

Tuberculosis: a biosocial problem that requires biosocial solutions



Tuberculosis continues to exact a staggering toll globally. In 2022, an estimated 10.6 million people were affected by tuberculosis and 1.3 million people died from the disease.¹ Progress on global tuberculosis targets continues to lag. The WHO 2015 END TB strategy 2020 target for reducing catastrophic costs to 0% in all tuberculosis affected households was not achieved. At the current inadequate global pace of decline in tuberculosis incidence (8.7%) and mortality (19%), the END TB strategy milestones of 50% reduction in incidence and 75% reduction in mortality by 2025 will not be met.¹

Are these targets too ambitious or unrealistic in the 21st century? No, because similar goals were achieved in the UK decades ago, after the introduction of anti-tuberculosis chemotherapy against the backdrop of a welfare state, universal health coverage (UHC) provided via the National Health Service, and improved socioeconomic conditions. In a decade (1950–60), the UK saw notification rates for all forms of tuberculosis decline by 52%, while deaths from tuberculosis declined by 77%.²

Tuberculosis is a curable infectious disease linked to inequities. Socioeconomic conditions create the vulnerabilities to the disease and its catastrophic outcomes.³ Socially determined biological risk factors such as undernutrition (associated with poverty) and HIV are major drivers of tuberculosis in southeast Asia and Africa.⁴ Socially determined inequities in coverage and quality of health care lead to avoidable mortality due to tuberculosis while catastrophic costs of care lead to further poverty. Even in countries such as Canada with a low tuberculosis burden, the average annual rates of tuberculosis can be 290 times higher in vulnerable populations such as Inuit communities compared with Canadian-born, non-Indigenous people.⁵ To accelerate the decline of the incidence and mortality of this biosocial disease and mitigate its socioeconomic impacts, optimal and equitable use of existing biomedical interventions needs to be scaled up together with public health and socioeconomic solutions.⁶

The biomedical armamentarium (panel) to reduce tuberculosis incidence includes the BCG vaccine, which is protective against severe forms of childhood

tuberculosis, and tuberculosis preventive treatment (TPT), which now aims to cover other household contacts and clinical risk groups apart from children younger than 5 years and household contacts with HIV.⁷ Newer, shorter course (1–3 month) and effective rifamycin-based regimens are available and need to be scaled up.⁷ Between 2018 and 2022, the global target of TPT coverage in people living with HIV was achieved, but coverage in other populations was still inadequate or even poor (55% of children younger than 5 years and 10% of contacts older than 5 years).⁸ Expanded uptake of TPT will require increased awareness of its importance in communities and front-line providers, improved availability and affordability of newer, shorter regimens, and strengthened primary health care as a cornerstone of UHC.⁹

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Panel: Biosocial interventions in tuberculosis care and prevention

Strategies to reduce tuberculosis deaths:

- Strengthened primary care and universal health coverage for underserved communities
- Universal availability of WHO recommended rapid molecular diagnostics and drug-susceptibility tests
- Access to 6-month, all-oral, shorter regimens for drug-resistant tuberculosis
- Triage and manage severe disease: develop triage tools and protocols for inpatient care
- Assess and address comorbidities such as moderate-severe undernutrition, diabetes, HIV, and anaemia
- Nutrition and socioeconomic support to address food insecurity and undernutrition
- Audit of all tuberculosis deaths and improvement of quality of clinical care
- Adequate budgetary allocation for health care including tuberculosis, human resources, and consumables

Strategies to reduce tuberculosis incidence:

- Scale-up of shorter tuberculosis preventive treatment as part of universal health coverage, increase awareness in front-line providers and communities
- Development and equitable access to newer vaccines
- Address undernutrition in affected communities
- Scale-up of HIV services and reduce exposure to tobacco and alcohol
- Poverty alleviation, social protection, and improved population health

In parallel, tuberculosis incidence can be reduced by actions (panel) to address major risk factors for tuberculosis such as malnutrition and food insecurity, which are worsening due to the impacts of the COVID-19 crisis, conflicts, economic downturns, growing inequality, and the climate crisis.¹⁰ Undernutrition is a leading risk factor for tuberculosis incidence, accounting annually for 2.2 million cases globally and 34–45% of incident cases in India, the world's highest tuberculosis burden country.^{4,11} Yet some optimism for ways to reduce tuberculosis incidence can be found in the results of the RATIONS trial from India, which showed that nutritional supplementation in household contacts could reduce tuberculosis incidence by 40–50%.¹² Nutrition could complement TPT in communities with severe prevalence of undernutrition.¹² Indeed, modelling suggests that action on poverty and expanding social protection could reduce tuberculosis incidence by 84%.¹³

