivered in the community. The referral system also needs to improve to ensure patients are not lost in the system. For sustainable rehabilitation service delivery, greater collaboration is needed between health professionals and community-based rehabilitation workers. These mid-level workers need more support and training to allow for efficient service delivery. Suggested rehabilitation services included the provision of assistive devices (not only mobility related ones), a focus on improving independence with daily living tasks, offering primary, secondary, and tertiary prevention, focusing on community reintegration and vocational rehabilitation.

The literature suggested a need to review vocational rehabilitation services. Focusing on vocational rehabilitation services as a health problem posed a barrier and one author suggested an intersectoral approach involving the departments of labor, health, social welfare and education. Community members suggested that therapists should focus on income–generation projects. Others reported the need for return-to-work programs, prevocational services, follow-up when placed back at work, and assistance with reducing the stigma of working with a disabled person.

Finally, the need to address mental health and well-being of mineworkers arose. There was a need to have services that address post-traumatic stress disorders.

**Rehabilitation Services within the four countries**

While there are multiple sources of information relating to clinics and healthcare facilities across the four countries, not all provide services relating to the needs of the injured ex-mine workers in terms of rehabilitation and equipment. In most instances, these services were public and provided very basic physical rehabilitation with physical therapy and occupational therapy. More specific services, like prosthetics and audiology were available, but were limited in quantity, and hence less accessible.

**Lesotho**

There are few rehabilitation facilities in Lesotho and most of them do not have adequate human resource. A study by Leshopo (2013) into disability and rehabilitation in Lesotho rightly mentions that models for disability impact on social policies, practices, and legal frameworks, and as such are always heavily debated. In 2011, the Ministry of Health and Social Welfare in Lesotho attempted to tackle issues of disability and produced the National Disability and Rehabilitation Policy (NDRP): Mainstreaming persons with disabilities into society. This policy takes a social model approach which places the problem away from the individual and towards
society. In clause 12 of the policy, community-based rehabilitation is adopted as a key strategy in achieving the objectives of the NDRP. Since May 2012, the Ministry of Social Development has taken the lead on disability and rehabilitation, but the policy does not go in-depth with rehabilitation issues such as referral pathway, or provision and maintenance of aids and assistive devices. There are no policies in Lesotho on donor funding relating to assistive devices and who/how to provide them to clients. Social development disability policy is focused more on advocacy, vocational rehabilitation, and welfare of the clients. Rehabilitation professionals and services are mostly found in Maseru, the capital of Lesotho. People in the rural areas are struggling to get basic rehabilitation, and this is compounded by a shortage of rehabilitation therapists.

Swaziland
In Swaziland, rehabilitation practitioners are currently working without an amended rehabilitation policy; although there is a health policy, there is little mention of rehabilitation. Preparations have commenced for the establishment of departmental policies in the different hospital settings. There is also a committee comprising of various rehabilitation professionals working closely with the Ministry of Health to raise the profile of rehabilitation. The committee, together with all relevant rehabilitation professionals, has set goals which include the following:

- Increase awareness of rehabilitation to the relevant policy makers, health professionals, and the public.
- Formulate, approve, adopt and implement policies.
- Advocate for inclusion in the ongoing health management information systems.

There exists a functional patient’s rights charter which is applicable to the ex-mineworkers in Swaziland who visit any health care facility. Aspects of note include:

- Patient’s right to access and care.
- Participation in decision making.
- Access to health care including awareness of rehabilitation.

Resources for rehabilitation and rehab professionals are mainly found around Mbabane and Manzini with little availability within the rural settings.

Mozambique
A paucity of literature and information made it challenging to review policy and uptake of rehabilitation within Mozambique. Key informants interviewed from the main public and private hospitals in Maputo were not aware of any policies within the Department of Health relating specifically to rehabilitation. They reported that international conventions were not being robustly implemented on the ground. Therapists performing rehabilitation were mainly in the capital city, Maputo, and a few in the provincial hospitals. Not these are applicable or accessible to ex-mineworkers, and some of the therapeutic resources focus on pediatric and mental health or are for inpatients only.

South Africa
An institutional analysis of the ability of the South African health system to deliver rehabilitation was undertaken by the Public Health Association of South Africa in 2012. It identified that successful rehabilitation outcomes are often judged by the level of integration into mainstream society of people with residual impairments. The analysis found that despite a progressive and enabling legislative framework in South Africa, services for people with disabilities are not meeting the needs of adults and children with disabilities. It was noted from more recent emerging evidence that South Africa is struggling to provide effective, efficient, and equitable rehabilitation services. However, in comparison to the other countries in this study, South Africa has taken up international disability and rehabilitation policy, interpreted these into local policy, and is addressing the issue of disability and rehabilitation, as evidenced by the 2015-2020 Framework and Strategy for Disability and Rehabilitation in South Africa.
Rand Mutual Assurance (RMA) opened a new care facility for mineworkers in Welkom, South Africa as it was identified that many of their pensioners, who suffered severe injuries, required ongoing medical care. The facility has over 120 beds and can provide rehabilitation to those pensioners who have undergone rehabilitation but require continued assistance with basic living skills. RMA correctly identifies that their pensioners are located across southern Africa, but are mainly from Lesotho, Eastern Cape, Free State, KwaZulu-Natal and Gauteng. The facility is centrally located in Welkom to allow ease of access from these areas. TEBA arranges free transport to and from the facility for the pensioners and their families can also visit and stay on site. The facility is also near several hospitals for medical treatment if needed. The concept is to provide one stop care and rehabilitation. Where the injury does not allow the worker to return to his original work, they will be upskilled at the facility so that they may either have the skills to move to another position or to follow a path of entrepreneurship. As this is a relatively new facility, its effectiveness in this regard is not yet known.

