

Finding missing TB cases post the COVID-19 epidemic at Doornkop operation, Harmony Gold Mine: lessons learnt

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BACKGROUND

Tuberculosis (TB) is a preventable and, usually, curable disease. According to the World Health Organization (WHO), TB was the world's second leading cause of death from a single infectious agent in 2022, after coronavirus disease.¹ Tuberculosis was also reported to have caused almost twice as many deaths as HIV/AIDS.¹ Globally, more than 10 million people are infected with TB every year.¹ Country member states of the United Nations and the WHO are committed to ending the TB epidemic, globally, by 2030.^{1,2}

The WHO has taken great strides to upscale TB case finding, globally, post-COVID-19 and has provided recommendations on measures that countries should take to find missing TB cases. This includes systematic screening for TB disease in the general population and among people at risk, household and close contacts, inmates, people living with HIV (PLHIV), and people exposed to silica in workplaces with a high TB prevalence.¹

South Africa, with less than 0.8% of the global population, contributes 3.6% of all TB cases worldwide, making it one of the countries with the highest burdens of TB.¹ South Africa remains one of eight countries that collectively account for two-thirds of the world's TB burden.³ The country also has the world's largest HIV epidemic, leading to a high TB/HIV co-infection rate of 54%.^{1,4} People living with HIV are 18 times more likely to develop TB than HIV-negative individuals, particularly when not on antiretroviral therapy (ART).⁵ In South Africa, TB remains a leading cause of death among PLHIV.^{5,6} Stigma and socio-economic factors contribute to poor treatment adherence and outcomes, including high mortality, among TB/HIV co-infected individuals.⁷ Poor nutritional status also increases the risk of mortality in people with HIV/TB co-infection.⁶

South Africa adopted the WHO recommendations for finding missing TB cases and, thus, developed a TB recovery plan, comprising four critical pillars:⁸

1. Find people with undiagnosed TB
2. Strengthen linkage of people diagnosed with TB to treatment
3. Strengthen retention in TB care
4. Strengthen TB prevention

The emphasis is on finding missing TB cases in high-risk populations, including PLHIV. It is through this recovery plan that the country developed a TB screening standard operational procedure (SOP) in 2022.³ The purpose of this SOP is to scale up TB case finding at health facility level and community level, using evidence-based scientific tools such as Xpert MTB/RIF (GXP-TB), one of the WHO-recommended molecular rapid diagnostic tests, digital X-rays, and lateral flow urine lipoarabinomannan (LF lam).

Harmony Gold

Harmony is a global, sustainable gold mining and exploration company. It is also the largest producer of gold from the retreatment of old tailings dams, making it a major player in the circular economy of gold.⁸

Harmony operates in three provinces in South Africa:

- 1) Gauteng, where it has three operations (Doornkop, Kusasaletu, and Mponeng mines); North West (Moab Khotsong operation); and
- 3) Free State (Masimong, Joel, Target, Tshepong, Target 1, and Joel mines).

Doornkop is one of the deep-level single-shaft operations in Gauteng province, about 30 km west of Johannesburg, on the northern rim of the Witwatersrand basin. While it is a mature operation, it still has 15 remaining 'life-of-mine' years.⁹ In 2022 and 2023, the size of the workforce at Doornkop operation was 4 444 and 4 543, respectively.⁹

In 2022, Doornkop reported 28 new cases of TB to both the Department of Health and the Department of Mineral Resources and Energy (DMRE), compared to 33 cases in 2023; incidence rates were approximately 630/100 000 and 726/100 000 in 2022 and 2023, respectively.

TB CASE-FINDING PROJECT

In March 2022, during TB awareness month, Harmony embarked on a project to strengthen TB case-finding in high-risk populations at Doornkop mine to: 1) find missing TB cases in high-risk populations, using the health facility TB screening algorithm at Doornkop medical hub; 2) scale up dust control measures/controls to prevent the spread of TB in high-risk populations; and 3) scale up TB prevention therapy to all identified high-risk groups at the Doornkop operation.

A desktop review was conducted at Doornkop medical hub. Tuberculosis data were collated for the period 2022–2023, post COVID-19. The following TB cascade indicators were reviewed for all reported TB cases:

1. TB screening
2. Suspect TB cases identified
3. Mode of TB diagnosis and TB/HIV integration component by looking at TB/HIV co-infection rate
4. Contact tracing of index TB cases was reviewed to assess TB cases identified using the TB screening tool

Socio-demographic data such as age, sex, occupation, record of service at Harmony Gold mine, and living occupancy were also collected.

Results

TB case finding cascade

More than 4 000 employees were screened for TB in both 2022 and in 2023 (Figure 1). Twice the number of presumptive TB cases were identified in 2023 than in 2022, viz. 390 (8.6%) and 196 (4.5%), respectively. Of these, 28 (14.3%) were diagnosed with TB disease in 2022, and 33 (8.5%) in 2023. All were male employees.

Mode of TB diagnosis

Seventeen of the cases were diagnosed in 2022 using the GXP-TB sputum test (60.7%) and nine (32.1%) were diagnosed on chest X-ray.

