Global tuberculosis report 2024

World Health Organization

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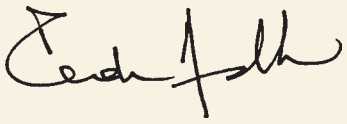
Tuberculosis is as old as humanity itself. It has afflicted kings and queens, poets and politicians, revolutionaries and writers, activists and actors. Most of its victims, however, are poor, marginalised or malnourished, and the out-of-pocket costs associated with treating TB expose them to financial hardship or drive them further into poverty. TB is the definitive disease of deprivation. Turning the tide on TB means screening and treatment for those it strikes, and preventing it by addressing its drivers and developing a new vaccine.

Only by working together can we turn the tide against this ancient killer.



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WHO's Global tuberculosis report for 2024 reveals a sobering reality: TB has probably returned to being the world's leading infectious disease killer. We are confronted with a multitude of formidable challenges: funding shortfalls, catastrophic financial burdens for many TB-affected households, climate change, conflict, migration and displacement, pandemics, and the urgent need to tackle drug-resistant tuberculosis, a significant driver of antimicrobial resistance. It is imperative that we unite across all sectors and stakeholders, to confront these pressing issues and ramp up our efforts, transforming our promises into tangible resources and unwavering resolve. Only through our collective determination can we make significant strides in our battle to end TB once and for all.

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The data collection forms were developed by Hazim Timimi, with input from staff throughout the WHO Global Tuberculosis Programme. Hazim Timimi led and organized all aspects of data and code management, including the preparation and implementation of the web system used for the 2024 round of global tuberculosis (TB) data collection from 215 countries and areas.

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The main text of the report was written by Katherine Floyd, with contributions from Taghreed Adam, Nimalan Arinaminpathy, Mathieu Bastard, Dennis Falzon, Nebiat Gebreselassie and Takuya Yamanaka. Irwin Law organized the preparation of all figures and tables, which were produced by Mathieu Bastard, Peter Dodd, Nebiat Gebreselassie, Irwin Law, Hazim Timimi and Takuya Yamanaka. Annexes 1, 3 and 5 were prepared by Katherine Floyd; Annex 2 by Hazim Timimi; and Annex 4 by Mathieu Bastard and Katherine Floyd.

The webpages that accompany the report, which provide a large number (>100) of interactive graphics and short commentary text organized according to the standard topics of the report, were prepared by staff from across the WHO Global Tuberculosis Programme. The webpages on TB incidence and mortality were prepared by Nimalan Arinaminpathy, Mathieu Bastard and Katherine Floyd. The webpage on drug-resistant TB was prepared by Mathieu Bastard and Hazim Timimi. The webpage on national TB prevalence surveys was prepared by Katherine Floyd and Irwin Law. The webpages on TB diagnosis and treatment were prepared by Katherine Floyd and Takuya Yamanaka, with contributions from Alexei Korobitsyn, Fuad Mirzayev, Carl-Michael Nathanson and Linh Nhat Nguyen. The webpage on TB prevention and screening was prepared by Annabel Baddeley, Saskia den Boon, Dennis Falzon and Hazim Timimi. The webpages on financing for TB prevention, diagnostic and treatment services were prepared by Taghreed Adam and Takuya Yamanaka, with contributions from Katherine Floyd. The webpages on universal health coverage (UHC) and TB determinants were prepared by Takuya Yamanaka, with contributions from Taghreed Adam, Delia Boccia (WHO consultant), Katherine Floyd and Ernesto Jaramillo. The webpage on TB research and innovation was prepared by Nebiat Gebreselassie and Irwin Law, with contributions from Saskia den Boon, Dennis Falzon, Katherine Floyd, Medea Gegia, Nazir Ismail (WHO consultant), Alexei Korobitsyn, Cecily Miller, Fuad Mirzayev and Matteo Zignol.

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The online technical appendix that explains the methods used to produce estimates of TB disease burden was prepared by Nimalan Arinaminpathy, Mathieu Bastard, Hazim Timimi and Peter Dodd.

The data and other content provided in the mobile app that accompanies the report were prepared by Katherine Floyd, Irwin Law and Hazim Timimi. The app was first developed by the WHO Global Tuberculosis Programme in collaboration with Adappt in 2019 and has subsequently been maintained by Adappt throughout the year and then updated on an annual basis. The report team is very appreciative of the excellent work done by Adappt.

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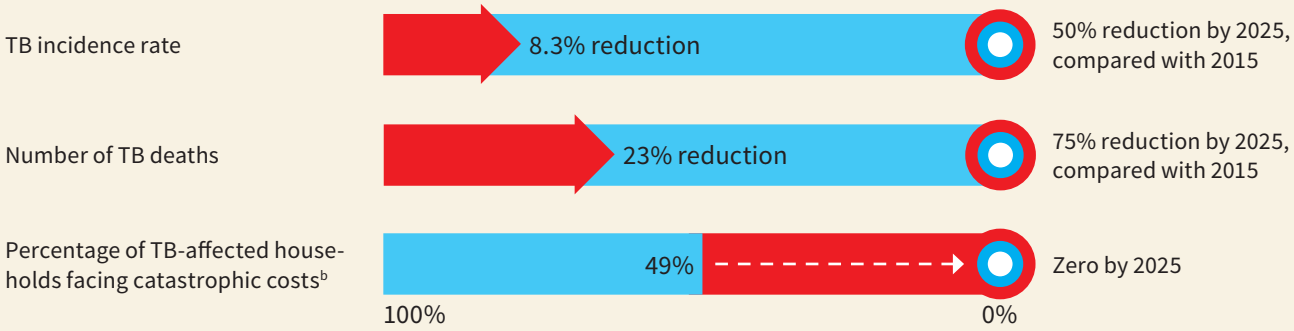
Abbreviations

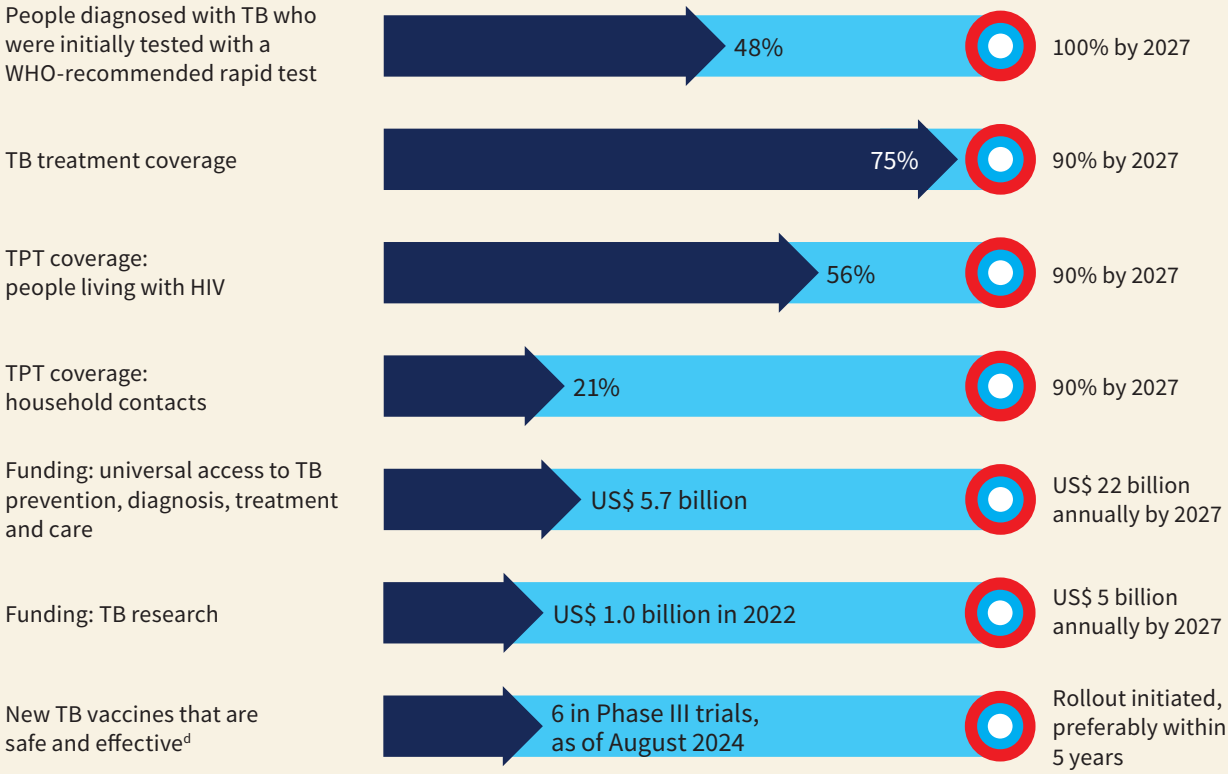
AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
BCG	bacille Calmette-Guérin
BPaLM	bedaquiline, pretomanid, linezolid and moxifloxacin
BRICS	Brazil, the Russian Federation, India, China and South Africa
CFR	case fatality rate
CSV	comma separated value
CI	confidence interval
COVID-19	coronavirus disease 2019
ECDC	European Centre for Disease Prevention and Control
GDP	gross domestic product
GHO	Global health observatory
HBC	high burden country
HIV	human immunodeficiency virus
IGRA	interferon-gamma release assay
IHME	Institute for Health Metrics and Evaluation
LF-LAM	lateral flow urine lipoarabinomannan assay
LMICs	low- and middle-income countries
MAF-TB	multisectoral accountability framework for TB
MDR-TB	multidrug-resistant TB
NTP	national TB programme
OECD	Organisation for Economic Co-operation and Development
PPP	purchasing power parity
PPPR	pandemic preparedness, prevention and response
RR-TB	rifampicin-resistant TB
SCI	service coverage index
SDG	Sustainable Development Goal
SHA	System of Health Accounts
TB	tuberculosis
UHC	universal health coverage
UI	uncertainty interval
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNPD	UN Population Division
VR	vital registration
USAID	United States Agency for International Development
WHO	World Health Organization
WRD	WHO recommended rapid diagnostic test
XDR-TB	extensively drug-resistant TB

Global TB milestones and targets: latest status[a] of progress

End TB Strategy, 2025 milestones



2023 UN high-level meeting on TB, targets[c]



TPT, TB preventive treatment.

[a] This is the end of 2023 for all indicators unless otherwise stated.

[b] This indicator is not the same as the SDG indicator for catastrophic health expenditures. See **Box 3** for further explanation.

[c] There is also a target that all people with TB have access to a health and social benefits package by 2027. Methods to assess progress towards this target are in development.

[d] The length of the arrow represents 1 year (out of five) since the 2023 UN-high level meeting on TB.

1. Introduction

Tuberculosis (TB) is a preventable and usually curable disease. Yet in 2023, TB probably returned to being the world's leading cause of death from a single infectious agent, following 3 years in which it was replaced by coronavirus disease (COVID-19),[1] and caused almost twice as many deaths as HIV/AIDS. More than 10 million people continue to fall ill with TB every year and the number has been rising since 2021. Urgent action is required to end the global TB epidemic by 2030, a goal that has been adopted by all Member States of the United Nations (UN) and the World Health Organization (WHO) *(1, 2)*.

TB is caused by the bacillus *Mycobacterium tuberculosis*, which is spread when people who are sick with TB expel bacteria into the air (e.g. by coughing). About a quarter of the global population is estimated to have been infected with TB *(3)*. Following infection, the risk of developing TB disease is highest in the first 2 years (approximately 5%), after which it is much lower *(4)*.[2] Some people will clear the infection *(5, 6)*. Of the total number of people who develop TB disease each year, about 90% are adults, with more cases among men than women. The disease typically affects the lungs (pulmonary TB) but can affect other sites as well.

Basic facts about TB are provided in **Annex 1**.

Without treatment, the death rate from TB disease is high (close to 50%) *(7)*. With treatments currently recommended by WHO (a course of anti-TB drugs for 4–6 months), about 85% of people with TB can be cured. Regimens of 1–6 months are available to treat TB infection. Universal health coverage (UHC) is necessary to ensure that all people who need treatment for TB disease or infection can access these treatments. The number of people acquiring infection and developing disease (and in turn the number of deaths caused by TB) can also be reduced through multisectoral action to address TB determinants such as poverty, undernutrition, HIV infection, smoking and diabetes.

Some countries have already reduced their burden of TB disease to fewer than 10 cases and less than one death per 100 000 population per year. Research breakthroughs (e.g. a new vaccine) are needed to rapidly reduce the global number of cases and deaths each year to the levels already achieved in these low-burden countries.

Political commitment to ending the TB epidemic has stepped up in recent years. The UN has held two high-level meetings on TB: the first in 2018 *(8)* and the second in 2023. The political declaration at the 2023 meeting reaffirmed existing commitments and targets set in the UN Sustainable Development Goals (SDGs) and the WHO End TB Strategy and included new ones for the period 2023–2027 *(9)*.

WHO has published a global TB report every year since 1997. Its main purpose is to provide a comprehensive and up-to-date assessment of the status of the TB epidemic and progress in the response at global, regional and national levels, in the context of global TB commitments, strategies and targets. This 2024 edition covers six major topics: the burden of TB disease; TB diagnosis and treatment; TB prevention and screening; funding for the TB response; UHC and TB determinants; and TB research.

The report is based primarily on data gathered by WHO from national ministries of health in annual rounds of data collection. In 2024, 193 countries and areas (out of 215) with more than 99% of the world's population and TB cases reported data (**Annex 2**), including all high TB burden countries (**Annex 3**).[3] The WHO mortality database and Global Health Observatory (GHO) as well as databases maintained by other UN agencies and the World Bank are also used. All data and estimates can be downloaded from WHO's online global TB database *(10)*.

The report is accompanied by webpages[4] that include a large number (>100) of graphics in interactive format and an app that contains country, regional and global profiles.

The top findings and messages of the 2024 report are highlighted in **Box 1**.

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[1] The number of deaths from COVID-19 officially reported to WHO in 2023 was 320 000. Estimates adjusted for late reporting as well as underreporting have not yet been produced but are currently considered unlikely to exceed the total for TB. WHO will publish a definitive assessment for 2023 in a future edition of the Global Health Estimates.

[2] For people with a long-established infection, empirical data suggest an annual risk of about 10–20 per 100 000 individuals.

[3] Compared with previous years, data collection was expanded for five topics: TB in prisons, zoonotic TB, diagnostic testing, social protection and community engagement.

[4] There are 15 webpages organized according to the six main topics of the report. There are also five webpages on "featured topics": asymptomatic TB, community and civil society engagement in the TB response, multisectoral accountability in the TB response, TB and pregnancy, and the 2023 national TB inventory study in Indonesia.

Box 1. Top findings and messages in the 2024 report

Ending the global TB epidemic remains a distant goal but there are several positive trends.

The global rise in the number of people falling ill with TB (incident cases) that started during the COVID-19 pandemic has slowed and started to stabilize. The total was 10.8 million (95% uncertainty interval [UI]: 10.1–11.7 million) in 2023, a small increase from 10.7 million in 2022 although still much higher than 10.4 million in 2021 and 10.1 million in 2020.

Most of the global increase in incident cases between 2022 and 2023 reflects population growth. The TB incidence rate (new cases per 100 000 population) in 2023 was 134 (95% UI: 125–145), a very small (0.2%) increase compared with 2022.

Most of the people who develop TB disease each year are in 30 high TB burden countries, which accounted for 87% of the global total in 2023. Five countries accounted for 56% of the worldwide total: India (26%), Indonesia (10%), China (6.8%), the Philippines (6.8%) and Pakistan (6.3%).

In 2023, 55% of people who developed TB were men, 33% were women and 12% were children and young adolescents.

The global number of deaths caused by TB fell in 2023, reinforcing the decline that was achieved in 2022 after 2 years of increases during the worst years of the COVID-19 pandemic (2020 and 2021). TB caused an estimated 1.25 million deaths (95% UI: 1.13–1.37 million) in 2023, including 1.09 million among HIV-negative people and 161 000 among people with HIV.[a] The total was down from best estimates of 1.32 million in 2022, 1.42 million in 2021 and 1.40 million in 2020, and below the pre-pandemic level of 1.34 million in 2019.

Despite this progress, TB has probably returned to being the world's leading cause of death from a single infectious agent (replacing COVID-19).[b]

Globally, the net reduction in the TB incidence rate between 2015 and 2023 was 8.3%, far from the WHO End TB Strategy milestone of a 50% reduction by 2025. The WHO African and European regions have made the most progress (reductions of 24% and 27%, respectively); 79 countries achieved reductions of at least 20%.[c]

The net reduction in the global number of deaths caused by TB between 2015 and 2023 was 23%, almost one third of the way to the WHO End TB Strategy milestone of a 75% reduction by 2025. The WHO African and European regions have made the most progress (reductions of 42% and 38%, respectively); 43 countries achieved reductions of at least 35%.[c]

Reductions in the number of deaths from TB since 2022 and the slowing increase in the TB incidence rate are the result of substantial post-COVID recovery in TB diagnosis and treatment.

A global total of 8.2 million people were reported as newly diagnosed with TB in 2023, up from 7.5 million in 2022 and 7.1 million in 2019 and far above the levels of 5.8 million in 2020 and 6.4 million in 2021. Those newly diagnosed in 2022 and 2023 probably included a sizeable backlog of people who developed TB in previous years, but whose diagnosis and treatment was delayed by COVID-related disruptions.

The global gap between the estimated number of people developing TB (incident cases) and the reported number of people newly diagnosed with TB (notified cases) narrowed to a best estimate of 2.7 million[d] in 2023, down from about 4 million in both 2020 and 2021 and below the pre-pandemic level of 3.2 million in 2019.

Globally in 2023, 175 923 people were diagnosed and treated for multidrug-resistant or rifampicin-resistant[e] TB (MDR/RR-TB); this was 44% of the 400 000 people (95% UI: 360 000–440 000) estimated to have developed MDR/RR-TB in 2023.

The treatment success rate for drug-susceptible TB remains high (at 88%) and has improved to 68% for MDR/RR-TB.

One of the barriers to closing diagnostic and treatment gaps is financial costs faced by people with TB and their households. About 50% face total costs (direct medical expenditures, nonmedical expenditures and indirect costs such as income losses) during diagnosis and treatment that are catastrophic (>20% of annual household income).[f] This is far above the WHO End TB Strategy target of zero. Reducing this burden requires faster progress towards UHC and better levels of social protection.

Progress towards new global targets for 2027 set at the 2023 UN high-level meeting on TB can be summarized as follows:

- Coverage of rapid testing for TB: target 100% of those newly diagnosed; status in 2023, 48%.
- TB treatment coverage: target 90%; status in 2023, 75%.
- Coverage of TB preventive treatment: target 90% among high-risk populations; status in 2023, 21% among household contacts of people diagnosed with TB, 56% among people living with HIV.
- Availability of a new TB vaccine that is safe and effective: target, preferably within five years; status in 2023, six vaccines in Phase III trials.
- Funding for TB prevention, diagnostic and treatment services: target US$ 22 billion; status in 2023, US$ 5.7 billion.[g]
- Funding for TB research: target US$ 5 billion; status in 2022, US$ 1.0 billion.[h]

Ending TB requires that commitments made at the 2023 UN high-level meeting on TB are translated into action.

[a] Deaths from TB among people with HIV are officially classified as deaths from HIV/AIDS.
[b] See footnote 1 on page 1.
[c] This reduction corresponds to the first (2020) milestone of the End TB Strategy (**Box 2**).
[d] The rounded difference between 10.84 million incident cases and 8.16 million notifications of new cases.
[e] Rifampicin is the most powerful first-line anti-TB drug. MDR-TB is defined as resistance to rifampicin and isoniazid.
[f] This indicator is not the same as the SDG indicator for catastrophic health expenditures (**Box 3**).
[g] In constant US$ values for 2023.
[h] The source of this figure is the latest report on funding for TB research published by Treatment Action Group.

2. Global TB commitments, strategy and targets

In 2014 and 2015, all WHO and UN Member States committed to ending the TB epidemic, through their adoption of WHO's End TB Strategy (**Box 2**) and the UN SDGs *(1, 2)*. The strategy included milestones (for 2020 and 2025) and targets (for 2030 and 2035) for large reductions in the TB incidence rate (new cases per 100 000 population per year), the absolute number of deaths caused by TB, and costs faced by people with TB and their households.

Key requirements to reach the milestones and targets were defined within the three pillars of the End TB Strategy (**Box 2**). They included provision of TB prevention, diagnostic and treatment services within the context of progress towards UHC and social protection; multisectoral actions to address broader social and economic determinants of TB; and technological breakthroughs, such as a new TB vaccine.

The third target of the End TB Strategy is that no TB-affected households face costs that are catastrophic.[5] This target was set in recognition of the fact that removal of financial and economic barriers to accessing TB diagnosis and treatment is a prerequisite for achieving the milestones and targets for reductions in TB incidence and TB mortality. "Catastrophic" is defined as total costs (direct medical expenditures, direct non-medical expenditures and indirect costs such as income losses) that sum to more than 20% of annual household income.

Further details about the rationale for the milestones and targets and how they were defined are available elsewhere *(11)*.

Within the SDG monitoring framework, the indicator being used to monitor progress towards ending the TB epidemic is the TB incidence rate.

A global ministerial conference was held in 2017, the outcome of which was the Moscow Declaration *(12)*. This was followed less than a year later by the first-ever UN high-level meeting on TB. Bringing together heads of state and government as well as other leaders, the outcome was a political declaration in which commitments to the SDGs and End TB Strategy were reaffirmed and new ones added *(8)*. Global targets for mobilization of funding and provision of treatment were established for the first time, covering the period 2018–2022. Assessment of the extent to which these targets were achieved was part of WHO's *Global tuberculosis report 2023 (13)*.

A second UN high-level meeting was held in September 2023. The political declaration *(9)* included new commitments and targets for the period 2023–2027 (**Table 1**, **Table 2**).

TABLE 1

Global targets set in 2023 at the second UN high-level meeting on TB

INDICATOR	GLOBAL TARGET
TB treatment coverage (percentage of the estimated number of people who develop TB disease each year who are provided with quality-assured diagnosis and treatment)	90% by 2027 (equivalent to up to 45 million people globally in the 5-year period 2023–2027, including up to 4.5 million children and up to 1.5 million people with drug-resistant TB)
Coverage of TB preventive treatment (percentage of people at high risk of developing TB disease who are provided with TB preventive treatment)	90% by 2027 (equivalent to up to 45 million people globally in the 5-year period 2023–2027, including 30 million household contacts of people with TB and 15 million people living with HIV)
Coverage of rapid diagnostic testing for TB (percentage of those diagnosed with TB who were initially tested with a WHO-recommended rapid molecular test)	100% by 2027
Coverage of health and social benefits package for people with TB	100% by 2027
Availability of new TB vaccines that are safe and effective	Rollout initiated, preferably within 5 years
Annual funding for universal access to quality prevention, diagnosis, treatment and care for TB	US$ 22 billion by 2027, US$ 35 billion by 2030
Annual funding for TB research	US$ 5 billion by 2027

[5] This indicator is not the same as the SDG indicator for catastrophic health expenditures (see **Box 3**).

There are coverage targets for rapid testing to diagnose TB disease, TB treatment, TB preventive treatment and health and social benefits for people with TB. There are funding targets for the delivery of TB-related health services and TB research. There is also a target related to the availability of new TB vaccines that are safe and effective. Most of the targets are for 2027. There is an additional funding target for 2030 while the vaccine target is expressed as "preferably within 5 years".

The funding targets were informed by the Stop TB Partnership's *Global Plan to End TB, 2023–2030 (14)*.