Activity 2
From the analysis of respondents’ demographic, health, and occupational characteristics (n=703), most respondents (76%) were aged between 50 and 70 years. Forty-six percent were from South Africa, followed by Mozambique (28% percent). A large proportion of respondents had served in the mines for more than 15 years (66%); 37 percent and 35 percent were employed as mineworkers or mining support staff respectively, and more than three-quarters worked in a gold mine. Three out of five (61%) operated heavy machinery during their tenure at the mines, and almost everyone interviewed (97.5%) had been injured in one way or another while working in the mines. Of those injured at work, 79 percent had had the injury for more than 8 years, and 65.7 percent could return to work post the injury. Treatment for injury was received mostly at the hospital mine (51%) and almost everyone injured indicated that they received treatment (96%). Figure 4.7 lists the part of the body that got injured among those surveyed.

Figure 4.7: Distribution of location of injury among survey participants

<table>
<thead>
<tr>
<th>Part of the Body</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ears</td>
<td>18%</td>
<td>83%</td>
</tr>
<tr>
<td>Back</td>
<td>17%</td>
<td>83%</td>
</tr>
<tr>
<td>Right hand</td>
<td>16%</td>
<td>84%</td>
</tr>
<tr>
<td>Left leg</td>
<td>16%</td>
<td>84%</td>
</tr>
<tr>
<td>Eyes</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Right leg</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Left hand</td>
<td>12%</td>
<td>88%</td>
</tr>
<tr>
<td>Head</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>Right arm</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>Both legs</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>Left arm</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>Both arms</td>
<td>1%</td>
<td>99%</td>
</tr>
</tbody>
</table>

Figure 4.7 shows that injury to ears, including hearing loss constituted the highest burden of injury in the study sample (18%), followed by back injury (17%), then right hand injury (16%), left leg injury (16%) and eye injury (15%). A very small proportion reporting having been injured on both arms (1%).
Accessibility and acceptability of services received

Respondents’ perceptions about the accessibility of occupational health services were measured using five measures which are summarized in Figure 4.8.

Figure 4.8: Participants views on the accessibility of occupational health services (n= 391-395)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received care or treatment for their injury soon after being injured</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>Place where help was received after the injury was far from their home</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Received help or treatment that showed them how to get back to doing their daily tasks after injury</td>
<td>56%</td>
<td>44%</td>
</tr>
<tr>
<td>Had to pay for transport to get to the place where they received the care of their injury</td>
<td>19%</td>
<td>81%</td>
</tr>
<tr>
<td>Had to pay for any of the care or treatment they received after their injury</td>
<td>12%</td>
<td>88%</td>
</tr>
</tbody>
</table>

As shown in Figure 4.8, 93 percent of respondents received care or treatment for their injury, but 72 percent of these reported that the place where they received care after the injury was far from their home. Only 56 percent were informed on how to get back to doing their daily tasks after injury, but very few (19%) had to pay for transport to access health services, or pay for services rendered (12%). On average, based on the mean composite accessibility scores (%) of country of origin, respondents from Swaziland were more satisfied with their access to health services compared to respondents from other countries, a result which was statistically significant ($\chi^2(2) = 65.266, p = 0.0001$). Mozambique had the lowest level of tolerance towards accessibility. Respondents’ perceptions about the acceptability of occupational health services were measured using eight measures which are summarized in Figure 9.
Figure 4.9 shows that majority of patients (81%), were happy with the treatment they received, felt welcome and cared for while they were being treated (89%), and felt that they received enough care or treatment (79%). However, only 21 percent indicated that someone visited to see how they managed at home after their injury, and a small proportion (11%) had changes made to their home to make it easier for them to get about or do their daily task.

On average, based on the mean composite acceptability scores (%) of country of origin, respondents from Swaziland were more accepting of the health services provided to them compared to other countries, based on the mean composite acceptability scores (%). This difference was also statistically significant ($\chi^2(2) = 36.635, p = 0.0001$), with South Africa showing the lowest level of acceptability.

Current health status, services received and relationship of disability to work
Respondents’ opinions regarding the services they receive and where, shows that at the time of the survey, 71 percent of respondents still struggled to go about their daily tasks because of injury, and only 27 percent still received care or treatment for their injury. A very small proportion reported currently receiving care or treatment from the main hospital in their town, a hospital run by RMA, a local clinic near their village, or a care provider who visits their home. Only 16 percent indicated that they received care from a doctor. Few others were being seen by a physiotherapist (5.69%), an occupational therapist (1.7%), a nurse (9%), or a community caregiver (1.3%).

The results also show that less than half of rehab patients (42.32%) were receiving compensation /pension due to injury; 13 percent had not been paid even though they had applied for compensation because they were injured. Very few (14%) had to pay someone to look after them.

There was a significant relationship between the use of heavy machinery and hearing loss (injury of the ear) but not with any other type of body injury ($p=0.011$). Another notable relationship between use of heavy machinery and injury location was observed with the injury of the right arm but this was not statistically significant at any level of significance lower than 0.1 percent. There was a significant relationship between the inability to perform daily tasks and having suffered a head injury ($p=0.004$), and injury on both legs ($p=0.001$), but not any other potential predictor.
Returning to work at the mine after suffering an injury was associated with the position held by the study participant at the mines before the injury (p=0.001), working in a platinum mine (p=0.001), having suffered a back injury (p=0.001) and hearing loss (p=0.032). Other predictors were not associated with returning to work at the mine after suffering an injury. These relationships are further explored in a multiple binary logistic regression model showing predictors of the returning to the mine for work after injury. This predicted that working at the platinum mine, having suffered a back injury, having operated heavy machinery, and noise-induced hearing loss (injury of the ear) were the only statistically significant predictors of returning to work after suffering an injury. The odds of not returning to work were 83 percent higher among those who had back pain compared to those who did not have back pain (AOR=1.83, 95% CI=1.21 - 2.77, p=0.003), whereas those who had hearing loss were 43 percent more likely to return to work compared to those who had not suffered hearing loss (AOR=0.57, 95% CI=0.36 - 0.89, p=0.016). Similarly, the odds of not returning to work were 45 percent higher among those who operated heavy machinery compared to those who didn’t (AOR=1.45, 95% CI=1.04 – 2.03, p=0.029). There was also a 19 percent chance of those who worked in the platinum mines to return to work.

Focus Group Discussions on Acceptability and Accessibility of Services
Five main themes emerged from the focus group discussions that occurred with ex-mine workers from the four study countries: rural realities, the implications for the family, financial constraints, the challenge in sustaining their livelihoods, challenges in access to health services, and the need for rehabilitation and return to work programs.