Table 1. Socio-demographic characteristics of employees diagnosed with TB, 2022 and 2023

Year of diagnosis	n	No. HIV-positive	Age range (years)	Work area	Place of residence		
					Within mine premises	Outside mine premises	Unknown
2022	28	20	25–59	Underground	12	16	0
2023	33	24	29–59	Surface/ underground	10	20	3

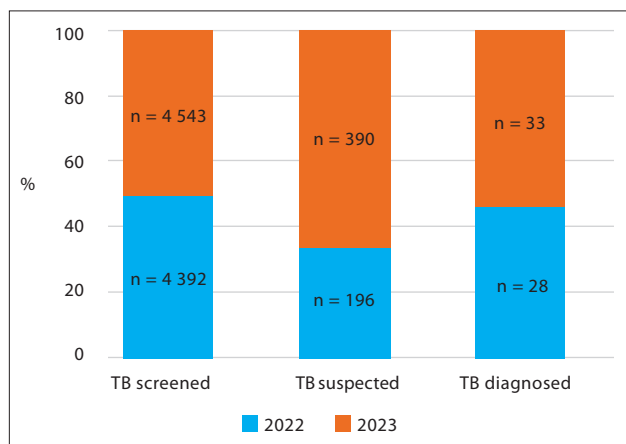


Figure 1. TB case-finding cascade

In 2023, 17 cases (51.5%) were diagnosed using the GXP-TB sputum test, 13 (39.4%) were diagnosed on chest X ray, and three (9.1%) were diagnosed using LF lam.

Demographic characteristics

Employees diagnosed with TB were aged from 25 to 59 years and worked both on-surface and underground (Table 1). More (almost 60%) lived outside the mining premises than within. Twenty (71.4%) and 24 (72.7%) of the TB cases were HIV-positive in 2022 and 2023, respectively.

The occupation of TB cases diagnosed in 2022 and 2023 varied widely. Those who worked underground were mainly from the production workforce.

Exposure to dust

In 2022, 17 of the TB cases were in homogeneous exposure group (HEG) A dust exposure category, four were in HEG B and seven were in HEG C. In 2023, only one case was in HEG A, while 24 and seven were in HEGs B and C, respectively (Table 2).

Table 2. TB cases by exposure category, 2022 and 2023

Exposure category/ HEG	RCS dust concentration (mg/m ³)	No. TB cases		
		2022	2023	All
C	< 0.05	7	7	14
B	0.05–0.1	4	24	24
A	> 0.1	17	1	18

Conclusion

The WHO continues to support countries with high TB burdens in their efforts to find missing TB cases, as a commitment to the goal of ending TB by 2030. South Africa is one of the countries with a high proportion of undiagnosed TB cases, and it has made great strides in its endeavours to find missing cases. The SOP for screening and testing for TB was implemented at Doornkop operations in 2022 and provides evidence that this is an effective strategy to find TB cases.

REFERENCES

1. Global tuberculosis report 2023. Geneva; World Health Organization; 2023. Available from <http://www.who.int/publications/i/item/9789240083851> (accessed 19 June 2024).
2. Millington KA, White RG, Lipman M, McQuaid CF, Hauser J, Wooding V, et al. The 2023 UN high-level meeting on tuberculosis: renewing hope, momentum, and commitment to end tuberculosis. *Lancet Respir Med.* 2024; 12(1):10-13. doi: 10.1016/S2213-2600(23)00409-5.
3. South Africa. TB screening and testing. Standard operating procedure. Pretoria: Department of Health; 2022. Available from: https://www.westerncape.gov.za/assets/departments/health/FP/tutt_circular_annexure_1_-_screening_testing_sop.pdf (accessed 19 June 2024).
4. Churchyard G, Kim P, Shah NS, Rustomjee R, Gandhi N, Mathema B, et al. What we know about tuberculosis transmission: an overview. *J Infect Dis.* 2017; 216(suppl_6):S629-S635. doi: 10.1093/infdis/jix362.
5. Bell LCK, Noursadeghi M. Pathogenesis of HIV-1 and Mycobacterium tuberculosis co-infection. *Nat Rev Microbiol.* 2018; 16(2):80-90. doi: 10.1038/nrmicro.2017.128.
6. Duarte R, Lönnroth K, Carvalho C, Lima F, Carvalho ACC, Muñoz-Torrico M, et al. Tuberculosis, social determinants and co-morbidities (including HIV). *Pulmonology.* 2018; 24(2):115-119. doi: 10.1016/j.rppnen.2017.11.003.
7. WHO operational handbook on tuberculosis. Module 6: tuberculosis and comorbidities: mental health conditions. Geneva: World Health Organization; 2023. Available from: <https://iris.who.int/bitstream/handle/10665/373829/9789240082557-eng.pdf?sequence=1> (accessed 19 June 2024).
8. Department of Health. Knowledge hub. TB national recovery plan. Available from: https://knowledgehub.health.gov.za/system/files/2024-03/updated%20TB%20Cluster_Webinar%201_TB%20Recovery%20Plan.pdf (accessed 20 June 2024).
9. Integrated Annual Report 2023. Harmony Gold Mining Company Limited; 2023. Available from: <https://www.har.co.za/23/download/HAR-IR23-about-report.pdf> (accessed 19 June 2024).