Box 2. The End TB Strategy at a glance

VISION	A WORLD FREE OF TB — zero deaths, disease and suffering due to TB			
GOAL	**END THE GLOBAL TB EPIDEMIC**			
INDICATORS	MILESTONES		TARGETS	
	2020	2025	2030	2035
Percentage reduction in the absolute number of TB deaths[a] (compared with 2015 baseline)	35%	75%	90%	95%
Percentage reduction in the TB incidence rate (compared with 2015 baseline)	20%	50%	80%	90%
Percentage of TB-affected households facing catastrophic total costs due to TB[b] (level in 2015 unknown)	0%	0%	0%	0%

PRINCIPLES

1. Government stewardship and accountability, with monitoring and evaluation
2. Strong coalition with civil society organizations and communities
3. Protection and promotion of human rights, ethics and equity
4. Adaptation of the strategy and targets at country level, with global collaboration

PILLARS AND COMPONENTS

1. INTEGRATED, PATIENT-CENTRED CARE AND PREVENTION

A. Early diagnosis of TB including universal drug-susceptibility testing, and systematic screening of contacts and high-risk groups
B. Treatment of all people with TB including drug-resistant TB, and patient support
C. Collaborative TB/HIV activities, and management of comorbidities
D. Preventive treatment of persons at high risk, and vaccination against TB

2. BOLD POLICIES AND SUPPORTIVE SYSTEMS

E. Political commitment with adequate resources for TB care and prevention
F. Engagement of communities, civil society organizations, and public and private care providers
G. Universal health coverage policy, and regulatory frameworks for case notification, vital registration, quality and rational use of medicines, and infection control
H. Social protection, poverty alleviation and actions on other determinants of TB

3. INTENSIFIED RESEARCH AND INNOVATION

I. Discovery, development and rapid uptake of new tools, interventions and strategies
J. Research to optimize implementation and impact, and promote innovations

[a] This indicator is for the combined total of TB deaths in HIV-negative and HIV-positive people. Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS, with TB as a contributory cause.
[b] This indicator is not the same as the SDG indicator for catastrophic health expenditures. See **Box 3** for further explanation.

TABLE 2

Highlights of commitments and requests at the second UN high-level meeting on TB in 2023

a) Commitments

TOPIC OR THEME	COMMITMENT
Provide comprehensive care to all people with TB	Strengthen the provision of comprehensive care for all people with TB, with particular attention to people who are vulnerable or in vulnerable situations (e.g. people with HIV, people with TB-associated disabilities, older people, migrants, refugees, internally displaced people, and pregnant and lactating women), using specific models of care such as nutritional, mental health and psychosocial support, social protection, rehabilitation and palliative care
	Scale-up comprehensive efforts to close longstanding gaps in the prevention, diagnosis, treatment and care of children
Address the crisis of drug-resistant TB	Work towards the achievement of universal, equitable and affordable access to WHO-recommended diagnostics and drug susceptibility tests, and all-oral shorter-duration treatment regimens for people with drug-resistant TB, complemented by monitoring and management of side-effects, together with care and support to improve treatment outcomes
Build on interlinkages across the global health agendas of TB, UHC and PPPR, to strengthen the TB response	Establish TB services as essential elements of national and global strategies to advance UHC, address antimicrobial resistance and strengthen PPPR
	Integrate systematic screening, prevention, treatment and care of TB, and related health conditions, within primary health care, including community-based health services
	Invest in public health infrastructure and the health workforce
Address TB during health and humanitarian emergencies	Safeguard TB services as essential health services during humanitarian and health emergencies
Strengthen the engagement of civil society and communities affected by TB	Intensify national efforts to create enabling legal and social policy frameworks to combat inequalities, and to eliminate all forms of TB-related stigma, discrimination and other human rights barriers and violations
	Strengthen the meaningful engagement of parliaments, civil society, and TB-affected local communities, including young people and women, in all aspects of the TB response, to ensure equitable and people-centred access to TB services, with increased and sustained investments, especially in community initiatives
Enable and strengthen TB research	Create an enabling environment for TB research and innovation across Member States and partners
	Strengthen research capacity and collaboration through TB research platforms and networks across the public and private sectors, academia and civil society
	Accelerate the research, development and roll-out of safe, effective, affordable and accessible vaccines, preferably within the next 5 years, including through leveraging global collaboration mechanisms and WHO initiatives such as the accelerator council for new TB vaccines
Promote access to affordable medicines	Promote equitable access to affordable, safe, effective and quality medicines, such as generics, vaccines, diagnostics and health technologies, including through the Stop TB Partnership/Global Drug Facility, to ensure availability and access to quality-assured and affordable commodities recommended by WHO
Strengthen multisectoral accountability	Support the WHO multisectoral accountability framework for TB by strengthening high-level multisectoral accountability and review mechanisms, in line with national contexts, defining the roles and responsibilities of relevant sectors and stakeholders with the meaningful engagement of people and communities affected by TB
	Develop and implement ambitious, costed national TB strategic plans or health strategies with a multisectoral approach

b) Requests

TOPIC OR THEME	REQUEST
Role of WHO	WHO is requested to continue providing global leadership to support Member States to build a resilient response to TB as an integral part of the UHC agenda, and to also address the drivers and determinants of the epidemic, including in the context of health and humanitarian emergencies, with multisectoral engagement, the provision of normative guidance and technical support, and through monitoring, reporting and review of progress, and by advancing the TB research and innovation agenda
Report and review progress	The UN Secretary-General, with the support of WHO, is requested to report, as part of his annual SDG report, on the global effort to end TB
	The UN Secretary-General, with the support of WHO, is requested to present a report to the UN General Assembly in 2027, on the progress achieved towards realizing the commitments made in the 2023 political declaration on TB
	Heads of state and government are requested to undertake a comprehensive review of progress at a UN high-level meeting on TB in 2028

HIV: human immunodeficiency virus; PPPR: pandemic preparedness, prevention and response; SDG: Sustainable Development Goal; UHC: universal health coverage; UN: United Nations; WHO: World Health Organization.

3. Main findings and messages

Ending the global TB epidemic remains a distant goal but there are several positive trends following strong post-COVID recovery efforts that continued in 2023. These include:

- the global rise in the number of people falling ill with TB each year has slowed and started to stabilize;
- the global number of people dying from TB each year continues to fall;
- the WHO African and European regions have made good progress towards the 2025 milestones for reductions in the TB incidence rate and the number of deaths caused by TB;
- the globally reported number of people newly diagnosed with TB reached a new high in 2023;
- the treatment success rate for people with drug-susceptible TB has been sustained at a high level and continues to improve for people with drug-resistant TB;
- the coverage of TB preventive treatment has been sustained for people living with HIV and continues to improve for household contacts of people diagnosed with TB.

At the same time, global milestones and targets for reductions in TB disease burden are off-track and other targets set for 2027 at the second UN high-level meeting remain some way off. Wider progress towards UHC and higher levels of social protection, action on TB determinants (e.g. poverty, undernutrition and HIV) and TB research and innovation remain essential.

Accelerating progress towards ending TB requires that commitments made at the second UN high-level meeting on TB in 2023 are translated into action.

Number of people developing TB

Global rise slowing down, starting to stabilize

Globally in 2023, an estimated 10.8 million people (95% uncertainty interval [UI]: 10.1–11.7 million) fell ill with TB (incident cases), a further increase from 10.7 million (95% UI: 10.0–11.5 million) in 2022, 10.4 million (95% UI: 9.7–11.1 million) in 2021 and 10.1 million (95% UI: 9.5–10.7 million) in 2020 (**Fig. 1**). The continued rise reflects the ongoing after-effects of disruptions to TB services during the worst years of the COVID-19 pandemic (2020 and 2021). These persist because of the lag time between more people being infected with TB during disruptions to services and the development (among a small proportion of those infected) of TB disease.[6,7]

The global TB incidence rate (new cases per 100 000 population per year)[8] is estimated to have increased by 4.6% between 2020 and 2023,[9] from 129 (95% UI: 121–136) in 2020 to 134 (95% UI: 125–145) in 2023, following declines of about 2% per year between 2010 and 2020 (**Fig. 1**, right panel).[10] More positively, the rate of increase has slowed considerably (to 0.2% between 2022 and 2023) and appears to be levelling off.

At regional level, trends in TB incidence rates vary (**Fig. 2**). The rate continued to increase in 2023 in two WHO regions: the Americas and the Western Pacific. After 2 years of increases, it fell slightly in the WHO Eastern Mediterranean and South-East Asia regions. In the WHO European Region, the decline up to 2020 flattened out from 2021 to 2023, with a small decline in 2023. In contrast to the other five regions, the TB incidence rate in the WHO African Region has declined every year since 2010.[11]

Geographically, most people who developed TB in 2023 were in the WHO regions of South-East Asia (45%), Africa (24%) and the Western Pacific (17%), with smaller proportions in the Eastern Mediterranean (8.6%), the Americas (3.2%) and Europe (2.1%).[12] The 30 high TB

[6] Country or region-specific models have been used to produce estimates of TB incidence and mortality during the period 2020–2023, for the subset of countries that experienced considerable disruptions to TB diagnosis and treatment in 2020 or 2021 (defined as TB case notifications that fell by 10% or more in either 2020 or 2021). Reductions in notifications were assumed to reflect reductions in access to diagnosis and treatment (and some level of underreporting), causing an increase in the number of people with undiagnosed TB and in turn both an increase in the number of deaths from TB and increased transmission of infection. With a lag time, increases in transmission result in an increase in the number of people developing TB disease (i.e. TB incidence). Further details are provided elsewhere *(13, 15, 16)*.

[7] The major contributors to the global increase between 2020 and 2023 were (in order of the absolute size of their contribution) Indonesia, the Philippines and Myanmar.

[8] The report uses the latest population estimates published by the UN Population Division (see **Annex 2**).

[9] The estimated increase was 2.2% from 2020 to 2021, 2.2% from 2021 to 2022 and 0.2% from 2022 to 2023.

[10] Globally, the TB incidence rate is estimated to have fallen by 22% between 2010 and 2020.

[11] In terms of TB case notifications, disruptions to TB diagnosis and treatment during the COVID-19 pandemic were negligible in the WHO African Region. In some countries, treatment coverage improved in these years.

[12] Regional percentages do not sum to 100 due to rounding.

FIG. 1

Global trends in the estimated number of incident TB cases (left) and the incidence rate (right), 2010–2023

The horizontal dashed line shows the 2025 milestone of the End TB strategy, which is a 50% reduction in the TB incidence rate between 2015 and 2025. Shaded areas represent 95% uncertainty intervals.

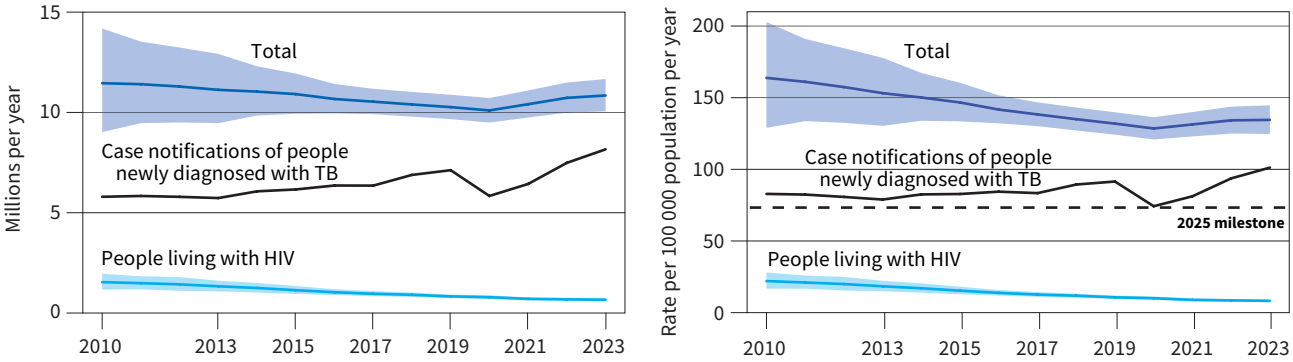


FIG. 2

Trends in estimated TB incidence rates by WHO region, 2010–2023

The overall TB incidence rate is shown in **blue** and the incidence rate among people living with HIV is shown in **light blue**. The **black** solid lines show case notifications of people newly diagnosed with TB, for comparison with estimates of the overall incidence rate. The horizontal dashed line shows the 2025 milestone of the End TB strategy, which is a 50% reduction in the TB incidence rate between 2015 and 2025. Shaded areas represent 95% uncertainty intervals.

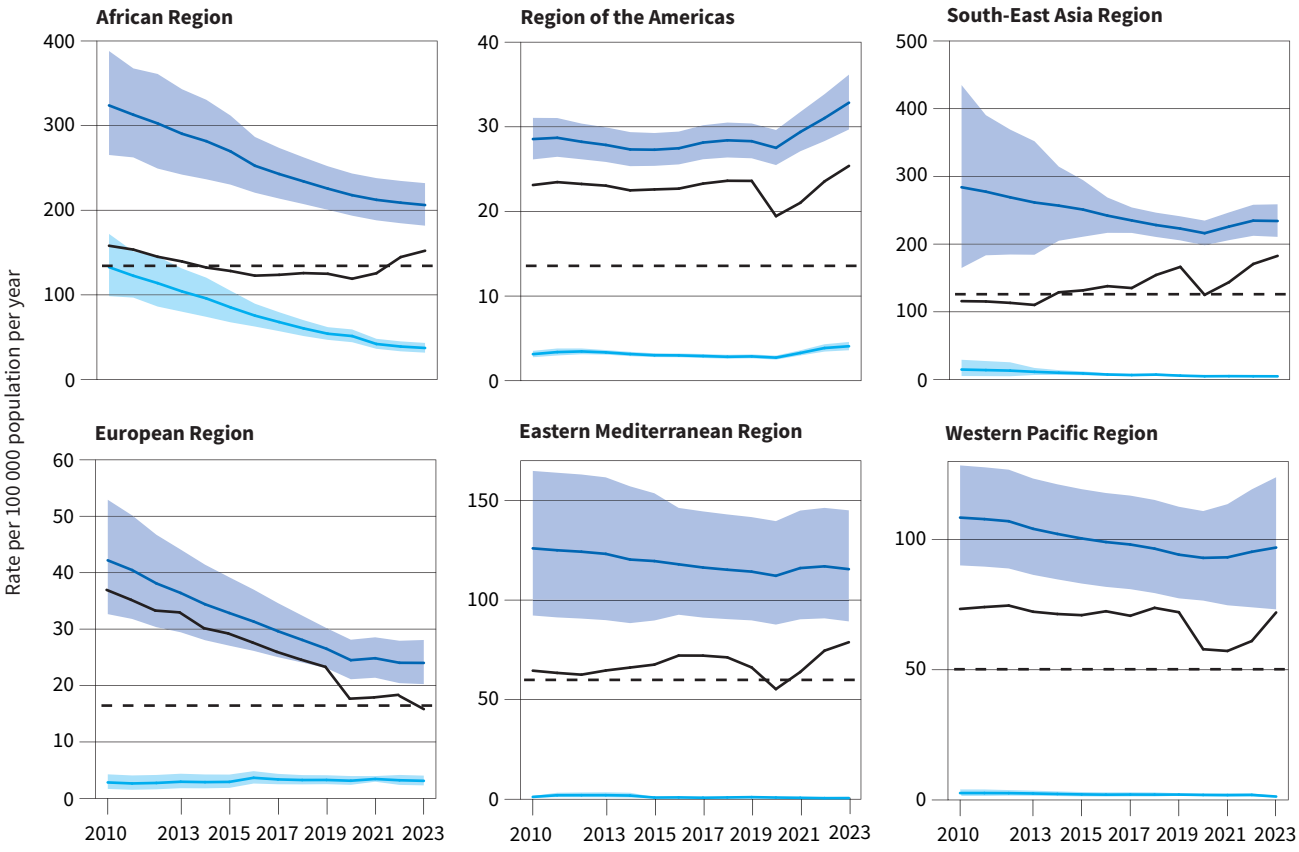
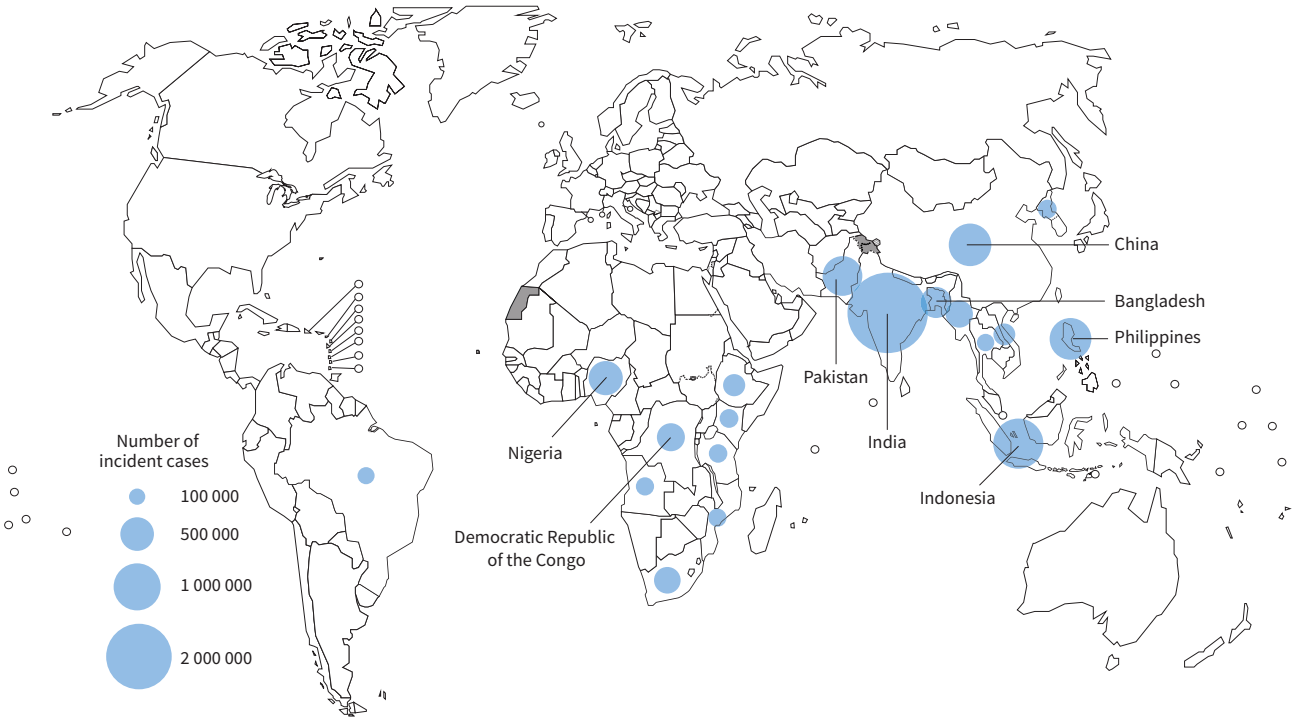


FIG. 3

Estimated number of incident TB cases in 2023, for countries with at least 100 000 incident cases[a]



[a] The labels show the eight countries that accounted for about two thirds of the global number of people estimated to have developed TB in 2023.

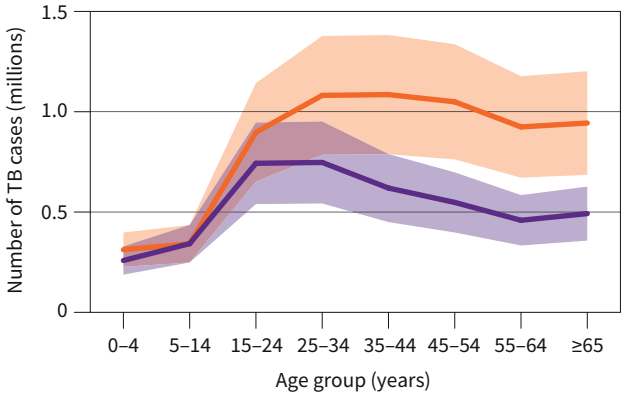
burden countries accounted for 87% of all estimated incident cases worldwide, with eight of these countries (**Fig. 3**) accounting for more than two thirds of the global total: India (26%), Indonesia (10%), China (6.8%), the Philippines (6.8%), Pakistan (6.3%), Nigeria (4.6%), Bangladesh (3.5%) and the Democratic Republic of the Congo (3.1%). The top five countries accounted for 56% of the global total.

TB can affect anyone, regardless of age or sex (**Fig. 4**). The highest burden is in adult men (aged ≥15 years[13]), with an estimated 6.0 million cases (95% UI: 5.5–6.4 million) in 2023, equivalent to 55% of the estimated total. There were an estimated 3.6 million cases (95% UI: 3.3–3.9 million) among adult women (aged ≥15 years), equivalent to 33% of the estimated total; and 1.3 million cases (95% UI: 1.2–1.3 million) among children and young adolescents (aged 0–14 years), equivalent to 12% of the estimated total.[14] The higher share of TB cases among men is consistent with evidence from national TB prevalence surveys, which show that TB disease affects men more than women, and that gaps in case detection and reporting are higher among men *(17)*.

Among all incident cases of TB in 2023, 6.1% were

FIG. 4

Global estimates of TB incidence disaggregated by age group and sex (female in purple; male in orange), 2023



people living with HIV; this proportion has been steadily declining for several years. The proportion of people with a new episode of TB who were living with HIV was highest in countries in the WHO African Region, exceeding 50% in parts of southern Africa.

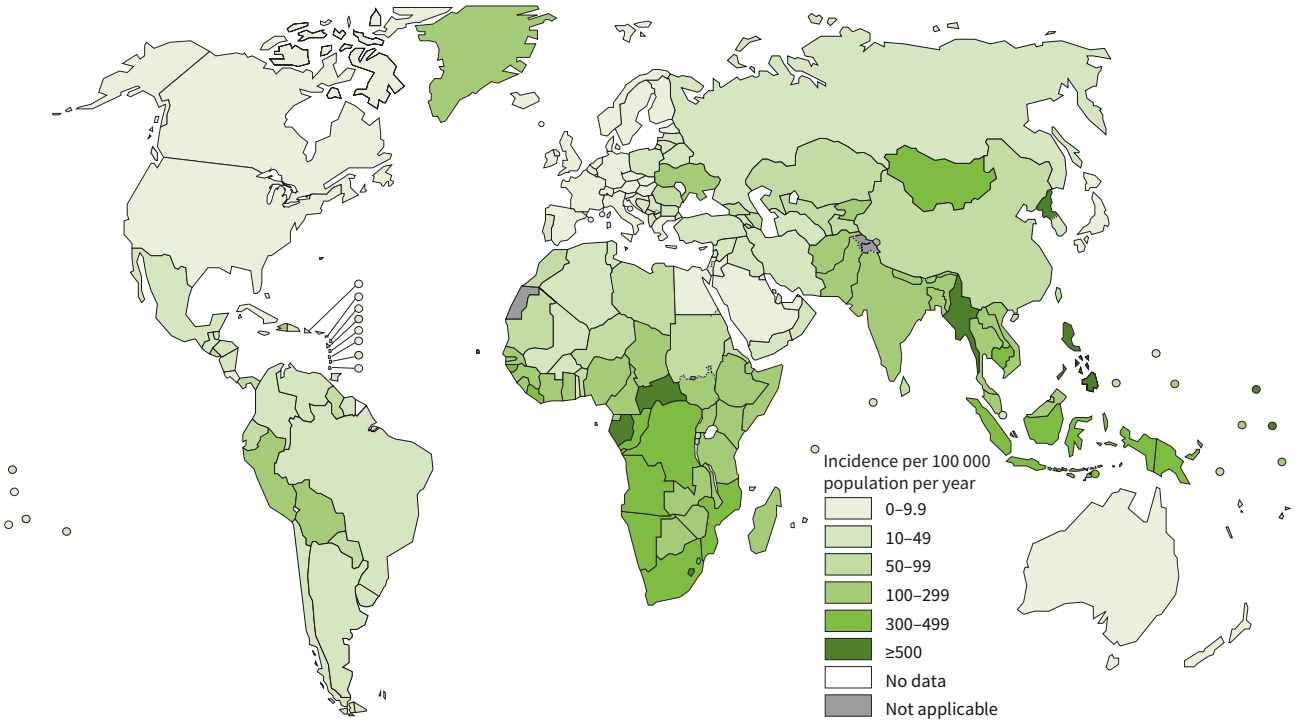
The severity of national TB epidemics – in terms of the number of incident (new) TB cases per 100 000 population per year – varies widely among countries, from less than 10 to more than 500 per year (**Fig. 5**). In 2023, 60 countries had a low incidence of TB (<10 new cases

[13] The age groups for which WHO collects case notification data and produces estimates of disease burden are 0–4, 5–14, 15–24, 25–34, 35–44, 45–54, 55–64 and ≥65 years.