Theme 1: Rural Realities
Participants needed support and assistance to complete their basic hygiene and daily life tasks. The terrain and the physical environmental challenges posed by their rural context, exacerbated the difficulties they experienced and limited their ability to be maximally self-sufficient. Mobility is often restricted by the uneven terrain. This makes accessing their outdoor toilets difficult and creates obstacles for the participants, even if they have a wheelchair, to leave their homes to access the community or just to move around their house. This further isolates the participants who must rely on family members to carry them to the nearest area with public transport or assist them to the toilet or around their home. Additionally, participants highlighted the issue of access to wheelchair-friendly transport. Currently, participants have to hire a private motor vehicle, which is expensive. Here are some recorded statements:

“Going to the toilet is a problem, because the area is not straight [flat] and I cannot push the wheelchair on my own” (South Africa).

“I have to be carried to get to the main road as it is gravel; very slippery, and steep for my wheelchair” (Swaziland).

“But to move I need to have someone to help me because of the yard that is convoluted” (South Africa).

“I would like wheelchair friendly transport because I have to hire a car to take me around which is expensive” (Swaziland).

Theme 2: Implications on Family
The participants relied on their family to assist them, which is extremely taxing on the health and well-being of their caregiver/family members. Caregiver burden arises as result of the conflict of caregivers trying to meet the demands of the caregiving role, to the detriment of meeting their own or their family’s basic needs. The culture and belief systems in the community about the role of the caregiver or spouse and the resultant stigma can also limit family members from engaging in tasks to satisfy the needs of the family. Some participants appeared to be unhappy and dissatisfied with the pensions they had been receiving as well as being upset with a lack of clarity over deductions that occurred whilst they were under the employment of the mines.
“I got work but had to leave because my husband cannot take care of himself when I (wife) am away in the day at work” (Lesotho).

“When I (wife) have to go out, I [have] worry about whether my husband is coping at home alone” (Swaziland).

“The community thinks I (wife) am shunning my husband when I try to get work. They think I would rather be away than be with him daily due to his condition” (Lesotho).

**Theme 3: Financial Constraints**
The burden of financial limitations on the family and the associated implications resounded throughout the focus group discussions. Many of the ex-mineworkers described the loss of their worker role as having serious implications on their families. Wives and children were most affected, with some of the verbatim responses indicated the burden placed on the family.

“Society and government have abandoned me” (Ex-mineworker, Lesotho). This statement by an ex-mineworker echoes the expressions of many of the participants.

“The money is not enough, because I always end up borrowing money from people” (Swaziland).

“My wife had to find ways to earn some income and is constantly searching for work as a maid (Lesotho).

“The school suspended my child as we did not pay fees” (Lesotho).

“My children have to alternate the years they go to school because of no funds to have them all go at the same time” (Lesotho).

“When I was working, money was deducted and I was told I will get my money when I retire…but I did not retire, I was injured” (Mozambique’).

“The challenge is the [low] pension I am getting” (Mozambique’).

“They did not pay me a single cent; they just sent me back here because I was sick. By then I could not walk without crutches” (South Africa).

“Life at home is difficult due to the little amount of money I receive monthly” (South Africa).

**Theme 4: Sustaining Livelihoods**
Participants stressed their desire to sustain their livelihoods. A recurrent theme that emerged centered on possibilities within their rural environments. These included subsistence farming, as illustrated in their expressions below:

“If I can get a dairy cow so can both feed off it and be able to sell the milk and earn some income” (Lesotho).

“…if I can also have egg-laying hens to sell eggs and feed the family as well” (Lesotho).

Interestingly, participants also voiced an innate need to remain relevant, as described by an ex mine worker from Lesotho, who conveyed his needs as follows:

“I want to be a relevant contributor towards the growth of the economy” (Lesotho).

Moreover, some participants attempted to provide solutions to their employer regarding ways in which they felt they required assistance for sustaining their livelihoods. Once more these were centered on farming activities:
“I want help in the farm like a tractor instead of hiring people to work for me since I cannot work” (Mozambique)

“I asked the mining company to use my money to buy farming equipment but until today nothing has happened.” (South Africa)

“I would like help to get farming equipment to make a living to support my family” (Swaziland)

**Theme 5: Access to Services and Return to Work Programs**
The participants experienced difficulty accessing health services due to the distance to the nearest access point. This difficulty in accessing health services was exacerbated by lack of transport required to go to the clinic or expenses incurred in having to hire transport to take them for medical intervention. The suggestion was that the clinics and services are offered closer to the residence of the ex-mineworkers.

“Health services should be closer to where ex-mineworkers live.” (Mozambique)

“I have to go to Johannesburg every six months to collect medication, and would like to receive my medication in Mbabane where it is closer” (Swaziland)

“It’s painful when I have to go for medical appointments because taking public transport is not easy for me” (Mozambique)

The participants also voiced a need for access to rehabilitation services. There were reports of annual reviews of the participants’ condition in some countries. Rehabilitation services were perceived to assist with improving the participants’ abilities, as illustrated by the quotes below:

“I received physiotherapy in 2010 and saw improvement with my mobility, but it (physiotherapy) was stopped. I feel having a physiotherapist to assist wheelchair bound ex-mineworkers will help.” (Swaziland)

“They (company contracted to provide the service) call all the people with amputation injuries once a year.” (Mozambique)

The need for home modifications and assistive devices such as wheelchairs or alternative forms of transport, which were more suited for rural use, were raised. For example, “having no ramp makes it difficult for me to get around” (Swaziland). Alternative forms of transport were suggested:

“I would like a quadbike to get around as I get tired easily on the farm.” (South Africa)

“I bought a wheelchair from someone who got it from a government hospital” (South Africa).

The participants voiced wanting to have the opportunity to return to work. There was limited access to rehabilitation and return to work programs and as a result, the participants went home after being injured, as there were no opportunities to try for jobs with less physical demands.