Alongside such strategies, accelerated action is needed to reduce tuberculosis deaths—these deaths are not inevitable and are preventable. Mortality occurs mostly among people with drug-susceptible tuberculosis, in those with extensive disease with complications, and in individuals with drug-resistant tuberculosis.¹⁴ Comorbidities, such as moderate to severe undernutrition, anaemia, advanced HIV, and uncontrolled diabetes, are major risk factors for death, and the first 2 months of treatment are the period of greatest risk.¹⁵ These risk factors need to be assessed and addressed early in the treatment to reduce deaths.¹⁴ People with tuberculosis also need to be screened for predictors of tuberculosis mortality (eg, severe disease and severe comorbidities) and provided with access to appropriate inpatient care.¹⁴ Unlike other infections, including COVID-19, there are no current guidelines to grade severity of disease and enable triage for appropriate care in patients with tuberculosis, especially in low-resource settings. Current practice for the evaluation of comorbidities typically involves screening and management of HIV and diabetes, but assessment for undernutrition and anaemia as well as provision of nutritional support continue to be gaps in tuberculosis programmes, despite WHO recommending them a decade ago.¹⁶ A facility-based and community-based audit of all tuberculosis deaths can help enable remedial action and guide quality improvement of tuberculosis programmes.¹⁴

The patient cohort nested in the RATIONS trial provides some clues for how to reduce tuberculosis deaths.¹⁷

Field workers in the trial used a triage tool consisting of red flags related to vital signs (eg, blood pressure, and oxygen saturation), nutritional status (eg, weight, BMI, haemoglobin, and presence of oedema), and performance status (eg, limited mobility or inability to stand without support).¹⁷ The trial showed that correction of severe undernutrition as a comorbidity with monthly food baskets and multivitamins is feasible and has a substantial impact on reducing tuberculosis deaths.¹⁷ Such triaging of patients for red flags has also been successfully used in programmatic initiatives in India to screen for severe illness in tuberculosis.¹⁸ Similarly, a tuberculosis score based on symptoms and clinical signs was developed to predict mortality and treatment response in Guinea-Bissau.¹⁹

Apart from nutritional support, socioeconomic support for patients and their families is another strategy to reduce tuberculosis deaths and catastrophic costs. Cash transfers in Brazil or tuberculosis-specific cash transfers in India have been associated with improved patient outcomes, although gaps in coverage need to be filled and the amount of financial support must be increased.^{20,21}

As we approach the END TB strategy milestone of 2025, it is important to remember that the decline of tuberculosis in high-income countries occurred before the large-scale use of modern biomedical interventions.^{2,22} This advance was due to improved nutrition and socioeconomic conditions together with declines in poverty.²³ Today, excellent biomedical options exist to control and treat tuberculosis, such as rapid molecular tests and shorter drug regimens, but their impact is nowhere close to their potential because governments and the global health community have not made sufficient progress in alleviating poverty and malnutrition or expanding social protection. People living in poverty not only suffer from a disproportionate burden of tuberculosis, but also from multimorbidity, especially non-communicable diseases.²⁴ Improved population health with social protection and food security, UHC centred on primary health care, and comprehensive patient-centred care with diagnostics, treatments, and vaccines offers the best hope for ending tuberculosis, as well as tackling multimorbidity.²⁵ The political declaration of the UN High-Level Meeting on the Fight Against Tuberculosis, held in September, 2023, reaffirmed the commitment to achieve the 2030 Agenda for Sustainable Development

and within it the goal to end the tuberculosis epidemic by 2030.⁸ Yet this needs to translate into equitable access for prevention, testing, treatment, and care and effective action on the social determinants of tuberculosis. In 2024, tuberculosis remains a quintessential biosocial problem that requires biosocial solutions.

AB was the Principal Investigator and MB was the Co-Principal Investigator of the RATIONS trial. MP is an adviser to WHO, Stop TB Partnership, Bill & Melinda Gates Foundation, and Foundation for Innovative New Diagnostics. We declare no other competing interests.

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