[14] The three numbers do not sum to the overall best estimate of 10.8 million due to rounding.

FIG. 5

Estimated TB incidence rates, 2023



per 100 000 population per year). Most of these countries were in the WHO Region of the Americas and the European Region, with the remainder in the Eastern Mediterranean and Western Pacific regions. There were 150–400 incident cases per 100 000 population in most of the 30 high TB burden countries, and more than 500 in the Central African Republic, the Democratic People's Republic of Korea, Gabon, Lesotho, Myanmar and the Philippines.

Number of people developing drug-resistant TB

Burden stable or falling slowly

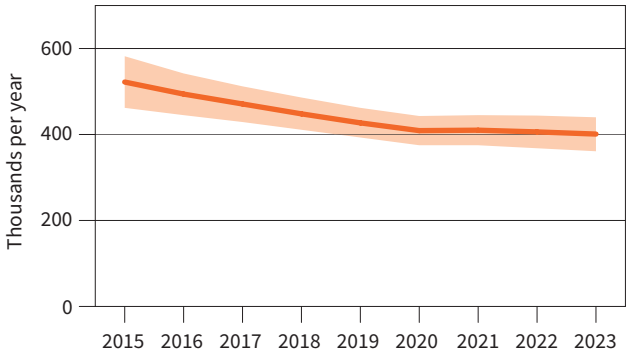
Drug-resistant TB continues to be a public health threat. Resistance to rifampicin – the most effective first-line drug – is of greatest concern. TB that is resistant to rifampicin and isoniazid is defined as multidrug-resistant TB (MDR-TB). Both MDR-TB and rifampicin-resistant TB (RR-TB) require treatment with second-line drugs.

Globally, the estimated annual number of people who developed MDR-TB or RR-TB (MDR/RR-TB) was relatively flat between 2020 and 2023 (**Fig. 6**), after a slow downward trend between 2015 and 2020. The estimated number in 2023 was 400 000 (95% UI: 360 000–440 000).[15] The reason why the number of people developing MDR/RR-TB was relatively stable from 2020 to 2023, in contrast to an estimated rise in the number of people developing TB overall (**Fig. 1**), was that increases in the overall number of people developing TB were offset by an estimated downward trend (since 2015) in the proportion of people with TB who have MDR/RR-TB, particularly among those with a previous history of treatment (**Fig. 7**).

FIG. 6

Global trend in the estimated number of people who developed MDR/RR-TB (incident cases), 2015–2023

The shaded area represents the 95% uncertainty interval.



In 2023, the estimated proportion of people with TB who had MDR/RR-TB was 3.2% (95% UI: 2.5–3.8%) among new cases and 16% (95% UI: 9.0–24%) among those previously treated; the figures in 2015 were 4.1% (95% UI: 3.1–5.0%) and 20% (95% UI: 11–30%) (**Fig. 7**).

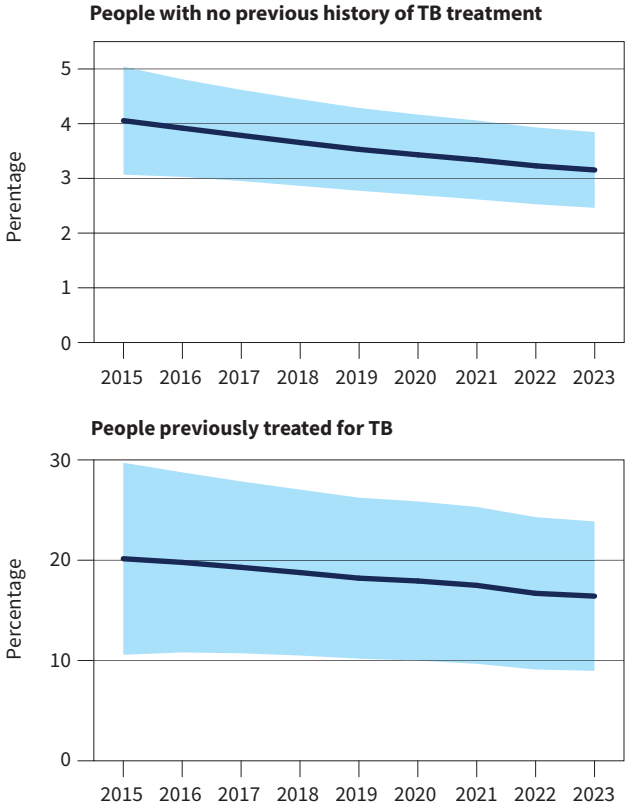
Five countries accounted for more than half of the global number of people estimated to have developed MDR/RR-TB in 2023: India (27%), the Russian Federation

[15] Estimates for 2015–2022 are similar to those published in 2023 *(13)*.

FIG. 7

Global trend in the estimated percentage of people with TB who had MDR/RR-TB, 2015–2023

Shaded areas represent 95% uncertainty intervals.



(7.4%), Indonesia (7.4%), China (7.3%) and the Philippines (7.2%) (**Fig. 8**). The highest proportions of people with TB who had MDR/RR-TB (>50% of previously treated cases in 2023) were found in the Russian Federation and in several countries in Eastern Europe and Central Asia.[16]

Deaths caused by TB

Continued global fall in 2023 after COVID-related increases

The estimated global number of deaths caused by TB fell for a second consecutive year in 2023, continuing the reversal of increases that occurred during the worst period of COVID-related disruptions to TB diagnosis and treatment in 2020 and 2021 (**Fig. 9**).[17]

Globally in 2023, TB caused an estimated 1.25 million deaths (95% UI: 1.13–1.37 million), including 1.09 million among HIV-negative people (95% UI: 0.98–1.20 million) and 161 000 among people with HIV (95% UI: 132 000–193 000).[18] This total was down from estimates of 1.32 million (95% UI: 1.21–1.45 million) in 2022, 1.42 million (95% UI: 1.29–1.55 million) in 2021 and 1.40 million (95% UI: 1.27–1.54 million) in 2020; it was also below the pre-pandemic level of 1.34 million (95% UI: 1.22–1.46 million) in 2019.

COVID-related disruptions are estimated to have resulted in almost 700 000 excess deaths from TB in the 4 years 2020–2023,[19] compared with the number that would have occurred if pre-pandemic trends had been maintained (**Fig. 10**).

Global trends in the number of deaths caused by TB differ by HIV status (**Fig. 9**, **Fig. 11**). Deaths from TB among HIV-negative people drove the overall trend, with a rise in 2020 and 2021 followed by falls in 2022 and 2023, to just below the pre-pandemic level of 1.11 million in 2019 (95% UI: 1.00–1.23 million).[20] Deaths from TB among people with HIV have been falling steadily for many years.

In 2023, TB probably returned to being the world's leading cause of death from a single infectious agent, following 3 years in which it was replaced by COVID-19

[16] Further details are provided in the report webpages (section 1.3).

[17] People with TB who remain undiagnosed and untreated have a higher risk of death than those started on treatment. Disruptions to TB diagnosis and treatment have a more immediate impact on TB mortality and a more delayed impact on TB incidence. Similarly, recoveries in access to TB diagnosis and treatment have a more immediate effect on TB mortality and a more delayed impact on TB incidence.

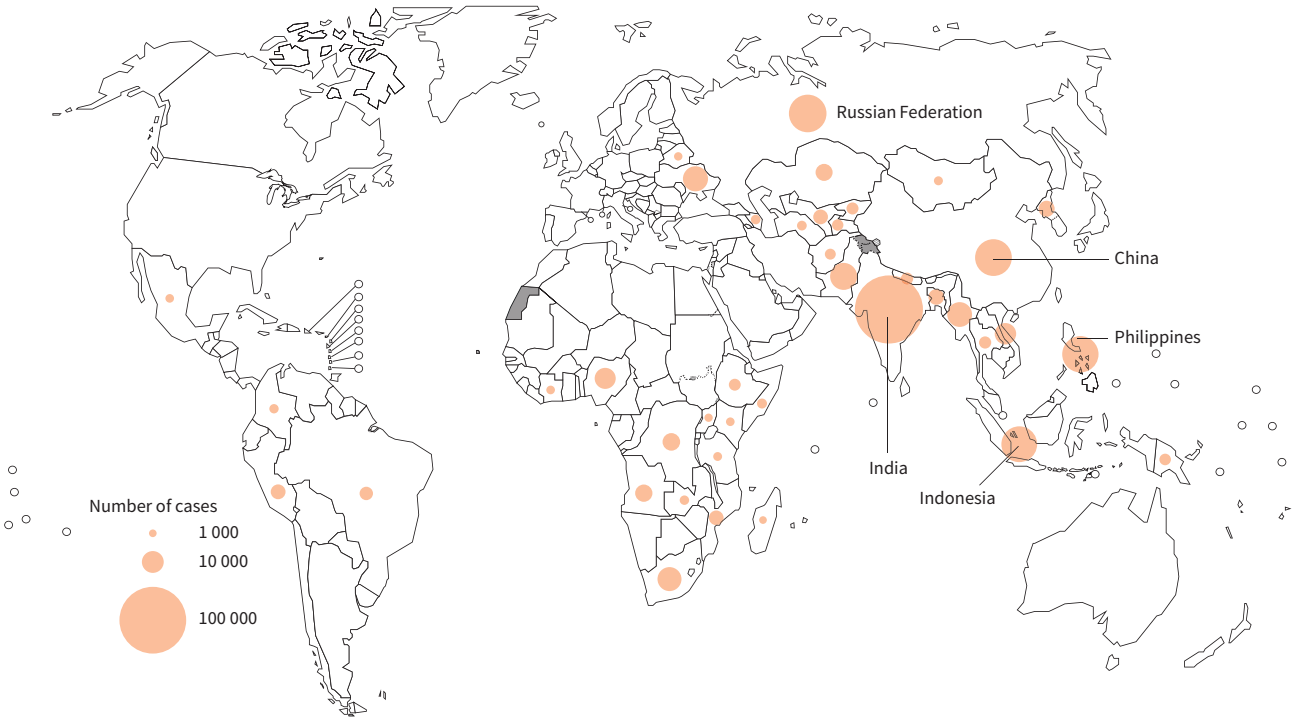
[18] Deaths from TB among people with HIV are officially classified as deaths from HIV/AIDS. Therefore, a clear distinction between deaths among HIV-negative people and those among people with HIV is made in **Fig. 9**, **Fig. 11** and **Fig. 12**.

[19] The estimate is a cumulative total of 676 648 in these 4 years.

[20] The estimated number of deaths caused by TB among HIV-negative people was 1.16 million (95% UI: 1.03–1.29 million) in 2020 and 1.20 million (95% UI: 1.08–1.33 million) in 2021.

FIG. 8

Estimated number of people who developed MDR/RR-TB (incident cases) in 2023, for countries with at least 1000 incident cases[a]

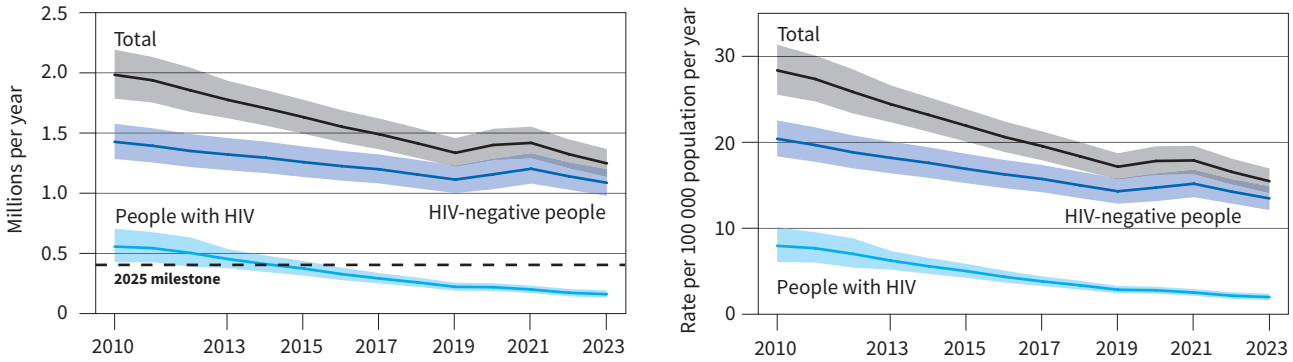


[a] The labels show the five countries that accounted for more than half of the global number of people estimated to have developed MDR/RR-TB in 2023.

FIG. 9

Global trends in the estimated number of deaths caused by TB (left) and the TB mortality rate (right),[a] 2010–2023

The horizontal dashed line shows the 2025 milestone of the End TB strategy, which is a 75% reduction in the total number of TB deaths between 2015 and 2025. Shaded areas represent 95% uncertainty intervals.



[a] Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS, with TB as a contributory cause.

FIG. 10

Estimated number of excess TB deaths during the COVID-19 pandemic and its aftermath, 2020–2023

The **blue** shaded area represents the 95% uncertainty interval of the actual number of deaths estimated to have been caused by TB; the **red** line shows the estimated number of deaths that would have been caused by TB in the absence of the COVID-19 pandemic; the **red** shaded area shows the excess number of deaths caused by TB due to disruptions associated with the COVID-19 pandemic.

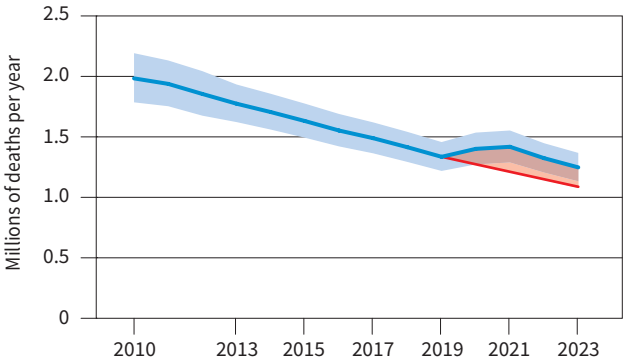
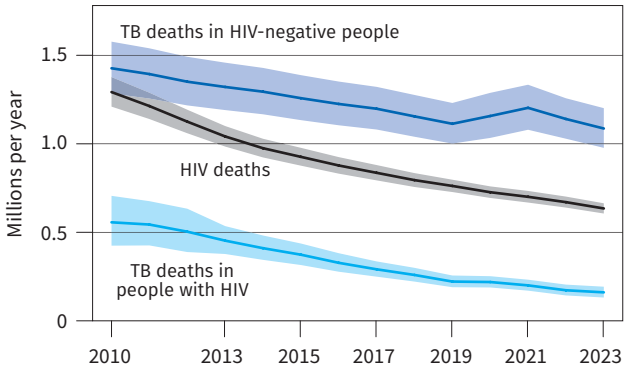


FIG. 11

Global trends in the estimated number of deaths caused by TB and HIV (in millions), 2010–2023[a,b]

Shaded areas represent 95% uncertainty intervals.



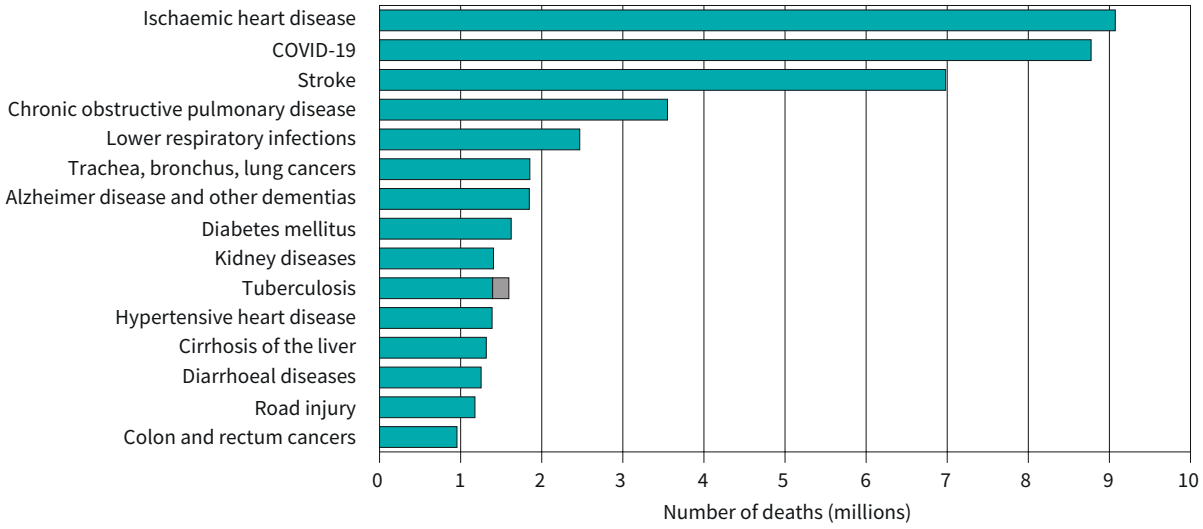
[a] For HIV/AIDS, the latest estimates of the number of deaths in 2023 that have been published by UNAIDS are available at http://www.aids.org/en/ (accessed 12 July 2024). For TB, the estimates for 2023 are those published in this report.

[b] Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS in the International Classification of Diseases.

FIG. 12

Top 15 causes of death worldwide in 2021[a,b]

Deaths from TB among people with HIV are shown in grey.



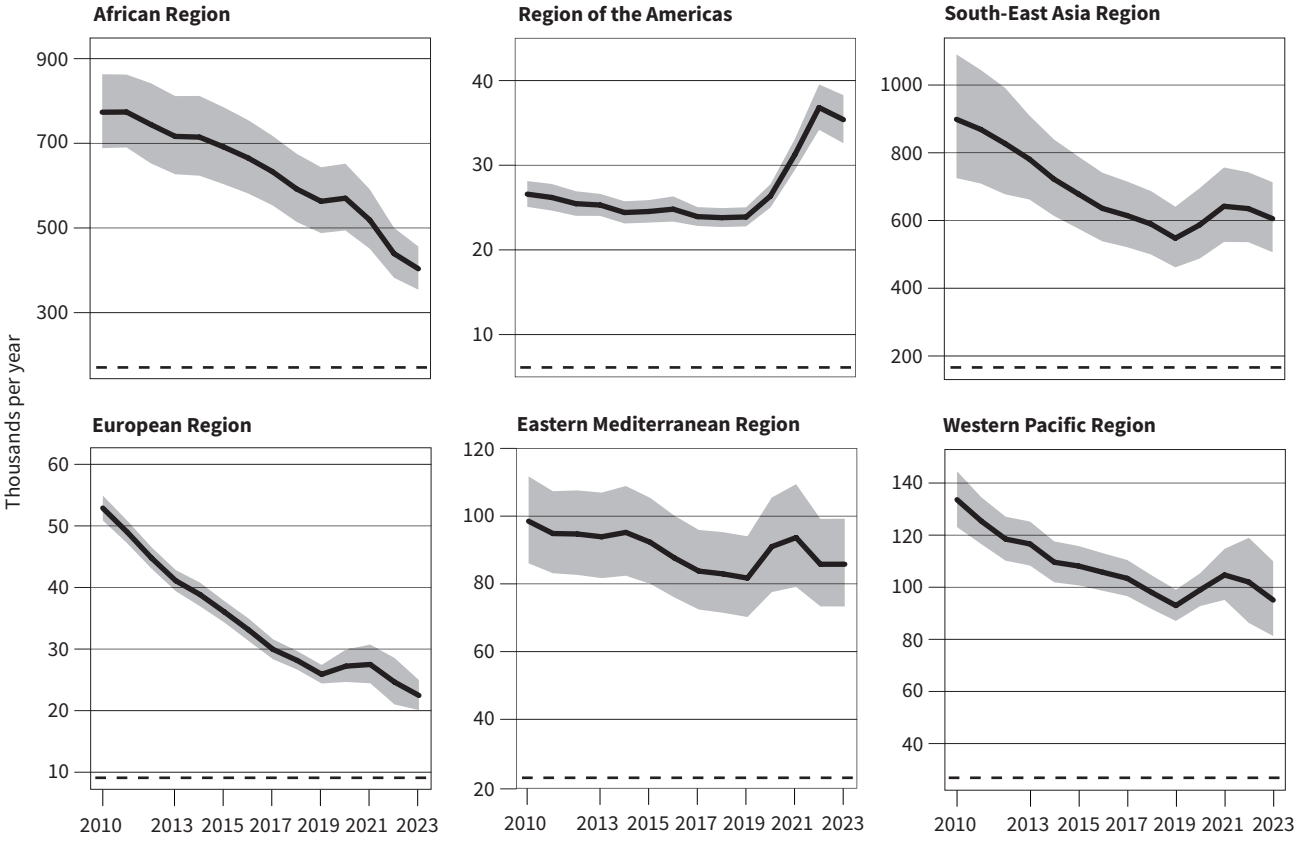
[a] This is the latest year for which estimates for all causes are currently available. See WHO estimates, available at https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death.

[b] Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS in the International Classification of Diseases.

FIG. 13

Trends in the estimated absolute number of TB deaths (in thousands, including deaths among people with HIV[a]) by WHO region, 2010–2023

The horizontal dashed line shows the 2025 milestone of the End TB strategy, which is a 75% reduction in the total number of TB deaths between 2015 and 2025. Shaded areas represent 95% uncertainty intervals.



[a] Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS, with TB as a contributory cause.

(18).[21] The global number of deaths officially classified as caused by TB in 2023 (1.09 million) was almost double the number caused by HIV/AIDS (0.63 million), and TB mortality was much more severely affected by the COVID-19 pandemic than HIV/AIDS (**Fig. 11**). In contrast to TB, deaths from HIV/AIDS continued to decline between 2019 and 2023 *(19)*.

The latest year for which WHO has published estimates of global deaths by cause is 2021 (**Fig. 12**). In that year, TB was the 10th leading cause of death worldwide.

The global pattern of a fall in the absolute number of deaths caused by TB (including those among people with HIV) until 2019, followed by increases in 2020 and 2021 and then declines in 2022 and 2023, was also evident in the WHO European, South-East Asia and Western Pacific regions (**Fig. 13**). In the WHO Eastern Mediterranean Region, an increase in 2020 and 2021 was followed by a decline in 2022 and a flat trend between 2022 and 2023. The estimated number of deaths caused by TB in the WHO Region of the Americas continued to rise until 2022, but fell in 2023. In the WHO African Region, the estimated number of deaths caused by TB has fallen since 2011, except for a small blip in 2020.

Patterns in the 30 high TB burden countries vary, but most had a declining or flat trend between 2022 and 2023.[22]

In 2023, 80% of the global number of deaths caused by TB among HIV-negative people occurred in the WHO African and South-East Asia regions; India alone accounted for 29% of such deaths. The WHO African and South-East Asia regions also accounted for 81% of the combined total number of deaths caused by TB among people with and without HIV; India accounted for 26% of such deaths.

Of the global number of deaths caused by TB among HIV-negative people in 2023, an estimated 568 000 (95%

[21] The number of deaths from COVID-19 officially reported to WHO in 2023 was 320 000. Estimates adjusted for late reporting as well as underreporting have not yet been produced but are currently considered unlikely to exceed the total for TB. WHO will publish a definitive assessment for 2023 in a future edition of the Global Health Estimates.

[22] Time series for each of the 30 high TB burden countries are displayed in graphics provided on the report webpages and in the mobile app.