“They should have rehab to go to their jobs and they should have been given back their jobs, but many mine workers were sent back home without any support; without any opportunity to go back to work.” (Mozambique)

“Like to go back to work but there is no work.” (Mozambique)

“I would love to work, but my physical problems make it difficult to perform physically-demanding tasks” (Lesotho)
Activity 3
Disability Assessments.
A total of 105 disability assessments were completed in each country as presented in Table 4.4.

Table 4.4: Number of Disability Assessments

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesotho</td>
<td>31</td>
</tr>
<tr>
<td>Mozambique</td>
<td>9</td>
</tr>
<tr>
<td>South Africa</td>
<td>46</td>
</tr>
<tr>
<td>Swaziland</td>
<td>19</td>
</tr>
<tr>
<td>TOTAL</td>
<td>105</td>
</tr>
</tbody>
</table>

Age and Gender: Ages ranged between 48 years and 85 years with the mean age of 61 years. All the ex-mineworkers were men.

Context and access to care: Most the injured ex-mineworkers studied were from rural areas (74.3%) across the four countries with 25.7 percent from urban areas in Lesotho and Mozambique. Outdoor access in terms of the home environment was more of an issue for the rural ex-miner as was access to health care in general, including rehabilitation.

Cause of injuries: Rock falls (10.5%) were the predominant cause of injury followed by those relating to mining machinery and locomotives.

Compensation: Across all the countries, 47.6 percent of the ex-mineworkers were in receipt of compensation in the form of an RMA pension. All the ex-mineworkers assessed in Mozambique (100%) and the majority in Swaziland (94.76%) reported receiving an RMA pension. This is because the ex-mineworkers were identified through the TEBA database of ex-mineworkers who paid the RMA pension. However, this was slightly different in Lesotho where 48.4 percent of the ex-mineworkers assessed were in receipt of an RMA pension and only 17.4 percent in South Africa received an RMA pension.

Classification and Level of Disability: From those assessed across the four countries the majority were identified to have mild disabilities, followed by moderate, and then severe as presented in Table 4.5.

Table 4.5: Classification of Assessed Ex-Mineworkers Disability

<table>
<thead>
<tr>
<th>Classification</th>
<th>Explanation</th>
<th>% of Total Ex-Mine Mineworkers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Disability</td>
<td>N/A</td>
<td>11.4%</td>
</tr>
<tr>
<td>Mild disability</td>
<td>Some difficulty with ADLs but minor</td>
<td>48.6%</td>
</tr>
<tr>
<td>Moderate disability</td>
<td>Dependent in 35%+ of ADLs</td>
<td>32.4%</td>
</tr>
<tr>
<td>Severe disability</td>
<td>Bed-bound or dependent for 70%+ of ADLs</td>
<td>6.67%</td>
</tr>
<tr>
<td>Severe (but unrelated to mining)</td>
<td>Bed-bound or dependent for 70%+ of ADLs</td>
<td>0.95%</td>
</tr>
</tbody>
</table>

1. Table 4.6 captures the findings of the survey.
Table 4.6: A summary of the Disability Assessments

<table>
<thead>
<tr>
<th>Main Injury Types</th>
<th>Mild Disabilities and Functional Challenges</th>
<th>Moderate Disabilities and Functional Challenges</th>
<th>Severe Disabilities and Functional Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amputations to fingers and toes</td>
<td>Amputations above and below knee – unilateral and bilateral</td>
<td>Spinal cord injuries</td>
<td></td>
</tr>
<tr>
<td>Back and head injuries</td>
<td>Spinal cord injuries and paraplegia</td>
<td>Amputations</td>
<td></td>
</tr>
<tr>
<td>Unilateral below knee amputations</td>
<td>Injuries to eyes and ears</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injuries to eyes and ears</td>
<td>Due to the nature of the injuries, much of the ex-mineworkers in this category were wheelchair users.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General soft tissue and skeletal injuries</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impairments</th>
<th>Mild Disabilities and Functional Challenges</th>
<th>Moderate Disabilities and Functional Challenges</th>
<th>Severe Disabilities and Functional Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased endurance and ability to carry out manual handling tasks, such as farming or carrying water or heaving objects. In a small percentage of cases, the lung-related conditions were a contributing factor too. Most of these ex-mineworkers used a type of walking aid such as sticks, crutches or below knee prostheses.</td>
<td>Decreased endurance.</td>
<td>Difficulties with mobility</td>
<td></td>
</tr>
<tr>
<td>Pain and decreased range of movement was also frequently identified as limiting factors</td>
<td>Visual and hearing loss</td>
<td>Difficulties with all ADLs</td>
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<tr>
<td>Visual and hearing loss</td>
<td></td>
<td></td>
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<tr>
<td>Difficulty with mobility</td>
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<tr>
<th>Functional Implications</th>
<th>Mild Disabilities and Functional Challenges</th>
<th>Moderate Disabilities and Functional Challenges</th>
<th>Severe Disabilities and Functional Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulties with accessing the home environment, particularly outdoors</td>
<td>Difficulties with accessing the home environment, indoors but mostly outdoors</td>
<td>Required full assistance with all personal care and domestics</td>
<td></td>
</tr>
<tr>
<td>Difficulty accessing services, including health care</td>
<td>Difficulty accessing services and utilizing transport</td>
<td>Unable to access services</td>
<td></td>
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<tr>
<td>Difficulty tending to farming activities for the rural dwellers</td>
<td>Difficulty tending to alternative forms of income generating activities</td>
<td></td>
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<tr>
<td>Difficulty with ADLs that required heaving lifting and moving such as domestic activities involving carrying water or tending to the laundry</td>
<td>Difficulty with personal care, requiring assistance or set up of the environment</td>
<td></td>
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<tr>
<td>However, in this category, most of the mineworkers could tend to their personal care and assist around the house, although it was evident from the majority of the assessments that the injured ex-miner did not perform domestic activities like laundry and cooking which were left to the women of the household. This could predominantly be perceived as a cultural factor.</td>
<td>Difficulty with domestic ADLs like laundry and cooking</td>
<td></td>
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<td></td>
<td>In this category, most of the mine workers required some form of assistance to tend to their personal care be that to assist in completing the task or to set up the environment. E.g.: filling a bowl with water and placing this in a place to wash. They were predominantly dependent with their domestic activities.</td>
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<table>
<thead>
<tr>
<th>Identified Needs</th>
<th>Mild Disabilities and Functional Challenges</th>
<th>Moderate Disabilities and Functional Challenges</th>
<th>Severe Disabilities and Functional Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustments to prostheses</td>
<td>Equipment and home modifications</td>
<td>Equipment and home modifications</td>
<td></td>
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<tr>
<td>New walking aids</td>
<td>Update of mobility and prosthetic equipment</td>
<td>Update of wheelchairs</td>
<td></td>
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<tr>
<td>Rehabilitation for mobility</td>
<td>NIHL assessments</td>
<td></td>
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<tr>
<td>NIHL assessments</td>
<td>Rehabilitation</td>
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<tr>
<td>Visual assessments</td>
<td></td>
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<tr>
<td>Investigation and treatment for lung related disorders</td>
<td></td>
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General Findings

Social Context: Many of the ex-mineworkers were living with and providing for extended family members. This placed financial pressure on the households and overall income to the household was limited. In some instances, the ex-mineworker identified that their injuries impacted on their ability to engage socially within their communities.

Work: While the assessment tool asked questions around work, most of the ex-min workers identified that they were either retired or unemployed. For those within the rural setting, subsistence farming was identified as a key occupation but was challenging due to their injuries. This is congruent with the findings from the focus group discussions in Activity 2 and the mineworkers also expressed the need to feel relevant in their roles and contribute towards sustaining their households.
Noise induced hearing loss
There are two key findings from the survey’s initial phase describing the nature and severity of the hearing status of ex-mineworkers:

- Hearing loss is a significant problem in this ex-mine worker population.
  - As many 94 percent are affected by hearing losses of varying degrees.
- Most ex-mineworkers’ hearing losses are highly likely due to noise exposure.
  - 69.8 percent have signs of noise-induced hearing loss.

Activity 4
Rehabilitation Model for Ex-Mineworkers
The goal of rehabilitation at all levels of the health system in the four countries would be to provide the ex-mineworker with the tools to live an independent and fulfilling life within their community functioning at their optimal capacity. The right to equitable services for persons living with disabilities is supported by the four countries’ commitment to the UNCRPD and their various constitutions. Notwithstanding this, the existence of policies does not always ensure effective implementation. The following three levels of care are thus incorporated into the model as ideal for rehabilitation for the ex-mineworker with a disability. The model incorporates the reality of ex-mineworkers having to access both the private and public health system. The one stop service centers could be seen as a single point of entry and a central referral hub for the ex-mineworker. Figure 4.10 depicts a proposed model for rehabilitation.
Institution-Based Rehabilitation

Within the model, it is envisaged that the client will be able to directly access institution-based rehabilitation—public or private, depending on the nature of the complaint. There is also the possibility of referral between the CHC and PHC to the institution within the public sector. Referrals between these levels of care are essential in ensuring that the client receives the optimal rehabilitation and for carry-over into the home-setting. Most hospitals have a basic team of rehabilitation professionals, although a general shortage of health professionals has been noted in these countries. The issue around task-shifting and role sharing may be necessary in the care of these ex-mine workers that access the public health system.
Rehabilitation at Community Care and Primary Health Care Clinics
There is a global shortage of well-trained health workers, creating an essential need for sustainable development strategies for health systems. Key members at this level of care in these four countries may thus include either the presence of rehabilitation professionals and/or community healthcare workers that extend the services of the rehabilitation team. This level of service is included in the model within the public sector only. CHWs are defined as “people chosen within a community to perform functions related to healthcare delivery, who have no formal professional training or degree.” CHWs screen, map, educate, link and extend PHC in the communities for which they are responsible and provide services to communities, families and individuals at community-based institutions or within their homes. This would be an integral level of care especially for those ex-mine workers that may not be able to easily access institution-based services.

Home-Based Rehabilitation (HBR)
HBR has a place in the public and private referral process within the model. HBR has been shown to improve the quality of life including the physical and mental well-being of people living with a wide range of chronic diseases in resource-rich settings. HBR forms a key component of a wider community based rehabilitation approach and is also considered to be a particularly effective strategy in resource-poor settings where access to institution based rehabilitation is limited. In this model, organizations in the four countries with existing footprints relating to mine workers and the national departments of health and social development are considered essential in the provision of services.

Initiatives of the South African government in establishing a one stop service delivery framework which is aimed at setting up a comprehensive database for current and ex-mineworkers and provides for access to comprehensive health services, including screening and rehabilitation, access to compensation benefits and access to social protection benefits such as unemployment insurance, pension and provident fund benefits is also noteworthy. Currently there are two centers that have been opened in South Africa; two centers are being established for the remaining three countries that are part of this study.

Model for Hearing
A basic profile of ex-mineworkers’ hearing first needs to be completed. Due to the fact that ex-mineworkers and/or their employers may not have records of their baseline hearing test, especially if they left work between the mid-1990s until November 2003, a baseline needs to be established. Therefore, all ex-mineworkers who have been identified or self-report as eligible candidates will be screened after a 16-hour noise-free period. This is to prevent a temporary hearing threshold shift from occurring due to exposure to recreational noise such as like music or noise from home environments, for example. Typically, adult screening for occupational/noise-induced hearing loss consists of a case history, physical evaluation of the ear, and auditory or hearing screening.

All the tests in Figure 4.11 are recommended for this screening activity for ex-mineworkers, with modifications suitable to the context and population. If the candidates pass this screening, they would still be eligible for a re-screening every six months to monitor their hearing as part of their being a high-risk group with a history of noise (and/or ototoxic chemical) exposures in the workplace. Given that old audiograms (baseline, periodic and/or exit audiograms) may not be readily available, all those failing the screening test will be referred for a full diagnostic audiological assessment. However, if audiograms are available—older baseline and especially exit audiograms—then the current screening test results must be compared to the previous results to ascertain if their hearing has deteriorated by 10 percent or more, which would make them eligible for a full diagnostic audiological assessment.
Education should be provided to the candidate about the broader issues pertaining to this intervention, procedures and process of hearing screening, whether there is a risk of their having a hearing disorder, follow-up procedures and the difference between screening and assessment/diagnostic audiology, all in accessible language(s). Critically, once the screening activity is connected to the intervention and during follow up medical and audiological management of ex-workers’ hearing, it is not possible to offer all services at the same time. However, aspects of medical and audiological management will be offered insofar as is possible within the one-stop service center framework.