UI: 511 000–629 000) were adult men (aged ≥15 years) equivalent to 52% of the total; 352 000 (95% UI: 317 000–389 000) were adult women (aged ≥15 years), equivalent to 32% of the total; and 166 000 (95% UI: 149 000–184 000) were children and young adolescents (aged <15 years), equivalent to 15% of the total.[23]

Of the global deaths from TB among people with HIV, an estimated 78 000 (95% UI: 63 000–93 000) were adult men (48% of the total), 58 000 (95% UI: 47 000–70 000) were adult women (36% of the total) and 25 000 (95% UI: 21 000–30 000) were children and young adolescents (16% of the total).

Milestones for reducing TB disease burden

Mostly off track, some success stories

The first End TB Strategy milestones for reductions in TB disease burden were a 35% reduction in the total number of deaths caused by TB (including those among people with HIV[24]) and a 20% reduction in the TB incidence rate by 2020, compared with levels in 2015; the second milestones, for 2025, were a 75% reduction in deaths from TB and a 50% reduction in TB incidence (**Box 2**). The first milestones set for 2020 have not yet been reached either globally or in most WHO regions and countries, and the second milestones are far away in most parts of the world. Reversals of progress during the COVID-19 pandemic have made both milestones much harder to achieve.

Globally, the net reduction in the TB incidence rate from 2015 to 2023 was 8.3% – a long way from the End TB Strategy milestone of a 50% reduction by 2025 (**Fig. 1**, right panel).

At the level of WHO regions, reductions in the TB incidence rate since 2015 vary (**Fig. 2**). The biggest reduction was in the WHO European Region, with a net reduction of 27% by 2023; however, there was no progress between 2019 and 2023. A similar reduction since 2015 was achieved in the WHO African Region, with a 24% decline by 2023. These are the only regions to have surpassed the first milestone of the End TB Strategy. The net decline by 2023 compared with 2015 was relatively small in three of the other WHO regions: the Eastern Mediterranean (3.4%), South-East Asia (6.7%) and the Western Pacific (3.5%). The net increase estimated for the WHO Region of the Americas (+20%) is of particular concern.

Progress in reducing the TB incidence rate at country level is highly variable (**Fig. 14**). By 2023, a total of 79 countries, mostly in the WHO African and European regions, had achieved estimated reductions of more than 20% since 2015, thus surpassing the first milestone of the End TB Strategy. A total of 13 countries are estimated to have achieved reductions of at least 50% between 2015 and 2023, surpassing the 2025 milestone of the End TB Strategy. This includes one high TB burden country (South Africa). Three other high TB burden countries are estimated to be close to reaching the 2025 milestone: Kenya, the United Republic of Tanzania and Zambia. At the other extreme, there are 39 countries where the TB incidence rate in 2023 was estimated to be more than 5% higher than in 2015. Many of these countries are in the WHO Region of the Americas, but they also include four high TB burden countries in Asia: Indonesia, Mongolia, Myanmar and the Philippines.

Globally, the net reduction in the total number of deaths caused by TB between 2015 and 2023 was 23%. Progress achieved up to 2019 (a 19% reduction from 2015 to 2019 and a 33% reduction from 2010 to 2019) was compromised by increases in the number of deaths caused by TB in 2020 and 2021 (**Fig. 9**, left panel).

At regional level, as with reductions in TB incidence rates, progress in achieving reductions in the number of deaths caused by TB since 2015 varies (**Fig. 13**). The biggest reductions between 2015 and 2023 were in the WHO African Region, with a 42% decline by 2023, followed by the WHO European Region with a decline of 38%. These two regions are the only ones that have surpassed the first milestone of the End TB Strategy. Following major reversals of progress in 2020 and 2021, the net decline by 2023 compared with 2015 was modest in three WHO regions: the Eastern Mediterranean (7.0%), South-East Asia (11%) and the Western Pacific (12%). In the WHO Region of the Americas, the estimated number of deaths caused by TB in 2023 was much higher than in 2015 (+44%). Nonetheless, the TB mortality rate remained low: comparable to the WHO European Region and much lower than in the other four WHO regions.[25]

Progress in reducing the number of deaths caused by TB at country level is highly variable (**Fig. 15**). By 2023, a total of 43 countries had reached or surpassed the first milestone of the End TB Strategy, with an estimated reduction of at least 35% since 2015. This included at least one country in every WHO region. Thirteen countries are estimated to have achieved reductions of 50% or more between 2015 and 2023, including six high TB burden countries (Kenya, Mozambique, Nigeria, Uganda, the United Republic of Tanzania and Zambia) and one of the three global TB watchlist countries (the Russian Federation).[26] At the other extreme, there are 71 countries where the number of deaths caused by TB in

[23] Percentages do not sum to 100 due to rounding.

[24] Officially classified as deaths from HIV/AIDS, with TB as a contributory cause.

[25] The TB mortality rate among HIV-negative people was 2.4 per 100 000 population in 2023, compared with 24 in the WHO African Region, 1.7 in the European Region, 10 in the Eastern Mediterranean Region, 28 in the South-East Asia Region and 4.5 in the Western Pacific Region.

[26] Alongside the list of 30 high TB burden countries for 2021–2025, WHO established a global TB watchlist (**Annex 3**). The watchlist comprises the three countries that transitioned out of the previous list for 2016–2020, which warrant continued global attention: Cambodia, the Russian Federation and Zimbabwe.

FIG. 14

Change (%) in estimated TB incidence (new cases per 100 000 population), 2023 compared with 2015

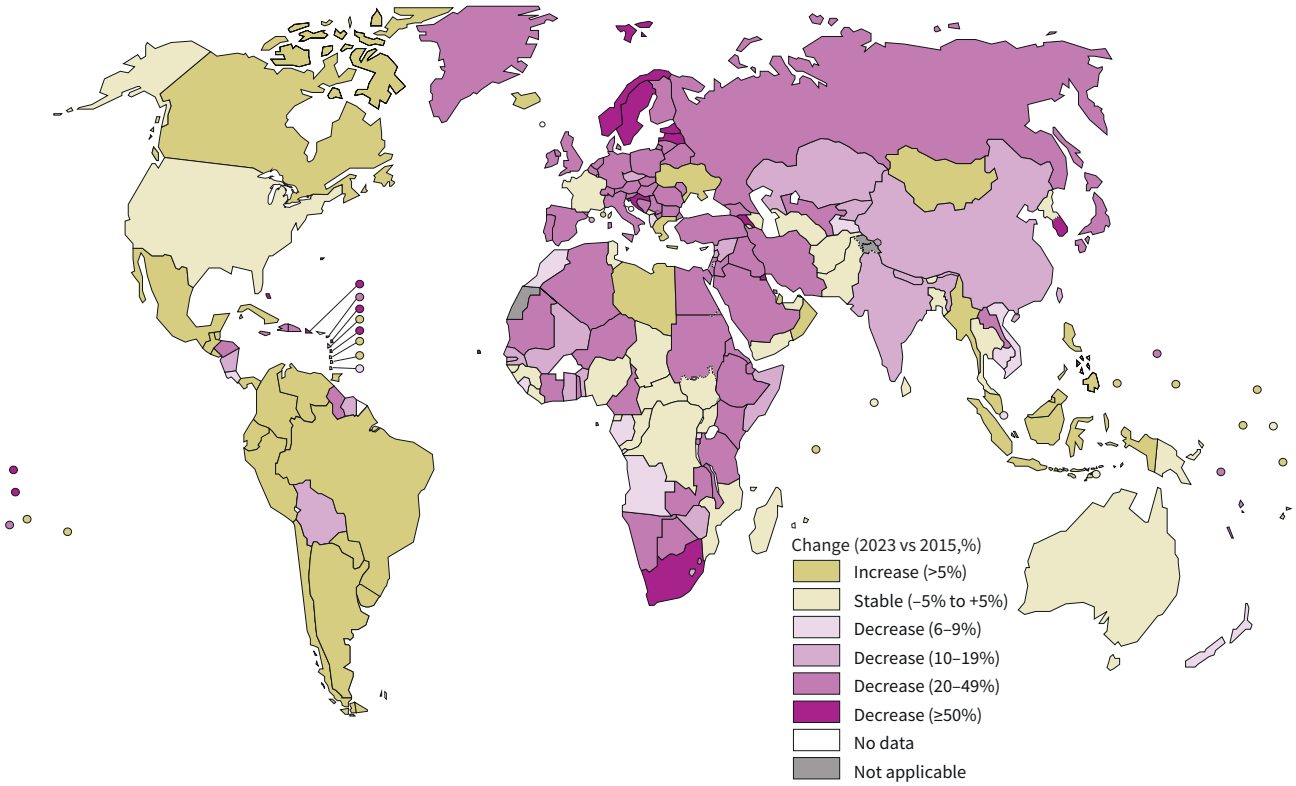
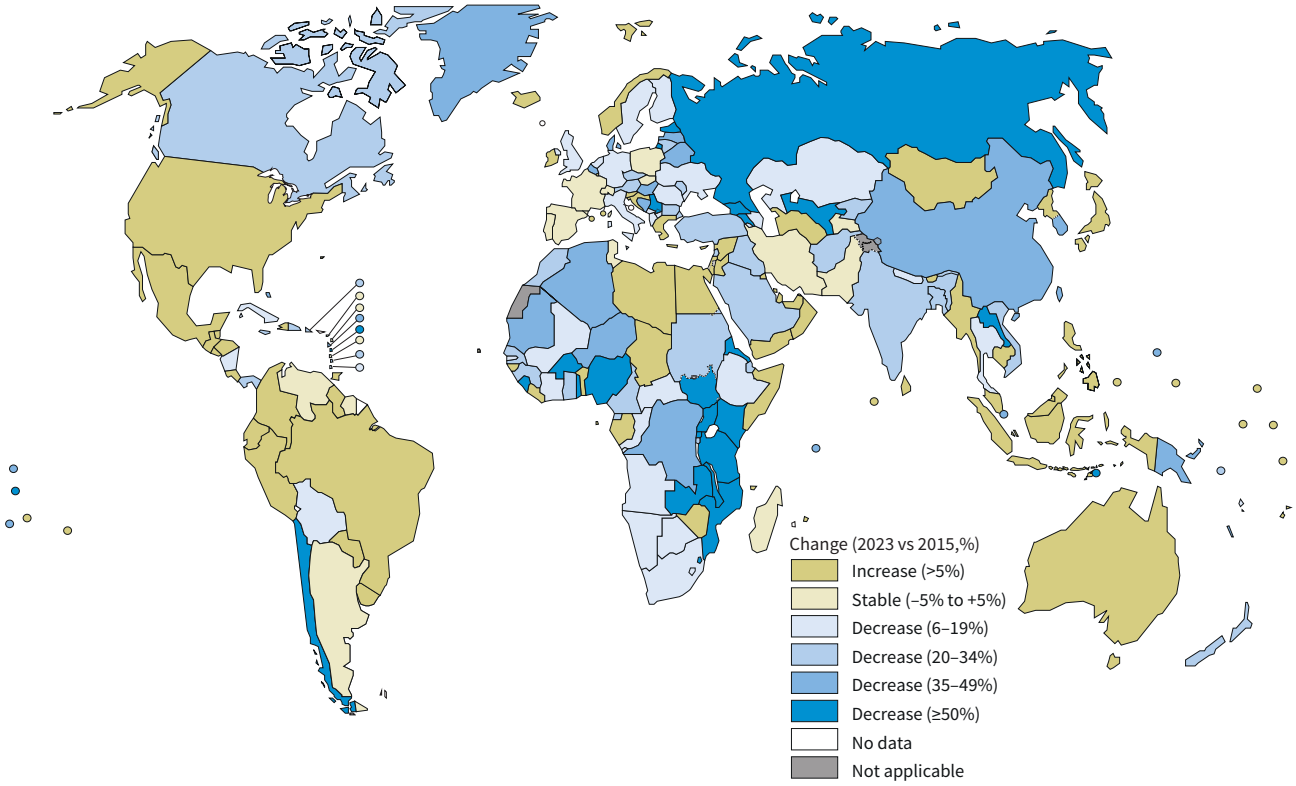


FIG. 15

Change (%) in the estimated number of deaths caused by TB (among HIV-negative people and people with HIV), 2023 compared with 2015



2023 was more than 5% above the level of 2015, most noticeably in the WHO Region of the Americas.

TB incidence and deaths beyond 2023

Global rise in incidence rate may reverse in 2024

Globally, the annual rate of increase in the TB incidence rate slowed between 2022 and 2023, to 0.2%. This was down from 2.2% from 2020–2021 and 2021–2022. If the recovery in the number of people being diagnosed and treated in 2022 and 2023 (see below) is sustained, then at global level the TB incidence rate may stabilize or start to fall in 2024, and the number of deaths caused by TB should continue to fall.

At country level, returning to pre-COVID downward trends in the TB incidence rate is most challenging in the countries that experienced the biggest reductions in the number of people newly diagnosed and treated for TB in 2020 and 2021. Of these, the two that have the biggest influence on global trends are Indonesia and the Philippines. Both countries achieved impressive recoveries in 2022 and 2023, which have already moderated upward trends in the number of people developing TB and the number of deaths caused by TB.

Estimation of TB disease burden

New direct measurements needed

Estimating TB disease burden during the COVID-19 pandemic and its aftermath is difficult. For 49 countries that experienced disruptions to TB diagnosis and treatment in 2020 or 2021, estimates for the period 2020–2023 have been produced using country- and region-specific dynamic models, which were calibrated to estimates for the pre-pandemic period *(13, 15, 16)*.[27] Data sources used to produce estimates of TB incidence in the period 2010–2019 include results from population-based surveys of the prevalence of TB disease (used for 29 countries that account for about two thirds of global TB incidence), results from national TB inventory studies (used for 10 countries that collectively account for about 17% of global TB incidence)[28] and case notification data (available for all countries). The main data source used to produce estimates of TB mortality in the period 2010–2019 is cause-of-death data from national or sample vital registration (VR) systems or mortality surveys, which are available for 123 countries that account for about 60% of the global number of deaths caused by TB among HIV-negative people.[29]

For this report, there were only three high TB burden or global TB watchlist countries for which data on the number of TB deaths in the period 2020–2023 were available from national VR systems and shared with WHO: Brazil, China and the Russian Federation.

There are only three countries in which a national TB prevalence survey has been completed since 2019: Cambodia, India and Timor-Leste. The survey in India was completed in 2021 and results were among the key inputs to the estimates of incidence published in this report. The field operations of the survey in Cambodia were completed in July 2024; once the final results are available, they will be used to update estimates produced for this report (**Annex 4**).

New national population-based surveys of TB disease, national TB inventory studies and up-to-date cause-of-death data from national or sample VR systems of high quality and coverage are needed for more accurate burden estimation in the wake of the COVID-19 pandemic. An excellent example is the second national TB inventory study that was implemented in Indonesia in 2023.[30] The results show a big reduction in the level of underreporting of people newly diagnosed with TB compared with the first study in 2017; estimates of TB incidence in 2023 based on use of capture–recapture methods are consistent with model-based estimates.[31] National TB inventory studies are being planned in the Philippines and Viet Nam.

As of September 2024, there were 13 countries actively interested in implementing a national TB prevalence survey: Bangladesh, Botswana, Ethiopia, Ghana, Indonesia, Malawi, Nigeria, Pakistan, Thailand, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe.[32]

TB case notifications

Further rebound to new historic high in 2023

Globally in 2023, 8.2 million people were newly diagnosed with TB and officially notified as a TB case. This is the highest number for a single year since WHO started to compile data from all countries and areas in the mid-1990s, up from the previous record of 7.5 million in 2022 and 15% higher than the pre-pandemic level of 7.1 million in 2019 (**Fig. 16**). These 2 years of record levels of TB case notifications follow 2 years of serious COVID-related disruptions to TB-related health services, when the reported numbers of people newly diagnosed with TB fell considerably below pre-pandemic levels, most noticeably in 2020 (with a global reduction of 18%, to 5.8 million) before a partial recovery in 2021 (to 6.4 million).

The historically high numbers in 2022 and 2023 show that there has been a strong global recovery in the provision of and access to TB diagnosis and treatment.

[27] These methods were explained in more detail in the previous two editions of this report *(13, 16)*; see in particular Box 3 and Box 4 of these reports, respectively.

[28] These measure the level of underreporting of people diagnosed with TB in official TB case notification data; if certain conditions are met, capture–recapture methods can be used to estimate TB incidence.

[29] Further details about the data sources and analytical methods used to produce estimates of TB incidence and mortality are provided in the report webpages (section 1.1 and section 1.2), and in the technical appendix.

[30] For further details, see the "featured topic" on the inventory study in Indonesia in the report webpages.

[31] Once results are officially published, they will be used as a direct input to estimates of TB incidence (**Annex 4**).

[32] Further details are provided in the report webpages (section 1.4).

It is likely that they also reflect two other factors: the diagnosis of a backlog of people who developed TB in previous years but whose diagnosis was delayed by COVID-related disruptions, and an estimated increase in the overall number of people developing TB disease (**Fig. 1**).

At the level of WHO regions, trends in TB case notifications before, during and in the aftermath of the COVID-19 pandemic vary (**Fig. 17**).

The pattern in the WHO South-East Asia Region is very similar to the global trend, with a big reduction (of 24%) between 2019 and 2020 followed by a partial recovery in 2021 and then a strong rebound to above the pre-COVID level in 2022–2023; indeed, it is this region that drove the trend at global level. There were similar patterns in the WHO Eastern Mediterranean Region (mostly influenced by trends in Pakistan) and the Region of the Americas.

In the WHO European Region, notifications fell at a rate above the historic trend in 2020, increased in 2021 (probably representing some backlog from 2020) and then returned to a downward trend in 2022–2023.

In the WHO Western Pacific Region, case notifications in 2023 recovered to the 2019 level, following a big drop in 2020–2021. The recovery in 2023 in the Western Pacific Region was driven by China and the Philippines,

FIG. 16

Global trend in case notifications of people newly diagnosed with TB (black) and the estimated number of incident TB cases (green), 2010–2023

The shaded area represents the 95% uncertainty interval.

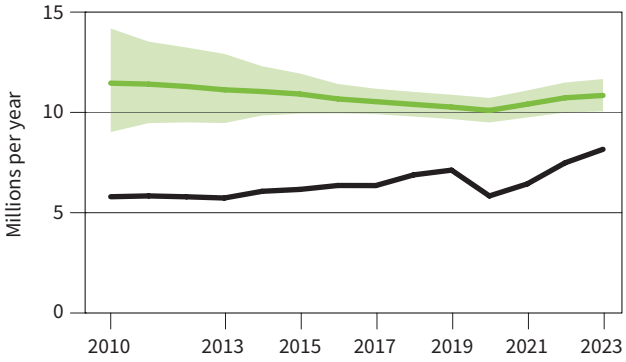
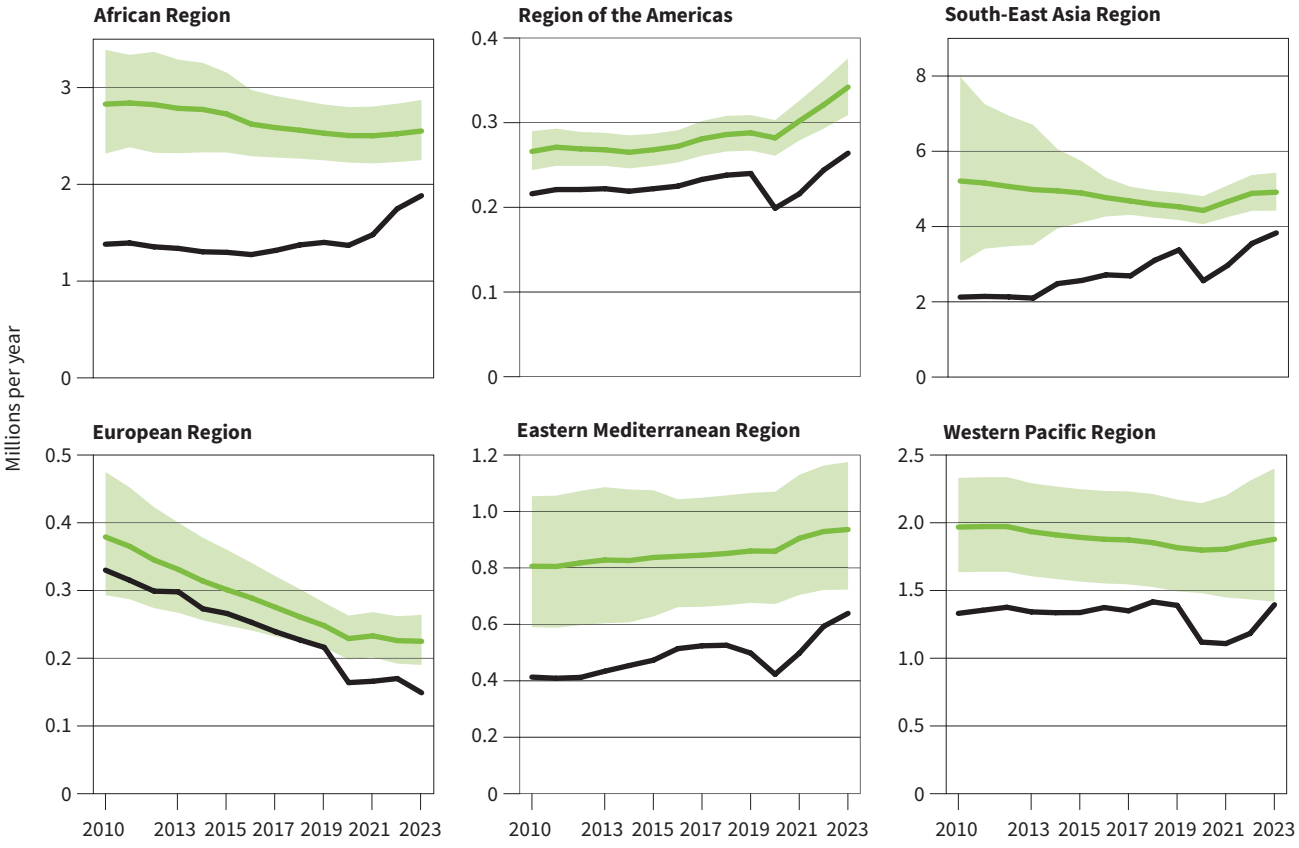


FIG. 17

Regional trends in case notifications of people newly diagnosed with TB (black) and the estimated number of incident TB cases (green), 2010–2023

Shaded areas represent 95% uncertainty intervals.



which together accounted for 81% of total notifications in the region in the 5-year period 2019–2023.

It is striking that in the WHO African Region, TB case notifications increased throughout the pandemic and its aftermath; the total in 2023 was 34% above the level of 2019. This suggests that any COVID-related disruptions had no or limited impact on TB case detection.

By 2023, TB case notifications in most of the 30 high TB burden and three global TB watchlist countries (**Annex 3**) had recovered to the pre-COVID level or beyond. The exceptions were Angola, Lesotho, Liberia, Mongolia, Myanmar, Thailand and Zimbabwe.[33]

The two countries that made the biggest contributions to the global rebound in the reported number of people newly diagnosed with TB in 2022 and 2023 were India and Indonesia, which together accounted for 45% of the increase between 2021 and 2023.[34] Three other countries also made major contributions to the global increase between 2021 and 2023: the Philippines, Nigeria and Pakistan (15%, 9.3% and 7.8% of the global increase, respectively).

Diagnostic testing for TB

Bacteriological confirmation and use of rapid tests need to increase

An essential step in the pathway of TB care is rapid and accurate diagnostic testing. Since 2011, rapid molecular tests have transformed the TB diagnostic landscape, which previously relied upon more traditional microscopy and culture methods.

People diagnosed with TB using rapid molecular tests recommended by WHO *(20)*,[35] lateral flow urine lipoarabinomannan (LF-LAM) assays, sputum smear microscopy or culture are defined as "bacteriologically confirmed" cases of TB *(21)*. The microbiological detection of TB is critical because it allows people to be correctly diagnosed and ensures that the most effective treatment regimen (depending on the pattern of drug resistance) can be selected as early as possible. People diagnosed with TB in the absence of bacteriological confirmation are classified as "clinically diagnosed" cases of TB.

In many countries, there is a need to increase the percentage of people diagnosed with pulmonary TB based on bacteriological confirmation.

Of the 6.9 million people diagnosed with pulmonary TB worldwide in 2023, 62% were bacteriologically confirmed (**Fig. 18**), similar to 2022 (63%), following a steady improvement from 55% in 2018.

Among the six WHO regions, there were improvements between 2020 and 2023 in the African Region (from 65% to 69%) and the Region of the Americas (from 77% to 81%); in other regions, levels of bacteriological confirmation were either relatively stable or fell slightly (**Fig. 18**). The highest levels of bacteriological confirmation were in high-income countries (median in 2023, 86%), where there is wide access to the most sensitive diagnostic tests.

The levels of bacteriological confirmation already achieved in the WHO Region of the Americas and in high-income countries show what is feasible with currently available TB diagnostics. Efforts to reach these levels, particularly through expanded use of rapid tests, are required elsewhere.[36]

The use of rapid tests is growing but remains much too limited and falls far short of the 100% coverage target set for 2027 (**Fig. 19**, **Table 1**).

Globally in 2023, a WHO-recommended rapid diagnostic test (WRD) was used as the initial test for 48% (3.9 million) of the 8.2 million people newly diagnosed with TB in 2023, a slight improvement from 47% (3.5/7.5 million) in 2022 and up from 38% (2.5/6.4 million) in 2021.

There was substantial variation in the coverage of rapid testing among regions and countries in 2023 (**Fig. 19**, **Fig. 20**). Among WHO regions, the best level of coverage was achieved in the European Region (78%) and the lowest was in the South-East Asia Region (39%). At country level, 68 countries achieved levels of at least 80% in 2023, but coverage was less than 20% in 25 countries. Among the 49 countries in one of the three global lists of high burden countries (for TB, HIV-associated TB and MDR/RR-TB),[37] 31 reported that a WRD had been used as the initial test for more than half of people newly diagnosed with TB in 2023; this was unchanged from 2022, but up from 27 in 2021 and 21 in 2020.

Testing for HIV among people diagnosed with TB

High levels of coverage sustained

The global coverage of HIV testing among people diagnosed with TB remained high in 2023, at 80%. This was the same level as in 2022, but an increase from 76% in 2021 and 73% in 2020.

At regional level, the highest percentages were achieved in the WHO African Region (90%) and the European Region (94%). In 99 countries or areas, at least 90% of people diagnosed with TB knew their HIV status; this included 31 of the 47 countries in the WHO African Region, where the burden of HIV-associated TB is highest.

Worldwide in 2023, a total of 436 805 cases of TB among people living with HIV were notified, equivalent

[33] Further details are provided in the report webpages (section 2.1).

[34] Previously, these two countries were also the main contributors to the large global increase in TB case notifications that occurred between 2013 and 2019.

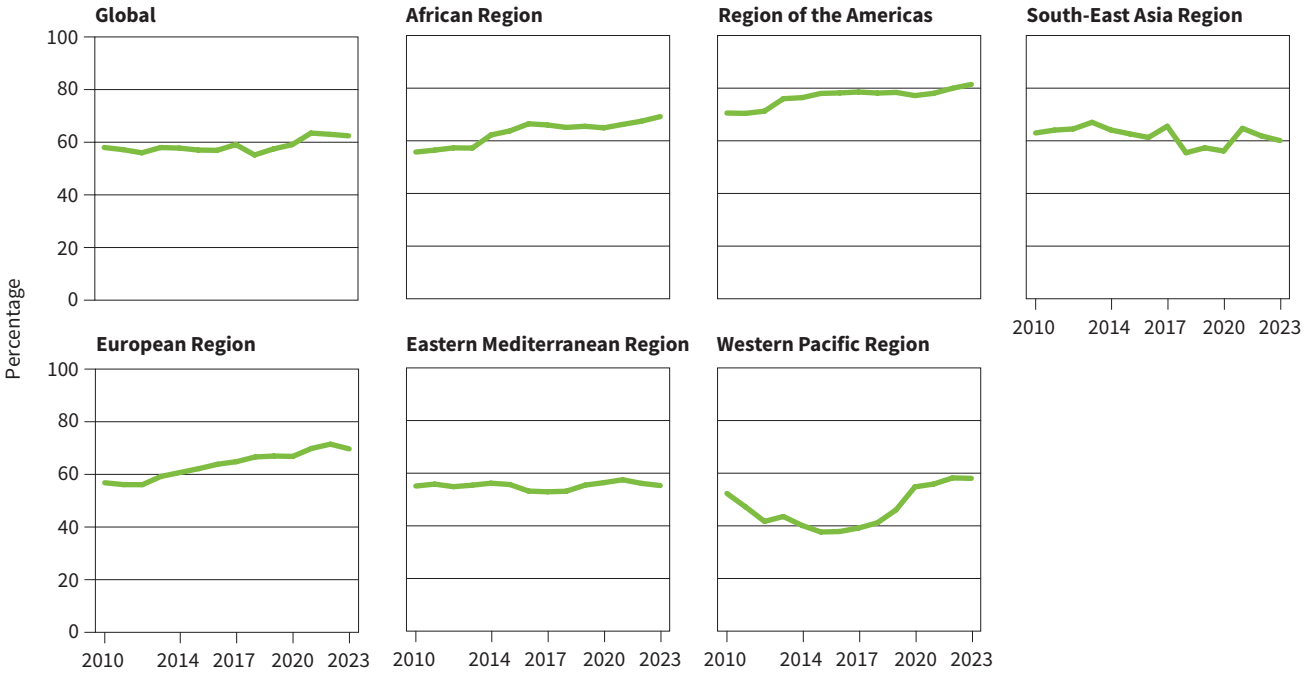
[35] To facilitate implementation of WHO guidelines, WHO also publishes operational handbooks. More recently, WHO has developed online courses that are designed for health care workers and people working with national TB programmes (NTPs). The courses are free of charge and can be accessed via the End TB channel in OpenWHO and the WHO Academy.

[36] Further details (e.g. for individual countries) are provided in the report webpages (section 2.2) and mobile app.

[37] See **Annex 3**.

FIG. 18

Percentage of people newly diagnosed with pulmonary TB who were bacteriologically confirmed, globally and for WHO regions,[a] 2010–2023



[a] Data are for notified cases. The calculation for years prior to 2013 is based on smear results, except for the European Region where data on confirmation by culture were also available for the period 2010–2012.

FIG. 19

Percentage of people newly diagnosed with TB who were initially tested with a WHO-recommended diagnostic rapid test (WRD), globally and for WHO regions, 2015–2023

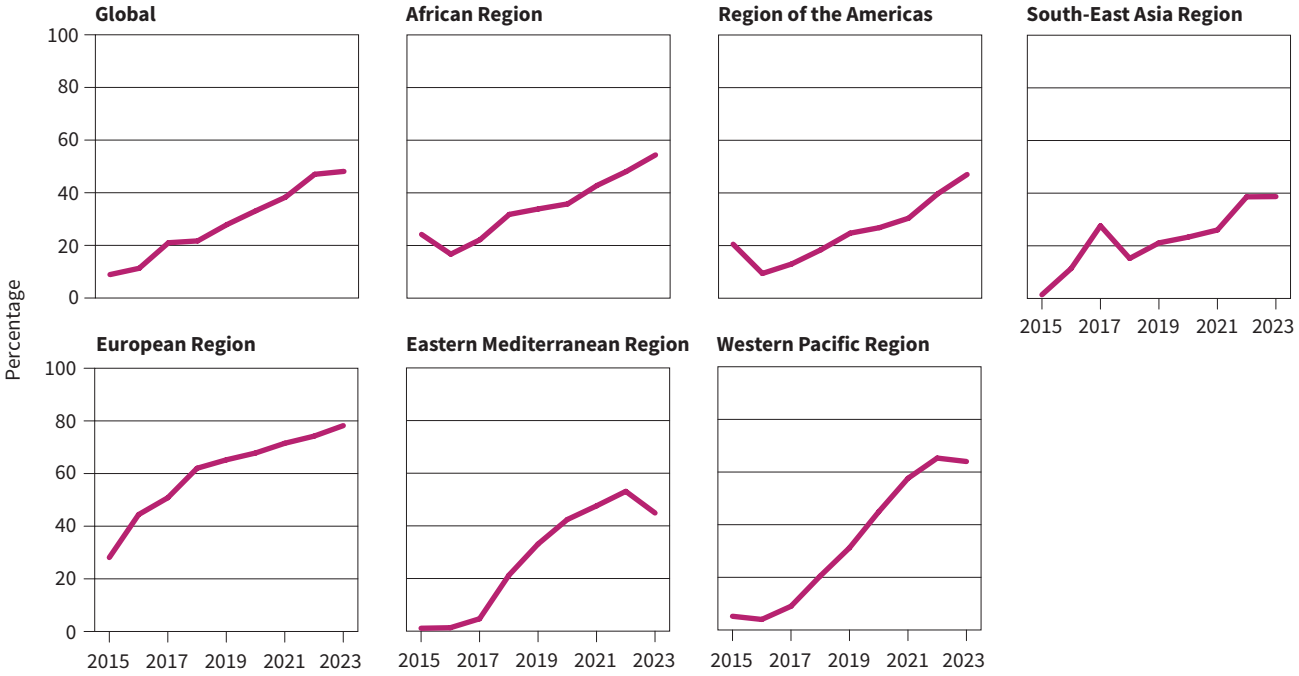
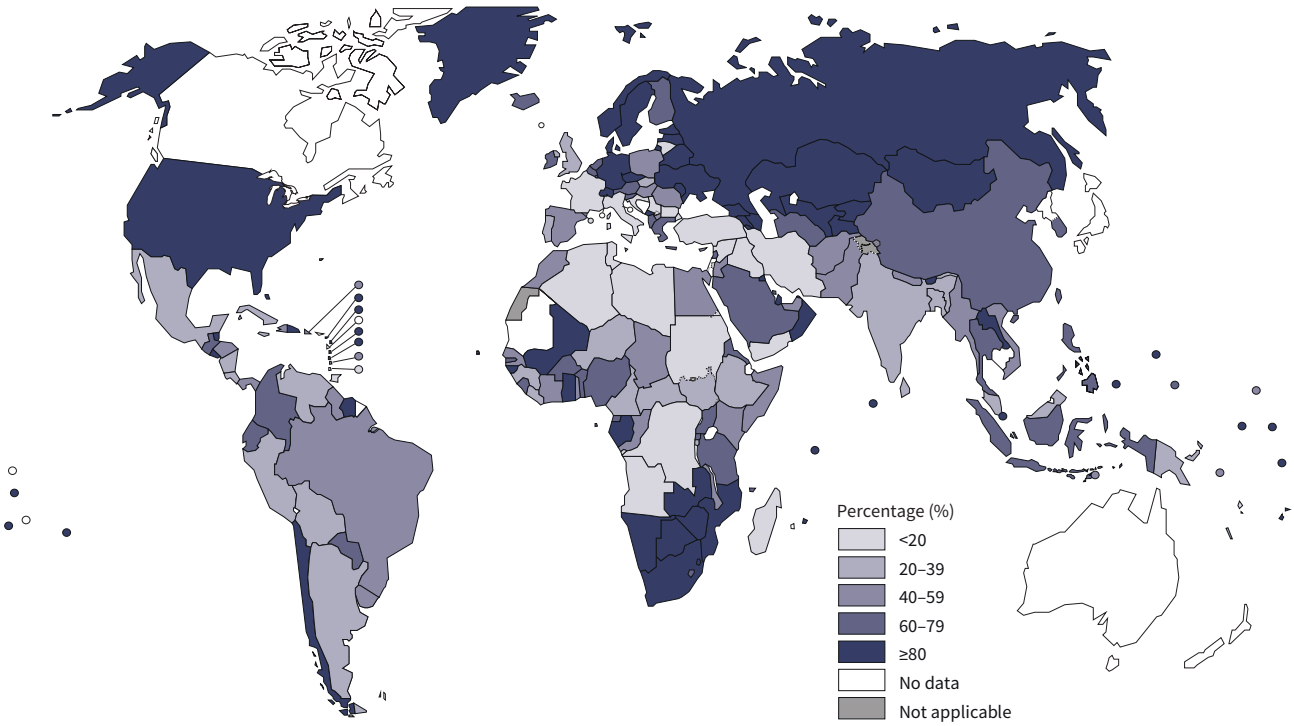


FIG. 20

Percentage of people newly diagnosed with TB who were initially tested with a WHO-recommended rapid diagnostic test (WRD), by country, 2023



to 6.8% of the 6.4 million people newly diagnosed with TB who had an HIV test result. Overall, the percentage of people newly diagnosed with TB who had an HIV-positive test result has fallen globally over the past 10 years.

TB treatment coverage

Post-COVID recovery but sizeable gaps remain

The 2025 milestone and 2030/2035 targets of the End TB Strategy can only be achieved if everyone who develops TB disease is promptly diagnosed and then treated with drug regimens recommended by WHO *(22, 23)*.[38]

There is still a sizeable gap between the estimated number of people who develop TB each year (incident cases) and the number of people newly diagnosed with TB and officially reported as a TB case (**Fig. 16**, **Fig. 17**). This reflects both underdiagnosis of people with TB and underreporting of people diagnosed with TB to national authorities. At global level in 2023, the best estimate of the gap was 2.7 million.[39] The gap has narrowed since 2020, a year in which it widened substantially (to a best estimate of 4.3 million) amid COVID-related disruptions in the first year of the pandemic.

TB treatment coverage can be approximated as the annual number of people newly diagnosed with TB and officially reported as a TB case divided by the estimated number of people who developed TB (incident cases) in the same year, expressed as a percentage.[40]

Globally, there were steady improvements in treatment coverage between 2010 and 2019: from 51% (95% UI: 41–64%) in 2010 to 56% (95% UI: 52–62%) in 2015 and then 69% (95% UI: 65–74%) in 2019 (**Fig. 21**). Disruptions during the COVID-19 pandemic then resulted in a sharp reversal of progress in 2020: treatment coverage was only 58% (95% UI: 54–61%), back to the level of 2015.

Following the rebound in notifications of people newly diagnosed with TB between 2021 and 2023 (**Fig. 16**), treatment coverage appears to have recovered to above pre-pandemic levels, reaching a best estimate of 75% (95% UI: 70–81%) in 2023. Some of the strong rebound in notifications in 2022 and 2023 probably reflects a backlog of people who developed TB in previous years, thus distorting estimates of treatment coverage in these years, as well as estimated increases in TB incidence. Further efforts are needed to reach the global target of 90% by 2027 (**Table 1**).

Trends among the six WHO regions vary (**Fig. 22**). In 2023, treatment coverage remained below pre-pandemic levels in the WHO Region of the Americas and in the European and Western Pacific regions. TB treat-

[38] A summary of the treatment regimens recommended by WHO is provided in **Annex 1**.

[39] That is, the difference between a best estimate of 10.84 million incident cases and 8.16 million people who were newly diagnosed with TB and officially notified as a TB case.

[40] Some people who are newly diagnosed and reported may not be started on treatment, and some people may be diagnosed and treated but not reported (and thus not included in the number of case notifications).

ment coverage was highest in the WHO South-East Asia Region (with a best estimate of 78%).

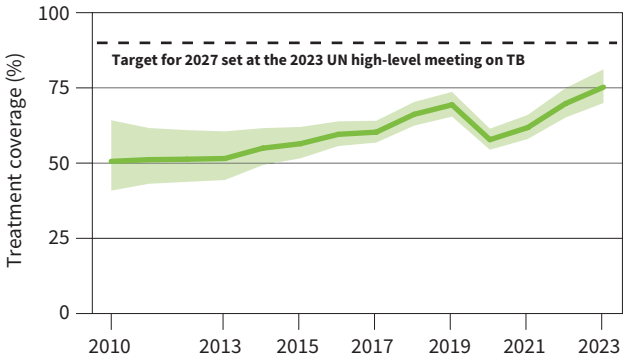
Of the 30 high TB burden countries, those with the highest levels (>80%) of treatment coverage in 2023 included Brazil, India, Mozambique, Papua New Guinea, Sierra Leone, Uganda and Zambia.[41] As already highlighted for the global level, the estimates for these and other countries may be distorted by strong post-COVID recovery efforts that have resulted in large backlogs of people who developed TB in previous years being diagnosed relatively late, in 2023. It is also possible that the notification data reflect some level of over-diagnosis of TB; for example, the proportion of notified cases diagnosed based on bacteriological confirmation in 2023 was less than 50% in Mozambique and Papua New Guinea.

Four high TB burden countries had particularly low levels of treatment coverage in 2023, with best estimates of less than 50%: Lesotho, Liberia, Mongolia and Myanmar.

FIG. 21

Global trend in TB treatment coverage,[a] 2010–2023

The shaded area represents the 95% uncertainty interval.

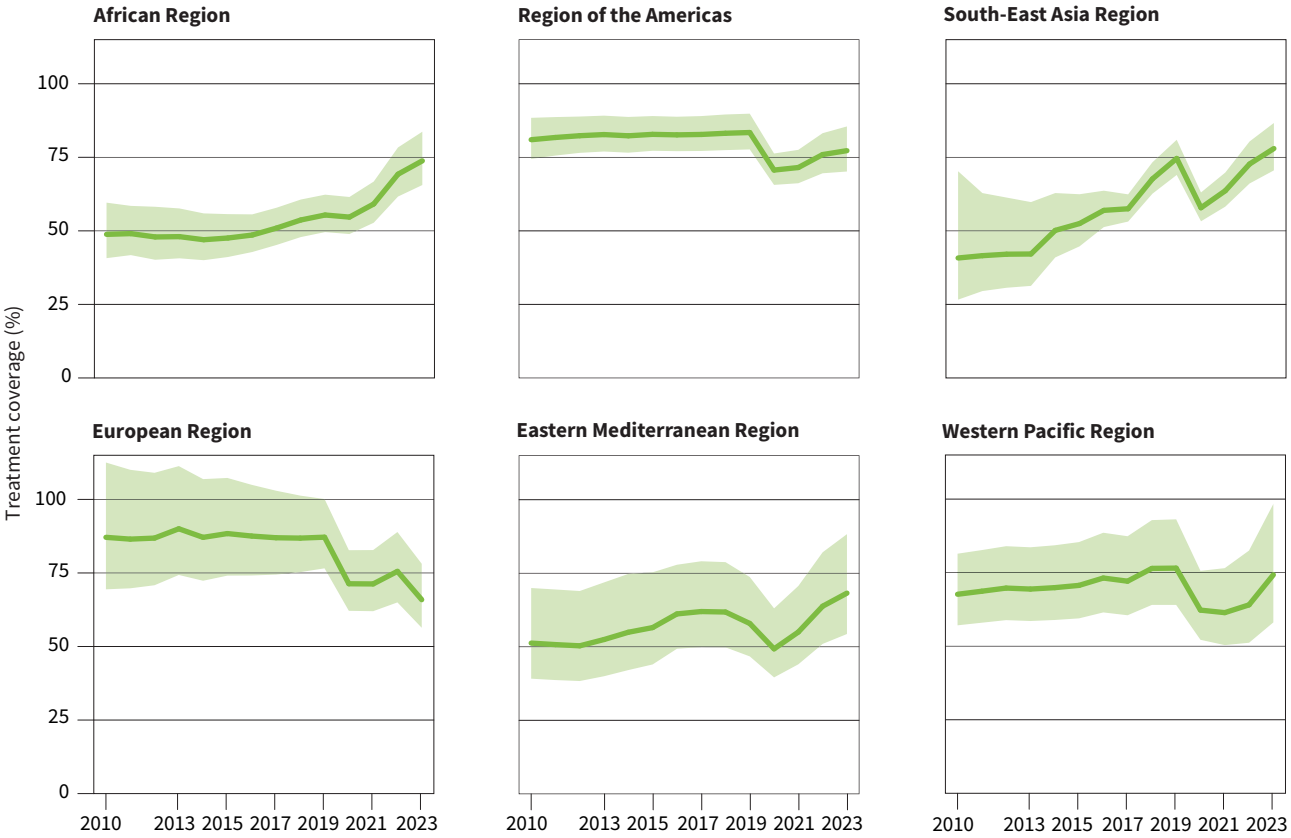


[a] Notifications of people with a new or relapse episode of TB as a percentage of estimated incident TB cases, in the same year.

FIG. 22

Regional trends in TB treatment coverage,[a] 2010–2023

Shaded areas represent 95% uncertainty intervals.

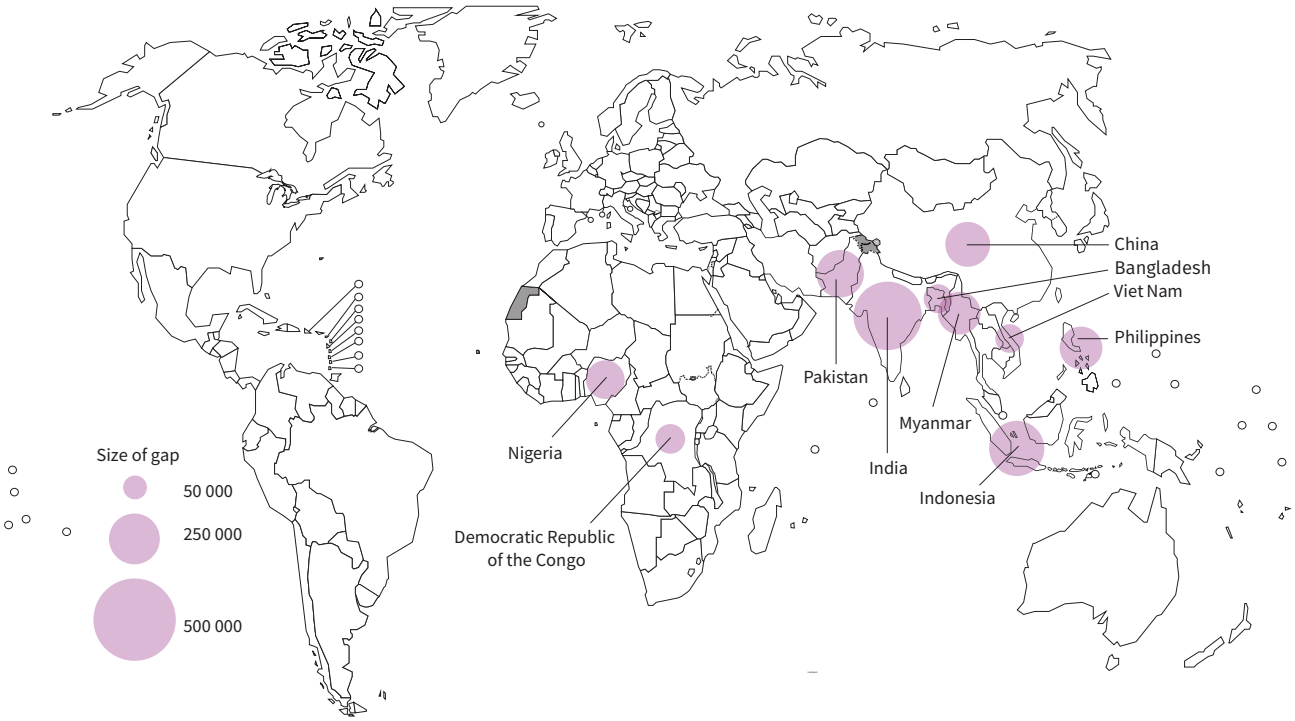


[a] Notifications of people with a new or relapse episode of TB as a percentage of estimated incident TB cases, in the same year. TB treatment coverage in the European Region in 2023 is underestimated, because at the time the data snapshot for this report was taken (29 July 2024), 15 countries had not yet reported notification data for 2023 to WHO (**Annex 2**). Once data from these countries have been reported, it is anticipated that treatment coverage in 2023 will be similar to the level of 2022.