The screening service is connected to follow-up medical and audiological intervention, of which there are two streams—a fast track dubbed the FITT track, or the fast, important, treatment and therapeutic track, and the extended auditory rehabilitation [EAR] track.

Findings/Conclusions

- Despite policy being in place in most of the countries for disability and rehabilitation, there is often a lack of enactment of the policies that safeguard the rights of persons with disability to access rehabilitation and health promotion services. This means the foundations of a rehabilitation infrastructure for injured ex-mineworkers are either limited or lacking, negatively impacting accessibility and acceptability. Access to and the maintenance of equipment is an example of this.
- From the desktop analysis, COIDA is a comprehensive act providing for the needs of injured mine workers. The Mine Health and Safety Act (MHSA) implemented by its Council (MHSC) addresses issues to reduce injuries in the mines, but more needs to be done around the quality and the
monitoring of post-injury rehabilitation to further prevent mineworkers from becoming ex-mineworkers through a lack of appropriate rehab.

- Rehabilitation services need to have a stronger focus on community-based rehabilitation, but this is geographically challenging in rural southern Africa. Inter-sectoral collaboration across the key stakeholders for injured mine workers is needed to improve processes like referral networks to ensure the injured ex-mineworker is not lost in the system.

- Unlike a physical injury from mining which presents itself immediately and can be easily managed, NIHL is latent, developing over time, and ex-mineworkers may not have had the benefits of baseline and regular testing to identify this compensable injury. A lack of knowledge and awareness from the ex-mineworker of this condition, combined with inadequate facilities to diagnose and treat, means the prevalence and cause of NIHL in ex-mineworkers may be more of a problem than meets the eye.

- Rural realities: Living in a rural environment poses challenges and further disables many injured ex-mineworkers reducing their level of independence. Indoor toilets, running water and, to a lesser extent electricity, are often disabling factors for the injured mineworker but are difficult to resolve due to infrastructure in the rural settings.

- Accessibility of rehabilitation and healthcare services: This was identified as difficult and disabling for the ex-mineworker. Getting to services, architectural and home environmental barriers all contribute to this challenge. RMA contracts TEBA to provide home modifications and equipment across the four countries, and this appears to be working well. However, it may be that where the mineworkers did not feel that they had the necessary adaptations or equipment, this could have been due to factors like perceived vs actual need or around knowledge and awareness of their rights or possibly failures in the compensation process following injury.

- Acceptability of rehabilitation and healthcare services: Acceptability was variable across the four countries, with South Africans feeling the least satisfied. This could be due to personal factors or problems regarding relationships.

- Implications for family: The culture and belief systems in the community about the role of the caregiver or spouse and the resultant stigma can also limit the family from engaging in tasks to satisfy the needs of the family and therefore result in potential loss of income from caregivers. Under COIDA there are benefits that can be accessed for attendance allowances and other assistances, but the ex-miners’ knowledge and awareness of these may be lacking, or at the time of injury it may not have been seen to be necessary or they did not meet the criteria. The literature is quite clear about the cycle of poverty and disability on health and the addition of ageing and working in a mine both compound this.

- Financial constraints: The burden of financial constraints is a major theme including the implications this has on current and ex-mineworkers’ families and quality of life. In some instances, mine workers felt abandoned by their employers or let down by the system. While progress is being made to reduce injuries on the mines in South Africa, the injured ex-mineworker may have been prematurely dismissed without the proper rehabilitation to ascertain their ability to return to work, leading to a lack of adequate income or the ability to return to the job market, especially in the physically demanding jobs of the mines. Pensions were not enough to live on and in some instances provided an income below the poverty line.

- Sustaining Livelihoods: The loss of a productive role such as work because of an occupational injury often leaves the person afflicted with feelings of despondency and an inability to sustain themselves. In the context of rural impoverished southern Africa, it is not uncommon for the injured ex-mineworker to stress the desire to sustain their livelihoods, not only for financial reasons, although this is often the primary reason, but also to feel like they have a sense of purpose and to contribute to sustaining themselves and their families. Combined with this is an innate need to feel and remain relevant. Participants provided solutions on ways in which they felt they required assistance for sustaining their livelihoods. Unsurprisingly, this frequently centered on farming activities across the four countries, particularly for rural dwelling ex-mineworkers. This highlights and supports the need for training, capacity building and skills development programs and projects.

- Knowledge and awareness: This activity highlighted that knowledge and awareness around the ex-mineworkers’ rights in terms of compensation, benefits and financial aspects, was possibly limited; mirroring an emerging theme from the literature. The Financial Services Bureau identifies that there
are unclaimed benefits with regards to ex-mineworkers; this example is indicative of ex-mineworkers not being aware of their rights or not knowing they can claim benefits.

- The findings would suggest that there is a need for access to ongoing or routine maintenance to maximize independence in daily tasks through ongoing rehabilitation, providing or updating equipment or general rehabilitation to reduce the impact of the impairment or disability in their ADLs.
- Substantial numbers of ex-mineworkers, up to 94 percent, present with hearing loss. This figure is unusually high, almost five times more that the global average of 20 percent of the total population (WHO, 2012). As one grows older, hearing loss may occur naturally. However, age is at best a factor that may exacerbate these workers’ hearing disability. Indeed, many experience hearing losses that are between moderate and severe (28% to 40%). This pattern of hearing loss is unusually severe and highly prevalent. Normal aging results in various forms of (usually mild, perhaps moderate) hearing loss. That as many as 40 percent of these ex-mineworkers have severe (disabling) hearing losses tells us that other factors besides age may be contributing to this phenomenon.