[41] Further details are provided in the report webpages (section 2.3).

FIG. 23

The ten countries with the largest gaps between case notifications of people newly diagnosed with TB and the best estimates of TB incidence, 2023



In 2023, the global gap between estimated TB incidence and the reported number of people newly diagnosed with TB was mostly accounted for by 10 countries (**Fig. 23**). The top five contributors (collectively accounting for about 50% of the global gap) were India (16%), Indonesia (11%), Pakistan (7.8%), China (6.5%) and Myanmar (6.5%). From a global perspective, efforts to increase levels of case detection and treatment are of particular importance in these countries.

ART for people with HIV and TB

High coverage, scope for further progress

Among people living with HIV who develop TB, both TB treatment and antiretroviral therapy (ART) for HIV are required to prevent unnecessary deaths from TB and HIV. Since 2019, the global coverage of ART for people living with HIV who were newly diagnosed and reported with TB has been maintained at a high level (for example, 88% in 2023 and 89% in 2022). However, when compared with the total number of people living with HIV estimated to have developed TB in 2023, coverage was much lower, at 58% (up from 56% in 2022). This was far below the overall level of coverage of ART for people living with HIV, which was 77% (95% UI: 61–89%) at the end of 2023 *(24)*. The main reason for the relatively low coverage was the big gap between the estimated number of people living with HIV who developed TB in 2023 (a best estimate of 662 000) and the reported number of people living with HIV who were diagnosed with TB in 2023 (436 805).

TB treatment outcomes

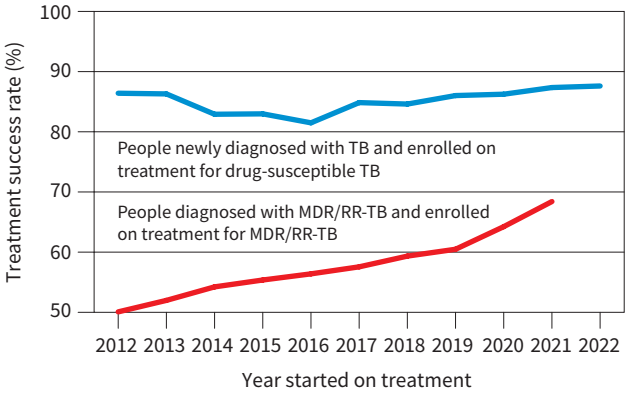
Sustained at high levels

The treatment success rate for people enrolled on treatment for drug-susceptible TB has been sustained at high levels in recent years. Globally, it improved further in 2022, to 88%; this was an increase from 87% in 2021 and 86% in both 2019 and 2020 (**Fig. 24**).

Treatment success rates remain lower among people living with HIV (79% globally in 2022), although there have been steady improvements over time. The treatment success rate for children and young adolescents

FIG. 24

Global success rates for people treated for TB, 2012–2022[a]



[a] 2012 is the first year for which WHO collected data about treatment outcomes for MDR/RR-TB.

TABLE 3

Cumulative number of deaths averted by a) TB treatment as well as b) antiretroviral therapy for people diagnosed with TB who were also living with HIV, 2010–2023 (in millions), globally and for WHO regions

WHO REGION	PEOPLE WITHOUT HIV		PEOPLE WITH HIV[a]		TOTAL	
	BEST ESTIMATE	UNCERTAINTY INTERVAL	BEST ESTIMATE	UNCERTAINTY INTERVAL	BEST ESTIMATE	UNCERTAINTY INTERVAL
African Region	5.9	4.9–6.9	5.1	4.4–5.8	11	9.8–12
Region of the Americas	1.2	1.1–1.4	0.25	0.23–0.27	1.5	1.4–1.6
South-East Asia Region	19	16–22	0.91	0.58–1.2	20	17–23
European Region	1.2	1.0–1.3	0.23	0.20–0.27	1.4	1.2–1.5
Eastern Mediterranean Region	3.9	3.4–4.4	0.048	0.034–0.063	3.9	3.4–4.5
Western Pacific Region	9.7	8.7–11	0.33	0.28–0.38	10	9.0–11
Global	**41**	**36–46**	**6.8**	**5.9–7.7**	**48**	**43–53**

[a] Deaths from TB among people with HIV are officially classified as deaths caused by HIV/AIDS (with TB as a contributory cause). This is the reason why the estimates make a clear distinction between people with and without HIV.

(aged 0–14 years) was 90% in 2022, similar to levels achieved in previous years. Among 27 high burden countries[42] that reported treatment outcome data disaggregated by sex, the treatment success rate in 2022 was slightly higher among females (89%) than males (86%).

Provision of TB treatment to HIV-negative people is estimated to have averted 41 million deaths between 2010 and 2023; among people living with HIV who were diagnosed with TB, the combination of TB treatment and ART is estimated to have averted an additional 6.8 million deaths between 2010 and 2023 (**Table 3**). The combined total for the period 2000–2023 was 79 million.

Drug-resistant TB: diagnosis and treatment

Diagnostic gaps, improving treatment outcomes

WHO uses five categories to classify cases of drug-resistant TB:

- isoniazid-resistant TB;
- RR-TB (defined above);
- MDR-TB (defined above);
- pre-extensively drug-resistant TB (pre-XDR-TB), defined as TB that is resistant to rifampicin and any fluoroquinolone (a class of second-line anti-TB drug); and
- XDR-TB, defined as TB that is resistant to rifampicin, plus any fluoroquinolone, plus at least one of either bedaquiline or linezolid.

Drug-resistant TB is one of 24 pathogens included in WHO's Bacterial Priority Pathogens List *(25)*.

Detection of drug resistance requires bacteriological confirmation of TB and testing for resistance using rapid molecular diagnostic tests, culture methods or sequencing technologies.

Since 2018, WHO has recommended all-oral regimens for the treatment of MDR/RR-TB, a landmark advance compared with previous regimens that included injectable agents *(26)*. The latest recommendations for treatment of drug-resistant TB include three major categories of regimen *(27, 28)*. The first category consists of two 6-month all-oral regimens for people with MDR/RR-TB (with or without resistance to fluoroquinolones).[43] The second category includes several all-oral short regimens of 9 months for people with MDR/RR-TB who do not have any resistance to fluoroquinolones. The third category includes longer regimens of 18–20 months that may include an injectable drug (amikacin). The 6-month regimens are prioritized for use while the longest regimens are a last resort.

Globally in 2023, 79% of people (3.4/4.3 million) diagnosed with bacteriologically confirmed pulmonary TB were tested for rifampicin resistance, up from 73% (2.9/4.0 million) in 2022, 69% (2.4/3.5 million) in 2021 and considerably better that the pre-pandemic level of 62% (2.2/3.6 million) in 2019 (**Fig. 25**). There were improvements in all six WHO regions; in 2023, the percentage was ≥80% in the South-East Asia, European and Western Pacific regions.

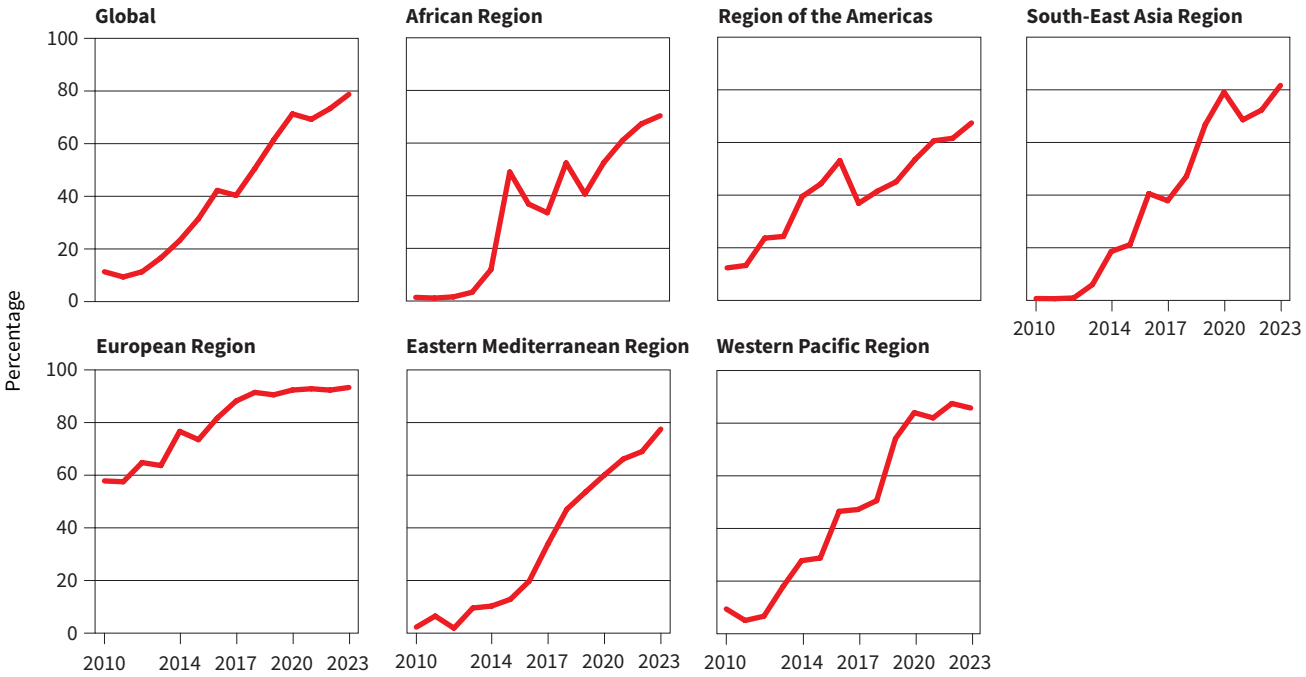
Among those tested in 2023, 159 684 people with MDR/RR-TB and 28 982 people with pre-XDR-TB or XDR-

[42] Since 2021, WHO has requested data on treatment outcomes disaggregated by sex from the 49 countries in one of the three lists of high burden countries (**Annex 3**). The countries from which such data are requested may be expanded in future (e.g. to include all countries with case-based digital surveillance systems for TB).

[43] One regimen consists of bedaquiline, pretomanid, linezolid and moxifloxacin and is referred to as BPaLM. The other regimen consists of bedaquiline, delamanid and linezolid, combined with levofloxacin or clofazimine or both, as is referred to as BDLLfxC. Unlike BPaLM, the latter can be used in children and during pregnancy.

FIG. 25

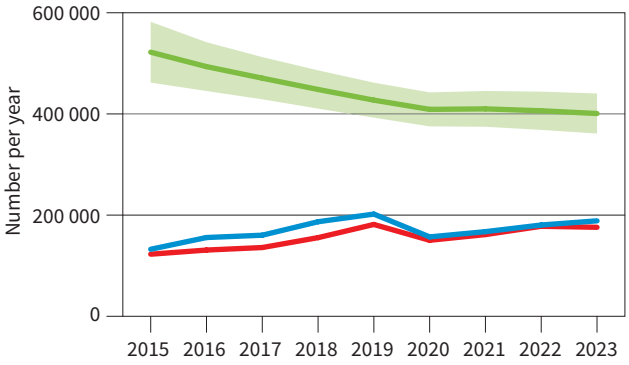
Percentage of people diagnosed with bacteriologically confirmed TB[a] who were tested for RR-TB, globally and for WHO regions, 2010–2023



[a] Includes both new and previously treated cases; data for 2017 onwards are for pulmonary cases only.

FIG. 26

Global number of people diagnosed with MDR/RR-TB (blue) and number enrolled on an MDR-TB treatment regimen (red), compared with estimates of the global number of incident cases of MDR/RR-TB (95% uncertainty interval shown in green), 2015–2023[a]



[a] The time period corresponds to the period for which estimates of the incidence of MDR/RR-TB are available.

TB were detected, giving a combined total of 188 666 (5.5% of those tested). This was a small increase (4.6%) from a combined total of 180 426 in 2022, and much smaller than the 16% increase in the number of people diagnosed and reported with TB between 2022 and 2023 (**Fig. 16**). Despite increased testing coverage and an increase in the absolute number of people tested, the number of people detected with MDR/RR-TB was lower in 2022 than in 2019 (when the total was 202 009). This is consistent with the estimated decline in the proportion of people with TB who have MDR/RR-TB (**Fig. 7**).

Worldwide, 175 923 people with MDR/RR-TB were enrolled on treatment in 2023, a slight fall (of 1.1%) from 177 912 in 2022 and below the pre-pandemic level of 181 533 in 2019 (**Fig. 26**). This level of enrolment is equivalent to about 44% of the estimated number of people who developed MDR/RR-TB in 2023 (**Fig. 6**, **Fig. 26**).

Ten countries accounted for about 75% of the global gap between the estimated global number of people who developed MDR/RR-TB in 2023 (incident cases of MDR/RR-TB) and the global number of people enrolled on treatment in 2023. Listed in order of their share of the gap, these countries were India, the Philippines, Indonesia, China, Pakistan, Myanmar, Ukraine, Nigeria, Viet Nam and South Africa. To make substantial progress in closing this gap, improvements in the coverage of testing for drug resistance and access to treatment are needed in these countries.

There has been major progress in the treatment

success rates achieved among people diagnosed with MDR/RR-TB in recent years (**Fig. 24**). For people started on treatment in 2021 (the latest year for which outcome data are available), the treatment success rate was 68%, up from 64% in 2020 and 60% in 2019 and a big improvement from 50% in 2012.[44] Among WHO regions, the treatment success rate in 2021 ranged from 61% in the European Region to 74% in the Eastern Mediterranean Region.

By the end of 2023, 58 countries had started to use the 6-month BPaLM regimen to treat people with MDR/RR-TB or pre-XDR-TB, an increase from 41 by the end of 2022. A total of 100 countries were using the 9-month oral regimens for the treatment of MDR/RR-TB, an increase from 95 in 2022 and 93 in 2021.

TB prevention and screening

Global coverage of preventive treatment improving

The main health care intervention available to reduce the risk of TB infection progressing to active TB disease is TB preventive treatment. Other preventive interventions are TB infection prevention and control, and vaccination of children with the bacille Calmette-Guérin (BCG) vaccine, which can confer protection, especially from severe forms of TB in children.

WHO recommends TB preventive treatment for people living with HIV, household contacts of people diagnosed with bacteriologically confirmed pulmonary TB and clinical risk groups (e.g. those receiving dialysis) *(29)*.[45] Options include a weekly dose of isoniazid and rifapentine for 3 months, a daily dose of isoniazid and rifampicin for 3 months, a daily dose of isoniazid and rifapentine for 1 month, a daily dose of rifampicin for 4 months and a daily dose of isoniazid for 6 months or longer.

The global number of people provided with TB preventive treatment in 2023 was 4.7 million. This was a considerable increase from 3.9 million in 2022 and 2.9 million in both 2020 and 2021, above the pre-pandemic level of 3.6 million in 2019 and an almost fivefold improvement compared with 2015 (**Fig. 27**).[46]

Since 2021, there has been a particularly noticeable increase in the number of household contacts enrolled on TB preventive treatment: from 0.76 million in 2021 to 2.7 million in 2023. In contrast, the number of people living with HIV who were enrolled on TB preventive treatment increased between 2015 and 2019 (reaching a peak of 3.0 million in 2019) before falling in 2020 and subsequently levelling off at about 2 million people per year.

FIG. 27

The global number of people provided with TB preventive treatment, 2015–2023

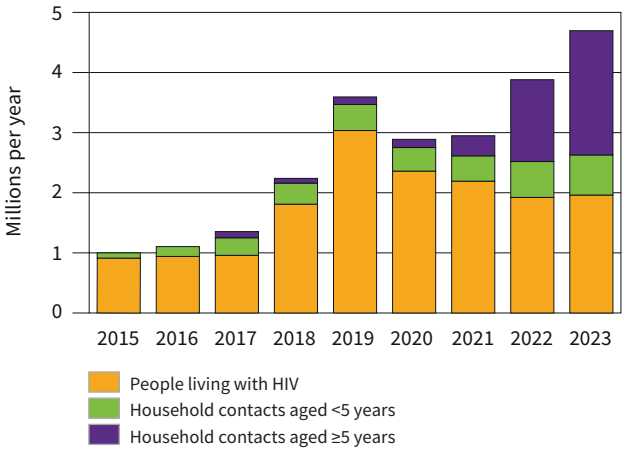
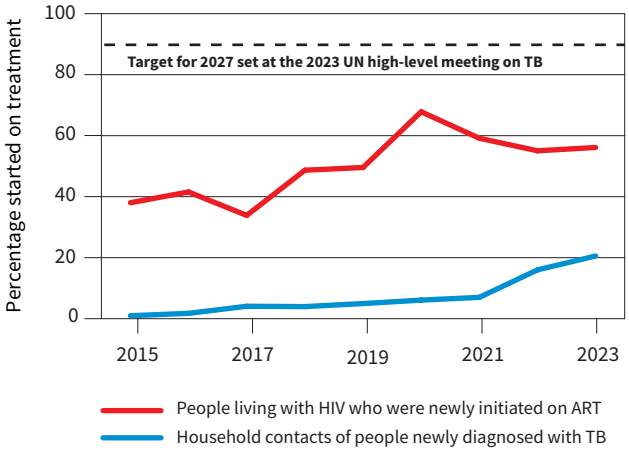


FIG. 28

Global coverage of TB preventive treatment, 2015–2023



The estimated global coverage of TB preventive treatment among household contacts reached 21% in 2023, representing substantial progress from 2015 (<1%) and 2019 (5.0%) (**Fig. 28**).[47] For people living with HIV, coverage among those newly enrolled on ART was higher, at 56% in 2023; however, this was down from a peak of 68% in 2019 (**Fig. 28**). The global target of 90% coverage by 2027 (**Table 1**) remains some way off.

In 85 countries that reported outcomes, the median completion rate for household contacts who started treatment in 2022 was 87%, a slight reduction from 89% in 2021. For people living with HIV, the median completion rate in 42 countries that reported data was 83% in 2022, up from 81% in 31 countries that reported data for 2021.

Substantial intensification and expansion of efforts

[44] 2012 was the first year for which WHO collected data on outcomes for people enrolled on treatment for MDR/RR-TB.

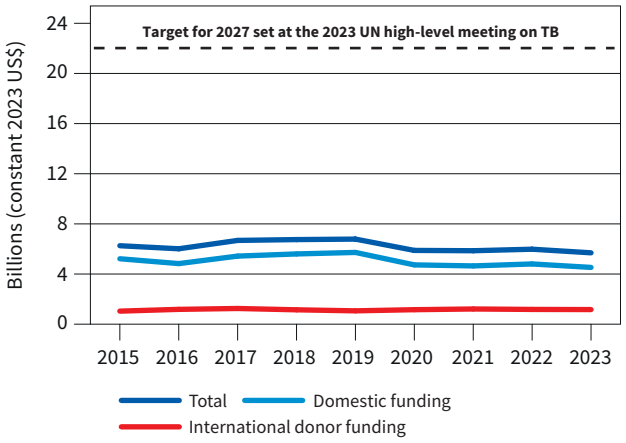
[45] Addressing broader determinants that influence TB epidemics can also help to prevent TB infection and disease. These are discussed below.

[46] The number in 2015 was 1.0 million.

[47] Region and country-specific data are provided in the report webpages (section 3) and mobile app.

FIG. 29

Funding available for TB prevention, diagnostic and treatment services in 132 low- and middle-income countries by source,[a,b,c] 2015–2023, compared with the global target of US$ 22 billion per year by 2027 that was set at the 2023 UN high-level meeting on TB



[a] Sources: data reported by NTPs and estimates produced by the WHO Global Tuberculosis Programme.

[b] The data sources, boundaries, accounting rules, and estimation methods used in this report are different from those of the system of Health Accounts 2011 (SHA2011). The TB funding data reported here are thus not comparable with the disease expenditure data, including for TB, that are reported in WHO's Global Health Expenditure Database.

[c] The 132 countries accounted for 99% of the global number of notified TB cases in 2023.

and investment are needed to improve the provision of TB preventive treatment. This includes providing more TB screening at household level, improving the follow-up to TB screening at household level and among people living with HIV, and increasing access to shorter (1–3 months) rifamycin-based regimens. The number of people treated using shorter regimens is expanding; it reached 1.0 million people in 86 countries in 2023,[48] an increase from 0.60 million people in 74 countries in 2022 and a fivefold increase from 0.19 million people in 52 countries in 2021.

The ratio of the TB notification rate among health care workers to the TB notification rate in the general adult population reflects the effectiveness of TB infection control in health facilities; the ratio should be about 1. However, in 2023 the ratio was greater than 1 in 12 countries that reported five or more TB cases among health care workers; this was a slight reduction from 14 countries in both 2022 and 2021.

Following concerning declines in the global coverage of BCG vaccination during the COVID-19 pandemic – from 89% in 2019 to 86% in 2020 and 85% in 2021 – there was a recovery to 88% in 2022 and 87% in 2023 *(30)*.

[48] Among these 86 countries, 77 reported using the 3-month weekly regimen of rifapentine and isoniazid and 20 reported using the 1-month daily regimen of rifapentine and isoniazid.

Funding for essential TB services

Funding decreased further, far below target

Progress in reducing the burden of TB disease requires adequate funding for TB prevention, diagnostic and treatment services, sustained over many years. However, in low and middle-income countries (LMICs) – which account for 99% of the reported number of people newly diagnosed with TB each year – funding falls far short of what is needed and has declined since 2019.

In 2023, the total funding available in LMICs was US$ 5.7 billion (in constant 2023 US$),[49] equivalent to only 26% of the global target of reaching US$ 22 billion per year by 2027 (**Fig. 29**, **Table 1**). This was down from about US$ 6.0 billion in each of the 3 previous years (2020–2022) and from US$ 6.8 billion in 2019.

Throughout the period 2015–2023, the share of funding available from domestic and international sources in LMICs has been relatively consistent. In 2023, 80% of the funding available for TB prevention, diagnostic and treatment services was from domestic sources, similar to previous years. From 2019 to 2023, there was a decline (of US$ 1.2 billion) in available funding from domestic sources and a slight increase (of US$ 0.1 billion) in funding provided by international donors. Most of the reduction in domestic funding is explained by trends in Brazil, the Russian Federation, India, China and South Africa (BRICS).

The aggregate figure for the share of funding provided from domestic sources in LMICs continues to be strongly influenced by BRICS (**Fig. 30**). Together, these five countries accounted for US$ 2.8 billion (63%) of the total of US$ 4.5 billion in 2023 that was provided from domestic sources. Overall, 97% of available funding in BRICS and all funding in Brazil, China and the Russian Federation in 2023 was from domestic sources.