**Recommendations**

*Developing a comprehensive and up to date master database of ex-mineworkers*

The current database and IT system at RMA are sophisticated and can be integrated. It is therefore recommended that there be inter-sectoral collaboration across the key stakeholders to agree that one organization hold the master database and all key stakeholders with vested interests concerning mine and ex-mineworkers provide information and resources to update and maintain this master database. Inter alia, this would require the following:

- A source to update changes of address to the dataset
- A source to identify if the mine worker is still employed or not
- A source to identify if the mineworker has died. This was previously done by TEBA in the RMA database until 2015.
- Sophisticated software to assimilate multiple sources of information with a unique identifying number for each mine worker.
- Possible tracking and tracing to identify injured ex-mineworkers who are still alive.

The mineworkers’ involvement and input would be required and education made available to create an awareness of their benefits. For example, it would be the responsibility of the mineworker and/or family to alert the holder of the master database regarding change of address, that they have discontinued working, or that they have deceased.

*Accessing information on Rehabilitation Services*

A detailed analysis of all the rehabilitation services available to ex-mineworkers across the four countries needs to be completed. This analysis should cover the full remit of possible services for ex-mineworkers. From this analysis, findings and recommendations should be presented to a multi-sectoral key stakeholder group with a role in the rehabilitation of all mineworkers to build networks and develop existing services with an integrated model. The development of any rehabilitation services for injured ex-mineworkers should consider aligning with the initiatives like the one-stop service delivery framework, which aims to improve health, social, and rehabilitation service delivery to current and ex-mineworkers. This will allow another point of entry for ex-mineworkers to access rehabilitation. It is important that health and rehabilitation services are available at single points of care.

*Rehabilitation Services*

To prevent mineworkers from becoming ex-mineworkers, an independent review and analysis is needed to examine the process following injury until the mineworker returns to the medical surveillance system at the mine. This will help to identify the gaps and challenges and make recommendations for improvement. The following recommendations are made regarding rehabilitation in southern Africa:

- Access to rehabilitation and compensation services which includes equipment needs to improve across all countries. With the introduction of two one-stop service centers in each of the countries,
facilities should be available at these service centers to support the ex-mine workers, either in terms of equipment or sign-posting to services or creating awareness. It is therefore recommended that an independent assessment and review of the one-stop service centers occurs, including engagement with key stakeholders to identify the potential collaboration and support that can occur to address the needs identified through this project.

- The Mining Quality Authority is responsible for improving skills development and training within the mining sector and it is recommended that raising awareness of the mineworkers’ rights in terms of compensation, benefits and advice on financial planning comes under their remit in collaboration with the mining sector.
- Rehabilitation post injury needs to be reviewed and quality standards and monitoring practices put into place among DMR, MHSC, RMA, and the mining companies to maximize rehabilitation and therefore potential to return to work. It is recommended, as in activity 1, that an independent analysis of this outsourced rehabilitation occurs and suggestions for the monitoring of quality, quantity and inspection of these services are presented to the MHSC, DMR, RMA and mining companies.
- Factors that determine acceptability in terms of rehabilitation and compensation for this cohort need to be better established before research into this topic continues.
- Ex-mineworkers who are injured working in the mines and return home need to have support and guidance for sustaining their livelihoods. Organizations like the MDA and many others need to develop a collaborative approach to address these needs in combination with the Department of Labor and the mining houses. Compensation is not enough on its own and a more detailed analysis and review of sustainable livelihood programs that occur across the four study countries is highly recommended, including identifying the gaps, commonalities and potential areas for collaboration.
- Integrated, accessible, and sustainable services across statutory, voluntary, and private organizations are needed to deliver rehabilitation for ex-mineworkers. The One-Stop Service Centers, operating as a referral hub, should be a single point of entry for injured ex-mineworkers to access a raft of services and programs to address the various needs identified for the ex-mineworkers, including screening and onward referral to establish NIHL. In line with Activity 2, it is recommended that an independent analysis and review of the 1-stop service centers be conducted to identify their scope and potential in this regard, making suggestions for how the above can be implemented. In addition, a stakeholder event should be held to gather collective knowledge in an appreciative way for stakeholders to find solutions to moving services for ex-mineworkers forward within an appreciative framework.
- Programs of sustainable livelihoods for ex-mineworkers need to be reinforced. It is recommended that an independent review of existing community-private partnership models around sustainable livelihoods be undertaken to inform potential models that may suit the ex-mineworker populations and their communities.
- Further testing to establish a clear diagnosis and pattern of individual’s hearing losses, provision of assistive listening devices such as hearing aids and consumables (mainly batteries), and provision of aural rehabilitation to manage difficult listening situations, to learn how to use the hearing aid/assistive listening device and to maximize hearing functioning.
- A focus on health and rehabilitation provision and continuity of care at all levels of service provision:
  - Improved accessibility for ex-mineworkers to health services including rehabilitation.
  - Appropriate and relevant service provision for ex-mineworkers.
  - Integrated service provision including community, primary health care and home-based rehabilitation.
  - Appropriate referral pathways between stakeholders towards coordinated care.
  - Co-ordinated care pathways for ex-mineworkers living with disability.
  - Inclusion of vocational rehabilitation that is aligned to create opportunities for reintegration, realignment and reskilling of mine workers.
- Inter-sectoral collaboration between key stakeholders to strengthen service delivery for ex-mine workers including:
  - Effective communication between stakeholders involved in the care of ex-mineworkers.
  - Empowerment of the ex-mineworkers with disability towards social inclusion and community participation.
o Inclusion of the voices of the disabled mineworkers and ground-workers as key informants.
o Creating awareness of the rights of ex-mineworkers through education and empowerment
drives on compensation and access to health services.
o Reskilling of mine workers prior to exit from the mining industry.
o Provision of opportunities for sustaining livelihoods through community-private partnerships.

- It is recommended that a workshop be conducted with the key stakeholders in each country to discuss the models in terms of feasibility to determine
  o Country specific requirements.
o Unpack the model and determine the barriers and opportunities to implementation.
o Understand and develop realistic pathways for care.
o Establish key stakeholders that can contribute to test out the model.

Glossary of Terms
Acceptability: In healthcare, acceptability is largely subjective and can constitute a range of factors including affordability, cleanliness, professionalism, appropriate skills, caring attitudes, accessibility, and timeliness.