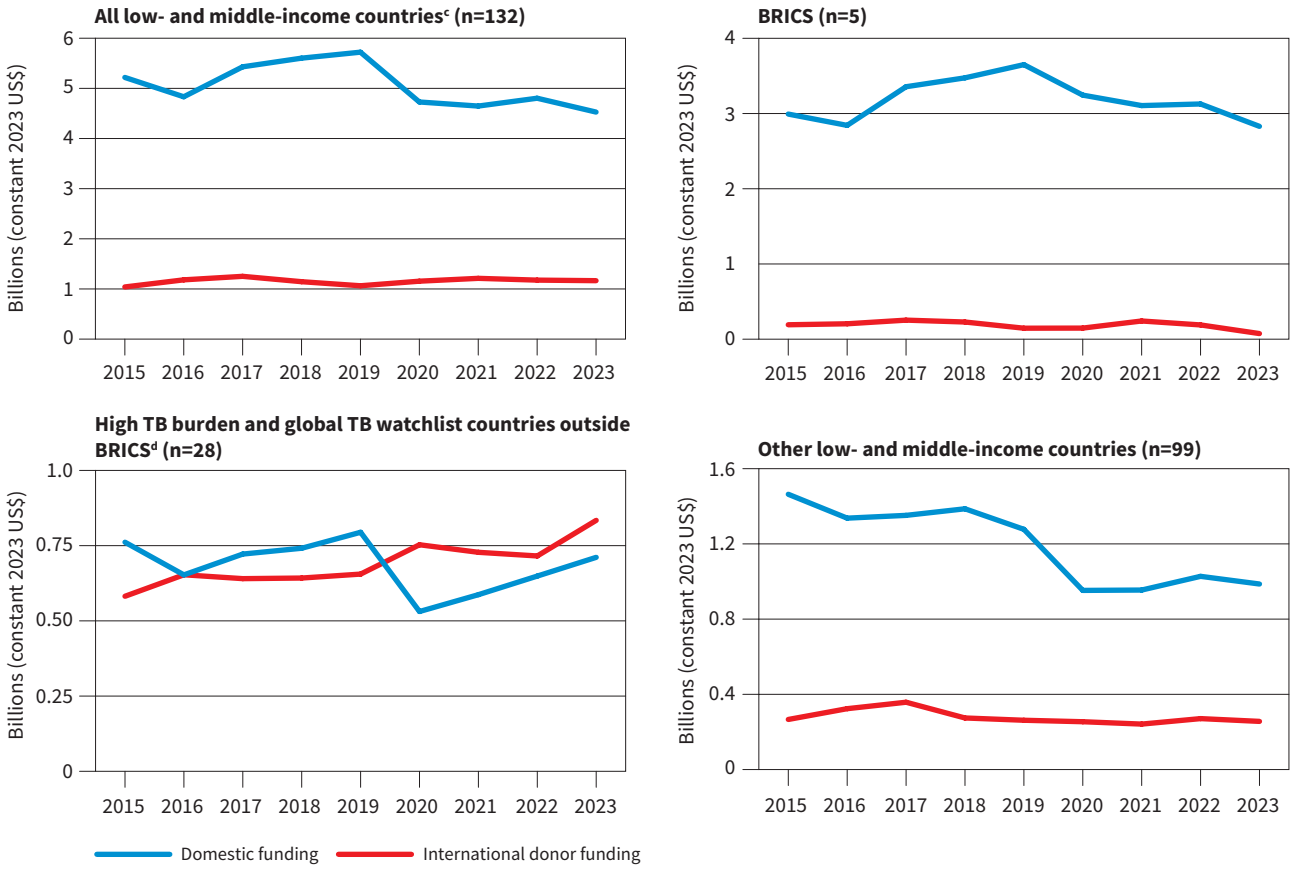
In other LMICs, international donor funding remains crucial (**Fig. 30**). For example, in 2023 such funding accounted for 54% of the funding available in the 26 high TB burden and two global TB watchlist countries (Cambodia and Zimbabwe) outside BRICS, and 62% of the funding available in low-income countries.

The total amount of international donor funding reported to WHO by NTPs in LMICs has remained stable at around US$ 1.1 to US$ 1.2 billion per year for several years (**Fig. 29**). The main source has also been consistent: The Global Fund. The share of the Global Fund in 2023 was 76%, comparable to both 2022 (76%) and 2021 (77%). The government of the United States of America is the largest contributor of funding to the Global Fund (about one-third) and is also the largest bilateral donor; overall, it contributes about 50% of international donor

[49] All amounts quoted in this subsection are in constant 2023 US$. Numbers should not be directly compared with those in previous reports, because adjustments to the whole time series are made for each new report, to account for inflation.

FIG. 30

Funding available for TB prevention, diagnostic and treatment services in 132 low- and middle-income countries and three other country groups,[a,b] 2015–2023



BRICS: Brazil, the Russian Federation, India, China, South Africa.

[a] Sources: data reported by NTPs and estimates produced by the WHO Global Tuberculosis Programme.

[b] The data sources, boundaries, accounting rules, and estimation methods used in this report are different from those of the System of Health Accounts 2011 (SHA2011). The TB funding data reported here are thus not comparable with the disease expenditure data, including for TB, that are reported in WHO's Global Health Expenditure Database.

[c] The 132 countries accounted for 99% of the global number of notified TB cases in 2023.

[d] The two global TB watchlist countries included are Cambodia and Zimbabwe.

funding for TB.[50]

Substantial increases in both domestic and international funding for TB are urgently required.

Variation in the share of funding from domestic sources within a given income group suggests that there is scope to increase domestic funding in some high TB burden and global TB watchlist countries.[51]

Mobilization of increased levels of funding will require the development of strong national strategic plans for TB that are properly costed; countries committed to such plans at the 2023 UN high-level meeting on TB (**Table 2**). WHO guidance on national strategic planning is available *(31)* and the TB module of the Integrated Health Tool for planning and costing (available online) can be used for budgeting as well as optimization of resource allocation and use.

UHC, TB determinants and multisectoral accountability

Faster progress required, TB target off track

Global TB targets for reductions in TB disease burden can only be achieved if TB prevention, diagnostic and treatment services are provided within the context of progress towards UHC, and if there is multisectoral action to address the broader determinants that influence TB epidemics. For example, when the End TB Strategy was adopted in 2014, it was estimated that reaching the 2025 milestone of a 75% reduction in the number of deaths caused by TB (compared with 2015) would require reducing the TB case fatality rate (CFR)

[50] This figure is based on a comprehensive analysis of international donor funding for TB based on donor reports to the Organisation for Economic Co-operation and Development (OECD). This including funding provided to entities outside NTPs, which is not reported by NTPs to WHO. It also includes analysis of contributions disaggregated by source country. A graphic that illustrates the shares contributed by OECD countries is provided in the report webpages.

[51] Further details are provided in the report webpages (section 4.1).

to 6.5% by 2025.[52] Such a low CFR is only feasible if everyone with TB can promptly access diagnostic and treatment services.

UHC means that everyone can obtain the health services they need without suffering financial hardship *(32)*. Through their adoption of the SDGs, all countries have committed to achieving UHC by 2030: Target 3.8 is "Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all" *(1)*. The two indicators being used to monitor progress towards this target are a UHC service coverage index (SCI) (Indicator 3.8.1), and the percentage of the population experiencing household expenditures on health care that are "large" in relation to household expenditures or income (Indicator 3.8.2).[53] The SCI can take values from 0 (worst) to 100 (best) and is calculated using 14 tracer indicators, one of which is the coverage of TB treatment. In the monitoring of Indicator 3.8.2 by WHO and the World Bank, direct medical expenditures that account for 10% or more of household expenditure or income are classified as "catastrophic" *(32–34)*.

The latest published data for the two UHC indicators are for 2021 (SCI) and 2019 (catastrophic out-of-pocket expenditures on health) *(33, 34)*.

Worldwide, the SCI increased from a score of 45 (out of 100) in 2000 to 68 in 2019 and remained stable at this level in 2021. Most progress occurred between 2000 and 2015 and was primarily due to improvements in service coverage for infectious diseases (with only limited changes for other areas of service provision).

At regional level, the SCI increased in all six WHO regions between 2000 and 2019; the biggest gains in absolute terms were in the South-East Asia and Western Pacific regions. There were also increases in all four World Bank income groups. Progress stalled between 2019 and 2021 in most WHO regions and World Bank income groups. In 2021, the WHO regions with the highest values were the European Region (81) and the Region of the Americas (80); the African Region had the lowest value (44).

Among the 30 high TB burden countries, most made progress in service coverage between 2000 and 2019. The largest gains in absolute terms (+30 index points or more) were in China, India, Myanmar, Thailand and Viet Nam. However, as at global and regional levels, progress stalled or reversed in most countries between 2019 and 2021, during the COVID-19 pandemic. In 2021, the high TB burden countries with the highest SCI values (around 80) were Brazil, China and Thailand; most other countries had values between about 40 and 60 (**Fig. 31**).

In contrast to improvements in the SCI, the global level of financial protection for health expenditures worsened continuously between 2010 and 2019 (estimates for later years are not currently available). Worldwide, the proportion of the general population facing catastrophic expenditure on health (using a threshold of >10% annual household income or expenditure) rose from 11.4% (794 million people) in 2010 to 13.5% (1.04 billion people) in 2019 (33). At regional level, higher proportions in 2019 compared with 2010 were estimated for all WHO regions except the Region of the Americas.

National values for the level of financial protection are available for different years and there is more geographical variability than with the SCI, including within regions. Of the 30 high TB burden countries, estimates of the percentage of the population facing catastrophic health expenditures are particularly high (≥15% of the population) for Angola, Bangladesh, China, India, Nigeria, Sierra Leone and Uganda.

Values for both indicators in the 30 high TB burden countries show that there is a long way to go before the SDG targets for UHC are achieved in most of these countries (**Fig. 31**). Only Thailand stands out as having a high SCI (82 in 2021) and a low level of catastrophic health expenditures (2.0% of households). A Universal Coverage Scheme was established in Thailand in 2002 to provide an explicit benefit to all citizens of the country who were not already covered by a health insurance scheme in the formal sector; the scheme is supported by domestic funding and a strong primary health care system *(35)*.

To achieve UHC, substantial increases in investment in health care are critical. Between 2000 and 2021, there were striking increases in health expenditure (from all sources) per capita in a small number of high TB burden countries, notably the upper-middle-income countries of Brazil, China, South Africa and Thailand. There have also been considerable increases in several lower-middle-income countries: Bangladesh, India, Indonesia, Kenya, Lesotho, Mongolia, Myanmar, the Philippines and Viet Nam. Low-income and high TB burden countries in which health expenditure has generally been rising since 2010 include Ethiopia, Liberia and Mozambique, albeit from much lower levels.[54]

Given the importance of UHC to targets for reductions in TB incidence and mortality, the End TB Strategy included a third target for the reduction of cost barriers to accessing TB diagnosis and treatment that are faced by people with TB and their households (**Box 2**). The target is that no TB-affected households face total costs (comprising direct medical expenditures, nonmedical expenditures and indirect costs such as income losses)

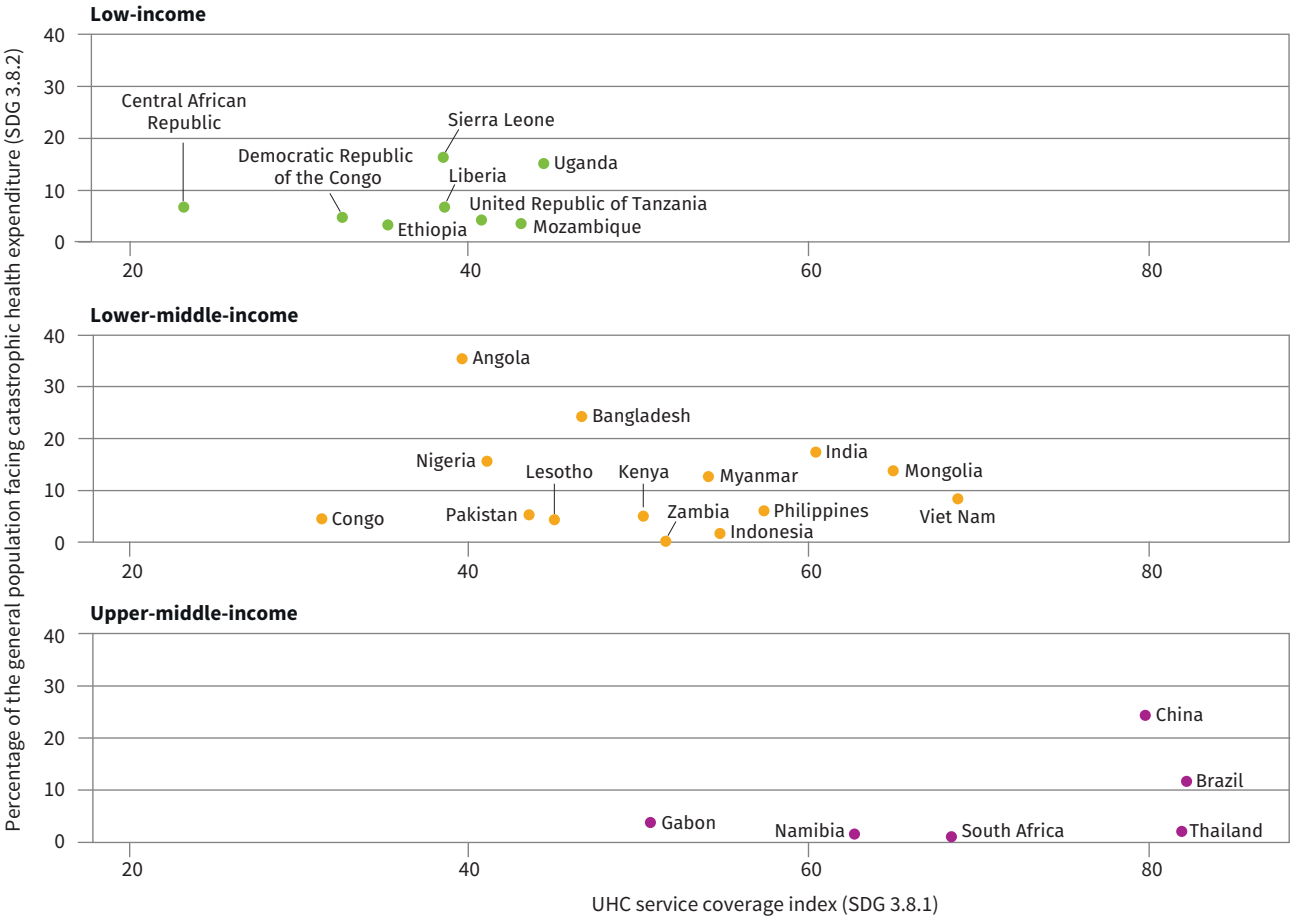
[52] This was in combination with a 50% reduction in the TB incidence rate. The estimated CFR in 2023 was 11.5%, down from 12.4% in 2022 and 13.6% in 2021. It was also below the pre-pandemic level of 13.0% in 2019.

[53] Indicator 3.8.2 is a measure of financial hardship rather than financial barriers to accessing health care. The need for out-of-pocket payments may deter many people from seeking care.

[54] Further details are provided in the report webpages (section 5.1).

FIG. 31

UHC service coverage index (SDG 3.8.1)[a] and percentage of the general population facing catastrophic health expenditure (SDG 3.8.2),[b] 30 high TB burden countries,[c] stratified by income group[d]



[a] The SCI can take values from 0 (worst) to 100 (best) and is calculated using 16 tracer indicators, one of which is the coverage of TB treatment. Values shown for the SCI are estimates for the latest year for which data for SDG 3.8.2 are available. Values are based on interpolated points between available years over the 2000-2021 period.

[b] Defined as ≥10% of total household consumption or income. The latest available year ranges from 2007 to 2021 for the 30 high TB burden countries.

[c] Data were not available for the Democratic People's Republic of Korea and Papua New Guinea.

[d] The classification is for the latest year for which data for SDG 3.8.2 are available.

Source: Global Health Observatory (https://www.who.int/data/gho)

that are catastrophic (defined as total costs exceeding 20% of annual household income). The key differences between this TB-specific indicator and the SDG UHC indicator for household expenditures on health care (Indicator 3.8.2) are explained in **Box 3**.

Between 2015 and August 2024, a total of 37 countries completed a national survey of costs faced by people treated for TB and their households, of which 35 (including 18 of the 30 high TB burden countries and one of the three global TB watchlist countries)[55] have reported results.[56] First-ever surveys were completed in six countries in the period 2023–2024: Argentina, Cambodia, the Congo, the Gambia, Nepal and Somalia. In August 2024, a repeat survey was ongoing in Viet Nam, and preparations for a repeat survey had been initiated in Brazil and Myanmar.

The percentage of TB-affected households facing total costs that were catastrophic ranged from 13% (95% confidence interval [CI]: 10–17%) in El Salvador to 92% (95% CI: 86–97%) in the Solomon Islands; the pooled average for all 35 countries, weighted for each country's number of notified cases, was 49% (95% CI: 38–60%) (**Fig. 32**).[57] Among 31 countries that reported disaggregated data, the percentage facing catastrophic total costs was much higher for drug-resistant TB, with a pooled average of 82% (95% CI: 73–91%).

The mean total cost (in constant US$ prices for 2024)[58] incurred by people treated for TB and their households

[55] See **Annex 3**.

[56] Results from surveys in China and Republic of Moldova have not been reported to WHO.

[57] Further details are provided in the report webpages (section 5.2).

[58] All values were converted to a common year of prices, to allow for fair comparisons among surveys.

Box 3. The difference between "catastrophic total costs" for TB-affected households, and the SDG UHC indicator related to household expenditures on health care

It is important to distinguish between SDG Indicator 3.8.2, "the proportion of the population with large household expenditures on health as a share of total household expenditure or income", and "the percentage of TB-affected households facing catastrophic total costs due to TB", which is an indicator within the WHO End TB Strategy.

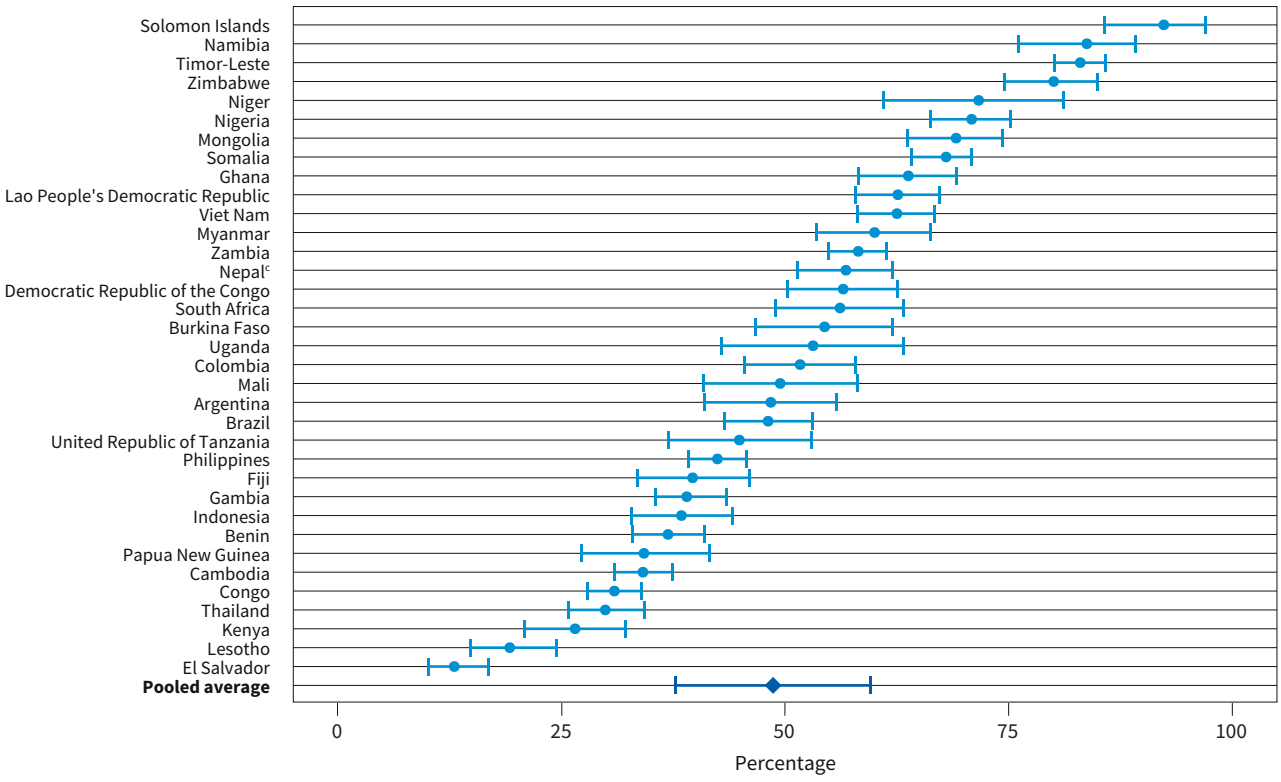
The SDG indicator is for the *general population*. Household expenditures on health are defined as *direct expenditures* on health by all household members who seek any type of care (preventive, curative, rehabilitative or long-term) for any type of disease, illness or health condition, in any type of setting (outpatient, inpatient or at home). They include both formal and informal expenditures. This indicator attempts to capture the impact of household expenditures on health on household ability to spend on other basic needs. The denominator of the total population includes many people who had no contact with the health system and thus had zero expenditures on health. Although these people did not experience financial hardship because of direct expenditures on health care, they may nonetheless have faced financial barriers to accessing health services that they needed. Hence, the SDG indicator cannot be used as a measure of financial barriers to access to health care.

Due to the nature of the illness, people with TB and their households can face severe direct and indirect financial and economic costs. These pose barriers that can greatly affect their ability to access diagnosis and treatment, and to complete treatment successfully. Costs included in the TB-specific indicator include not only *direct medical payments* for diagnosis and treatment, but also *direct nonmedical payments* (e.g. for transport and lodging) and indirect costs (e.g. lost income). In contrast to SDG Indicator 3.8.2, the TB-specific indicator is restricted to a particular population: *people diagnosed with TB who are users of health services that are part of NTP networks*.

Given these conceptual differences, the percentage of TB-affected households facing "catastrophic total costs" (defined as direct and indirect costs that account for >20% of their annual household income) is expected to be much higher than the percentage of the general population facing catastrophic expenditures on health care. Hence, the two indicators cannot and should not be compared directly.

FIG. 32

Estimates of the percentage of people with TB and their households facing catastrophic total costs,[a] national surveys completed 2015–2024[b]



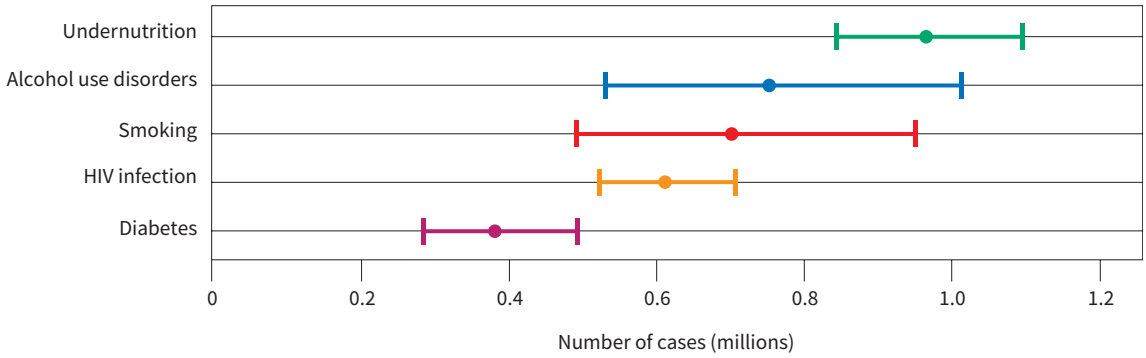
[a] Defined as direct medical expenditures, direct nonmedical expenditures and indirect costs (e.g. income losses) that sum to >20% of annual household income. This indicator is not the same as the SDG indicator for catastrophic health expenditures; see **Box 3**.

[b] The percentages are shown for 35 national surveys that have been completed and for which data have been reported. Data were not available for China and the Republic of Moldova.

[c] Results for Nepal are provisional.

FIG. 33

Global estimates of the number of people with a new episode of TB (incident cases) attributable to five risk factors,[a] 2023



[a] Undernutrition is defined as a low body mass index for people aged ≥5 years. Underweight (low weight-for-age), wasting (low weight-for-height) and stunting (low height-for-age) are used to define undernutrition for people aged under 5 years. Sources of data used to produce estimates include journal articles; the World Bank SDG database (http://datatopics.worldbank.org/sdgs/); the WHO Global Health Observatory; and the WHO World Health Data Hub (https://data.who.int/).

ranged from US$ 76 (95% CI: US$ 60–94) in the Gambia to US$ 3700 (95% CI: US$ 2960–4440) in Mongolia.