Accessibility: In relation to health care, this involves the timely access to or use of health care systems to achieve the best health outcomes. It includes gaining entry into the health system and place of care where patients can receive needed services. Accessibility in healthcare is about the right service at the right time and the right place.

Activities of Daily Living or Daily Tasks: These are routine activities that people tend do every day without needing assistance. There are six basic ADLs: eating, bathing, dressing, toileting, transferring (walking) and continence. Occupational Therapy extends this to work/play, leisure/social participation and sleep/rest.

Compensation: This is something, typically money, awarded to someone in recognition of loss, suffering, or injury.

Disability: The International Classification of Functioning, Disability and Health states that a disability is an umbrella term to cover impairments, activity limitations, and participation restrictions and reflects the interaction between features of a person’s body and features of the society in which he or she lives.

Functioning: This is the ability of an individual to perform their activities of daily living within the context of their social and physical environment

Impairment: The International Classification of Functioning, Disability and Health (ICF) define impairment as any loss or abnormality of psychological, physiological or anatomical structure or function.

Injury: Physical harm or damage to someone’s body caused by an accident or an attack.
Heat Maps: A heat map is a graphical representation of data often showing density or distribution where the individual values contained in a matrix are represented as colors.

Rehabilitation: This is the process of treatment to restore or recovery from an injury, illness, or disease to as normal a condition as possible. It involves helping a person restore lost skills and so regain maximum self-sufficiency or independence in their day to day activities.

References


CONCLUSION

The story of tuberculosis and occupational health in the mining sector in southern Africa is shifting from one of despair to hope. Since its inception, the South Africa Knowledge Hub has successfully convened collaborative partnerships among key stakeholders from the public, private, and civil society sectors in the SADC region to ensure that a framework was in place to drive the TB agenda forward. The Hub has demonstrated the depth of local expertise in gathering and sharing valuable evidence to shape the regional response to TB and Occupational Health in the Mining Sector. As a result, the TB in the Mining Sector Initiative has been widely recognized as catalytic in scaling-up innovative approaches and mobilizing additional resources for addressing TB in the mining sector in southern Africa.

Notable in this effort is the role that this collaboration has played to develop a common vision—codified in the Framework for the Harmonized Management of Tuberculosis in the Mining Sector—identify areas of opportunity and constraint, bridge longstanding divides between sectors and systems, and facilitate the implementation of measures to improve the delivery of TB services to mineworkers across the region. The combined achievements of this multi-sector initiative—which have included increasing access to occupational health and rehabilitation services (including compensation funds for occupational lung diseases); supporting several research studies that have deepened the collective understanding of the complexities of TB in the mining sector and have increased awareness of and advocacy for TB control services; and developing new models for active TB case finding, diagnosis, and treatment—have not only enhanced the delivery of essential services to mineworkers, ex-mineworkers, and mining communities but have also provided lessons learned for other countries interested in implementing a harmonized cross-border regional approach to address the complex health needs of a highly mobile or migrant population.

In addition, the project successfully generated knowledge that has been instrumental in assisting governments within the region to request additional funding and technical support to tackle the impact of TB. Tremendous opportunity exists for this catalytic work to drive new approaches in managing health and social challenges of vulnerable and migrant populations and refugees. To build on early lessons learned from this initiative, in July 2017 an international meeting titled, ‘Smart Investment in Health: Mining as a Catalyst for Building Sustainable Communities’ was convened in Johannesburg by the Southern African Regional Coordinating Mechanism (SARCM) for the TB in the Mining Sector Program. It brought together senior-level stakeholders from Government and the private sector and civil society, and partners from the African Union and the Southern African Development Community, The STOP TB partnership, The Global Fund and The World Bank Group. The meeting explored ways of improving Occupational Health (OH) Services for mineworkers and public health care services for the peri-mining communities. Recommendations from the meeting regarding priority interventions for further investment have been disseminated to countries through various fora to enable national programs to implement those recommendations most relevant to their context. Additionally, the recommendations have informed the implementation strategies of the ongoing World Bank regional TB initiative covering Lesotho, Mozambique, South Africa, and Swaziland.

Moving forward—and in order to continue this high-level dialogue amongst leaders and policy makers from various sectors and ministries—strong political support and leadership from all countries will be needed to consolidate gains and further advance robust strategies for reducing TB prevalence within the mining sector and mining communities in the southern Africa sub-region. This publication not only reflects the sustained commitment and ownership of the initiative that has taken root, but also provides evidence and the momentum required to rewrite the story of TB and ill-health in this sector.
Given the magnitude and the complexity of factors associated with tuberculosis (TB) in the mining sector in southern Africa, no sector or actor is solely equipped to effectively tackle the issue. A cross-border response to TB involves a number of policy, programmatic, and service delivery considerations and the success of these efforts largely depends on establishing effective coordination and implementation mechanisms that bridge the mines, communities, and countries—including the housing, labor, health and mining sectors; development partners; civil society; labor unions; and mineworkers.

Through its South Africa Health Knowledge Hub (the Knowledge Hub), established in 2012, the World Bank Group (WBG) has worked extensively in the southern Africa region to support sustainable health reform and promote investments in all sectors that form the foundation of healthy societies. The WBG’s Health, Nutrition and Population (HNP) Global Practice has served as a vital source of financial and technical assistance in South Africa—facilitating high-level dialogue, multisectoral and public-private engagement, knowledge generation, and implementation support to tackle long-standing health sector challenges, including the persistent challenge of TB in the mining sector.

This compendium assembles a rich and diverse collection of papers, reports, and other material generated through technical assistance to tackle TB in the mining sector in southern Africa—spearheaded by the World Bank’s Southern Africa Knowledge Hub. The historical context details the significant progress and achievements made since the Hub was formally established in 2012. Particularly important is the documentation of work done on harmonization—often a challenge when working across sectors to develop a multisectoral approach. The information provides readers with the understanding necessary to examine the policy and practitioner approaches that have been used thus far and captures the successes, challenges, collaborations, and lessons learned in carrying out a range of comprehensive studies and innovative interventions.

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