Survey results have been used to inform approaches to health financing, service delivery and social protection that will reduce these costs *(36)*. They have also been used to produce model-based estimates of total costs faced by TB-affected households in other countries *(37)*.

In 2024, WHO requested all countries to report data about national policies related to financial and social protection for people with TB for the first time, as a starting point for assessment of the status of progress with respect to the new global target that everyone with TB should have access to a health and social benefits package (**Table 1**).[59]

In 2024, 122 countries reported having a national policy specifically related to social protection for people with TB and their households. The most common measure was free access to TB diagnosis (available in 118 countries) and treatment (available in 122 countries). Other forms of social protection were also reported: enablers to adhere to treatment (87 countries), cash-transfers (35 countries), support to help with food security (64 countries) and support to compensate for loss of income (47 countries).[60]

Many new cases of TB are attributable to five risk factors: undernutrition,[61] HIV infection, alcohol use disorders, smoking (especially among men) and diabetes (**Fig. 33**) *(38–41)*.[62] Multisectoral action is needed to address these and other determinants of TB, such as gross domestic product (GDP) per capita (**Fig. 34**) and poverty.[63]

The political declaration from the 2023 UN high-level meeting on TB includes commitments to strengthen multisectoral action and accountability (**Table 2**), including through use of the WHO multisectoral accountability framework for TB (MAF-TB) *(42)*. To illustrate how the MAF-TB can be used at national level, WHO has published a checklist that can be used for a baseline assessment, an operational guide and a compendium of country examples *(43–45)*.

Three key aspects of multisectoral accountability for the TB response at national level for which WHO collects data are multisectoral review of progress in the TB response and associated recommendations for action; the production of an annual TB report, to inform high-level review; and how different sectors of government are being engaged.

In 2024, 100 countries (including 23 of the 30 high TB burden countries) reported that they had a multisectoral review mechanism in place, up from 93 countries in 2020; this included representation from civil society and affected communities in 82 countries (including 23 of the 30 high TB burden countries), an improvement from 66 countries in 2020. A total of 124 countries reported publishing an annual TB report on progress towards national TB-related targets and commitments, including 27 of the 30 high TB burden countries. Beyond the health sector, the most widely engaged sectors of government were education (47% of countries), defence

[59] Following the establishment of this new target, standard methods for how to assess the coverage of a health and social benefits package among people with TB are being developed.

[60] Further details are provided in the report webpages (section 5.2).

[61] Previous reports included an estimate of the number of TB cases attributable to undernourishment. In this report, that estimate has been replaced by an estimate of the number of TB cases attributable to undernutrition, following a recent systematic review of the relative risk of developing TB among people with and without undernutrition.

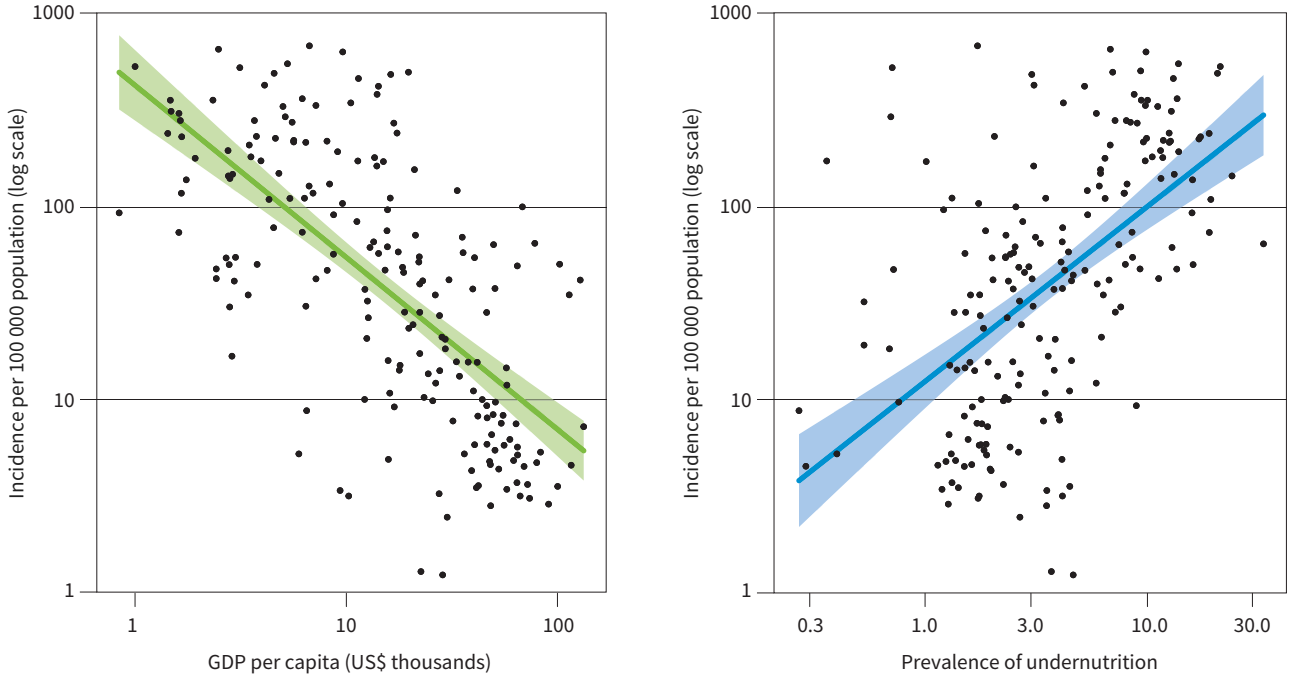
[62] Sources of data used to produce estimates include journal articles *(38–41)*, the World Bank SDG database, the WHO GHO and the WHO World Health Data Hub.

[63] SDG targets and indicators that are associated with TB incidence are described in **Annex 5**.

FIG. 34

The relationship between two SDG-related indicators and TB incidence per 100 000 population,[a,b] 2023

Each dot represents a country or area.



[a] The year of data used for GDP per capita and the population prevalence of undernutrition is the latest year for which data are available from the World Bank (https://data.worldbank.org/) and the WHO Global Health Observatory (https://www.who.int/data/gho), respectively.

[b] Undernutrition is defined as a low body mass index for people aged ≥5 years. The prevalence of undernutrition in the figure is the percentage of people aged ≥18 years with a body mass index <18.5.

(32%), justice (30%) and social development (26%). There is considerable scope to increase engagement in these key sectors and beyond.

In line with the global part of the MAF-TB and requests at the 2023 UN high-level meeting on TB (**Table 2**), WHO will continue to lead the coordination of global monitoring, reporting and review, and provide technical support and guidance to countries and partners. This work will continue to be informed by the WHO Civil Society Task Force on TB.

In 2024, WHO also initiated work on how climate change affects the TB epidemic and progress in response efforts. Particular attention is being given to three pathways through which climate change affects TB: food insecurity and undernutrition; displacement and migration of populations; and disruption to health systems. Building on an initial global consultation convened by WHO in October 2024, it is anticipated that an analytical framework on TB and climate change, and an associated research agenda, will be published in 2025.

TB research and innovation

Much more investment needed, new WHO vaccine initiatives hold promise

The End TB Strategy targets set for 2030 (**Box 2**) cannot be met without intensified research and innovation *(11)*. Major technological breakthroughs are urgently needed to accelerate the annual decline in the global TB incidence rate. Reductions in TB incidence achieved between 2015 and 2023 fall far short of the 2025 milestone of the strategy (8.3% compared with 50%).

Priorities include new vaccines to reduce the risk of infection, new vaccines or preventive drug treatments to cut the risk of TB disease in people already infected, rapid diagnostic tests for accurate detection of TB disease at the point of care, and simpler, shorter treatments for TB disease. WHO has developed a global strategy for TB research and innovation, which was adopted by all Member States in 2020 *(46)*. This aims to support accelerated TB research and innovation and improve equitable access to the benefits of research.

There is progress in the development of new TB diagnostics, drugs and vaccines.[64] However, this is constrained by the overall level of investment. Although

[64] A high-level summary is provided in this subsection. Further details are provided in the report webpages (section 6).

there have been modest increases in funding in recent years (**Fig. 35**), the most recently published data show a total of US$ 1.0 billion in 2022 *(47)*. This is only one fifth of the new target of US$ 5 billion per year by 2027 that was set at the second UN high-level meeting in 2023 (**Table 1**).

The diagnostic pipeline has expanded considerably in terms of the number of diagnostic classes, tests, products and methods in development. As of August 2024, there were more than 50 diagnostic tests for TB disease and infection in development. These include: low and moderate complexity automated nucleic acid amplification diagnostic tests; targeted next-generation sequencing and broth microdilution technology to test for TB disease; interferon-gamma release assays and TB antigen-based skin tests to test for TB infection; and computer-aided detection using digital chest radiography to identify people with a high likelihood of having TB disease.

As of August 2024, there were 29 drugs for the treatment of TB disease in Phase I, Phase II or Phase III trials *(48)*. This is an increase from eight drugs in 2015.

The 29 drugs comprise:

- 18 new chemical entities: alphibectir (BVL-GSK098), BTZ-043, delpazolid, GSK-286, ganfeborole (GSK-3036656), macozinone, MK-7762 (TBD09), quabodepistat (OPC-167832), TBAJ-587, TBAJ-876, TBI-223, pyrifazimine (TBI-166), TBA-7371, telacebec (Q203), sanfetrinem, SQ109, sutezolid, and sudapyridine (WX-081);
- three drugs that have already been approved by WHO for use in treatment. These are bedaquiline, delamanid and pretomanid; and
- eight repurposed drugs. These are clofazimine, levofloxacin, linezolid, moxifloxacin, rifampicin (high dose), rifapentine, sitafloxacin and tedizolid.

In addition, various combination regimens with new or repurposed drugs, as well as host-directed therapies, are in Phase II or Phase III/IV trials or being evaluated as part of operational research projects.

In August 2024, there were at least 30 clinical trials and implementation research studies underway to evaluate drug regimens and models of delivery for TB preventive treatment. Examples include a trial for the prevention of MDR-TB using delamanid, studies to assess how to optimize treatment administration in very young children and people living with HIV, studies to assess new models for delivery of TB preventive treatment, trials of thrice-weekly isoniazid and rifapentine for 1 month and trials of rifamycin monotherapies for durations of 6 or 8 weeks.

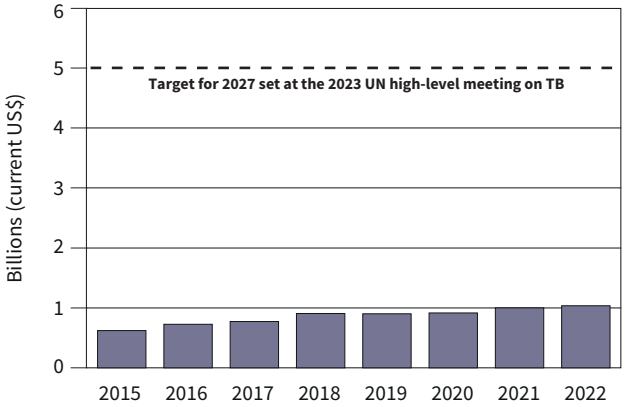
In August 2024, there were 15 vaccine candidates in clinical trials: four in Phase I, five in Phase II and six in Phase III. They included candidates to prevent TB infection and TB disease, and to help improve the outcomes of treatment for TB disease.

Effective vaccines are critical to achieve annual global and national reductions in TB incidence and mortality that are much faster than those achieved historically. Recent high-level actions by WHO to support the development and implementation of new TB vaccines, as well as other aspects of TB research and innovation, are summarized in **Table 4**.

When new evidence related to new TB drugs, diagnostic tests, treatment regimens and vaccines becomes available, it is reviewed by WHO and used to update WHO recommendations related to TB prevention, diagnosis and treatment. Several important updates were made in 2024 (**Box 4**).

FIG. 35

Funding for TB research, 2015–2022



Source: Treatment Action Group, Stop TB Partnership. Tuberculosis research funding trends 2005–2022. New York: Treatment Action Group; 2023 (https://www.treatmentactiongroup.org/resources/tbrd-report/tbrdreport-2023).

TABLE 4

WHO initiatives in TB research and innovation, 2023–2024 (ordered by month and year)

TIMING	ACTIVITY	RELEVANT COMMITMENTS AT THE 2023 UN HIGH-LEVEL MEETING ON TB *(9)*
September 2024	**TB trial platform** WHO convened a consultation on establishing a "trial platform" to fast track the testing and evaluation of promising regimens for treating TB. This initiative will establish a master protocol to evaluate multiple treatment regimens simultaneously, including through adaptive platform designs. The aim of this approach is to improve trial efficiency (compared with traditional methods) and foster collaboration among countries, clinical trial sponsors, funders and civil society.	Articles 67, 72, 73 and 74
May 2024	**TB vaccine accelerator council** WHO hosted the second meeting of the TB vaccine accelerator council *(49)*. Since the launch of the council in September 2023, WHO has convened a series of meetings to gather insights about the council's work on accelerating the translation of scientific breakthroughs into effective and accessible TB vaccines. Following discussions between WHO and council representatives, key goals and associated milestones for the council's first term, from 2024 to 2025, were agreed upon.	Article 76
March 2024	**Investment case for TB screening and preventive treatment** WHO released an investment case for TB screening and preventive treatment, aligned with the global target for coverage of TB preventive treatment agreed at the 2023 UN high-level meeting on TB. The investment case was developed collaboratively with Brazil, Georgia, Kenya and South Africa. It highlights that relatively modest investments could yield substantial health and economic benefits, offering a societal return of up to US$ 39 per dollar invested *(50)*.	Articles 39, 42, 45, 48, 49, 50, 53, 62, 65, 66, and 68
March 2024	**TB sequencing portal** WHO launched a TB sequencing portal to share the most advanced knowledge base for sequencing and phenotyping *Mycobacterium tuberculosis*. It was developed in collaboration with FIND and Unitaid. The portal features more than 56 000 sequences and visualizations of the data used in the WHO mutation catalogue *(51)*.	Article 55
February 2024	**Consultation on the translation of TB research into global policy guidelines** WHO convened this annual consultation to exchange views on emerging areas of need for global TB policy guidance, in the context of the existing landscape of evidence *(52)*.	Article 74
2023–2024	**BRICS TB research network** WHO continues to engage with and support various research platforms and networks, including serving as the Secretariat of the BRICS TB research network to accelerate collective efforts towards ending TB *(53)*.	Article 73

Box 4. WHO recommendations related to TB prevention, diagnosis and treatment issued in 2024

Several new WHO recommendations related to TB prevention, diagnosis and treatment were issued in 2024.

In March, recommendations on targeted next-generation sequencing were published as part of updated guidelines on TB diagnostics and an associated operational handbook *(20, 54)*.

In April, a recommendation for the co-administration of treatment for MDR/RR-TB and hepatitis C was released *(55)*.

In May, consolidated guidelines and an accompanying handbook on TB and comorbidities were published, which include content about HIV and mental health *(56, 57)*.

In August, updates to treatment recommendations for people with MDR/RR-TB were announced; these include a new 6-month regimen composed of bedaquiline, delamanid and linezolid, combined with levofloxacin or clofazimine or both, as well as options for 9-month regimens for people with MDR/RR-TB who do not have resistance to fluoroquinolones *(28)*.

In September, updated guidelines on TB preventive treatment were published, including a new recommendation for people exposed to MDR/RR-TB *(29, 58)*. Updated recommendations for concurrent diagnostic testing for TB in adults and adolescents living with HIV and in children were also published *(59)*. These recommendations include use of the LF-LAM assay in adults and adolescents living with HIV; molecular tests on respiratory specimens and stool in children; and concurrent use of molecular tests on respiratory samples, stool and the LF-LAM assay on urine in children living with HIV.

New WHO guidelines and operational handbooks, as well as training modules and other documents to support the production of evidence-based recommendations, can be found on the WHO TB Knowledge Sharing Platform *(60)*. The platform was launched in 2021 and is continually updated with the latest resources in different languages. Pages in Arabic and Portuguese were first released in mid-2024. A search tool based on artificial intelligence will be made available by the end of 2024.

4. Conclusions

All WHO and UN Member States have committed to ending the global TB epidemic, through their adoption of the End TB Strategy and SDGs. The 2030 targets of the End TB Strategy are a 90% reduction in the number of deaths caused by TB and an 80% reduction in the TB incidence rate, compared with levels in 2015; the 2025 milestones are reductions of 75% and 50%, respectively.

These commitments have been reaffirmed at two UN high-level meetings on TB, held in 2018 and 2023, and reinforced with additional targets related to funding, the provision of treatment to people with TB disease or TB infection, and the availability of new TB vaccines.

Ending TB remains a distant goal, but after serious setbacks during the worst years of the COVID-19 pandemic (2020 and 2021) there are several positive trends.

The global rise in the number of people falling ill with TB each year has slowed and started to stabilize; the global number of people dying from TB each year continues to fall; the WHO African and European regions have made good progress towards the 2025 milestones of the End TB Strategy; the globally reported number of people newly diagnosed with TB reached a new high in 2023; the treatment success rate for people with drug-susceptible TB has been sustained at a high level and continues to improve for people with drug-resistant TB; and the coverage of TB preventive treatment has been sustained for people living with HIV and continues to improve for household contacts of people diagnosed with TB.

Accelerating progress towards ending TB requires that commitments made at the 2023 UN high-level meeting on TB are translated into action.

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ANNEX 1

Basic facts about TB

Tuberculosis (TB) is an old disease. Studies of human skeletons show that it has affected humans for thousands of years *(1)*. Its cause remained unknown until 24 March 1882, when Dr Robert Koch announced his discovery of the bacillus responsible, subsequently named *Mycobacterium tuberculosis (2)*. The disease is spread when people who are sick with TB expel bacteria into the air (e.g. by coughing). TB typically affects the lungs (pulmonary TB) but can also affect other sites (extrapulmonary TB). Most people who develop the disease (about 90%) are adults and there are more cases among men than women.

Diagnostic tests for TB disease have improved substantially in recent years. There are now several rapid molecular tests recommended by WHO as the initial diagnostic test for TB, some of which can detect drug resistance simultaneously *(3)*. These tests can be used at the lower levels of the health system. A point-of-care lateral-flow test performed on urine is also recommended by WHO; its main use is to assist with diagnosis of TB in people with advanced HIV disease, in combination with rapid molecular tests. There are additional rapid molecular tests specifically for the detection of resistance to a variety of first- and second-line anti-TB drugs, while sequencing technologies can be used to provide a comprehensive individual profile of drug resistance. The older method of sputum smear microscopy (developed >100 years ago) is still widely used for TB diagnosis in low and middle-income countries but is increasingly being replaced with rapid tests.

Culture testing remains the reference standard for TB diagnosis. In addition, culture is required for the detection of resistance to newer anti-TB drugs and may also be used as a confirmatory test in settings and situations in which people have a low pre-test probability of having TB disease. Following diagnosis, culture or smear (as opposed to rapid molecular tests) are necessary to monitor an individual's response to treatment.

Without treatment, the death rate from TB is high. Studies of the natural history of TB disease in the absence of treatment with anti-TB drugs (conducted before drug treatments became available) found that about 70% of individuals with sputum smear-positive pulmonary TB died within 10 years of being diagnosed, as did about 20% of people with culture-positive (but smear-negative) pulmonary TB *(4)*.

Effective drug treatments were first developed in the 1940s.

The latest WHO treatment guidelines *(5)* include a strong recommendation for a 6-month regimen of isoniazid (H), rifampicin (R), ethambutol (E) and pyrazinamide (Z) for people with drug-susceptible TB (both pulmonary and extrapulmonary): all four drugs for the first two months, followed by H and R for the remaining 4 months. They also include newer recommendations that people aged 12 years and older with drug-susceptible pulmonary TB may be treated with a 4-month regimen of rifapentine (P), H, Z and moxifloxacin (M), and that children and adolescents between 3 months and 16 years of age with non-severe TB (and without suspicion or evidence of resistance to R and H) may be treated with a 4-month regimen (2 months of H, R, Z and sometimes also E, followed by 2 months of H and R). Treatment success rates of at least 85% for people enrolled on the 6-month regimen are regularly reported to WHO by its 194 Member States.

Treatment for people diagnosed with R-resistant TB (RR-TB) and multidrug-resistant TB (MDR-TB, defined as resistance to H and R) requires other regimens. The latest WHO recommendations *(6, 7)* prioritize two 6-month regimens. Nationally, treatment success rates for RR-TB reported to date have typically been in the range of 50–75%; the global average has been improving in recent years, reaching 68% in the most recent annual cohort of people enrolled on treatment for which data are available (2022). This may further improve with expanded use of the two 6-month regimens; for example, clinical trial data showed a treatment success rate of 89% for one of these regimens *(8)*. Treatment for extensively drug-resistant TB (XDR-TB, defined as resistance to R, any fluoroquinolone and at least one of bedaquiline or linezolid) remains much more difficult and treatment success rates are typically low.

A global modelling study published in 2016 estimated that about a quarter of the world's population had been infected with *M. tuberculosis (9)*. More recent analyses and commentary suggest that the number of those currently infected is lower, given that some people will clear the infection *(10, 11)*. Following infection, the risk of developing TB disease is highest in the first 2 years (approximately 5%), after which it is much lower *(12)*. The probability of developing TB disease is much higher among people living with HIV, and among people affected by risk factors such as undernutrition, diabetes, smoking and alcohol consumption.

Preventive treatment is available for people with

TB infection. Recommended options include: a weekly dose of H and P for 3 months (3HP), a daily dose of H and R for 3 months (3HR), a daily dose of H and P for 1 month (1HP), a daily dose of R for 4 months (4R), and a daily dose of H for 6 months (6H) or longer *(13)*.

The only licensed vaccine for prevention of TB disease is the bacille Calmette-Guérin (BCG) vaccine. The BCG vaccine was developed almost 100 years ago, prevents severe forms of TB in children and is widely used. There is currently no licenced vaccine that is effective in preventing TB disease in adults, either before or after exposure to TB infection; however, results from a Phase II trial of the M72/AS01E candidate are promising *(14)*. This vaccine is now in a Phase III trial, along with five other vaccine candidates.

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ANNEX 2

Data sources and access

A2.1 Database contents

The *Global tuberculosis report 2024* is based on data requested annually from 215 countries and areas, including all 194 World Health Organization (WHO) Member States. Data are stored in the global TB database, which is managed by the TB Monitoring, Evaluation and Strategic Information unit of the Global Tuberculosis Programme, at WHO headquarters.

The Global Tuberculosis Programme has implemented annual rounds of data collection since 1995. The main round of data collection for this report took place in April 2024 and May 2024. As in previous years, data were collected on the following: TB case notifications and treatment outcomes, including breakdowns by TB case type, age, sex, HIV status and drug resistance; laboratory diagnostic services; monitoring and evaluation, including surveillance and surveys specifically related to drug-resistant TB; contact screening and TB preventive treatment; digital systems for TB surveillance; TB infection control; engagement of all public and private care providers in TB prevention and care; community engagement; specific elements of the WHO multisectoral accountability framework for TB; budgets of national TB programmes (NTPs); use of general health services (hospitalization and outpatient visits) during treatment; and NTP expenditures. A shortened version of the questionnaire was used for high-income countries as defined by the World Bank[1] or low-incidence countries, defined as countries with an incidence rate of <20 cases per 100 000 population or <10 cases in total in 2022.

High TB burden countries and selected other regional priority countries were also asked to continue reporting monthly or quarterly provisional notification data. This process started in 2020 to monitor trends in the context of the COVID-19 pandemic.

Countries and areas reported data via a dedicated website.[2] Countries in the European Union submitted data on notifications and treatment outcomes to the TESSy system managed by the European Centre for Disease Prevention and Control (ECDC). Data from TESSy were uploaded into the WHO global TB database.

Additional data about the provision and completion of TB preventive treatment to people newly or currently enrolled in HIV care, detection of TB among people newly enrolled in HIV care, and provision of antiretroviral therapy for TB patients living with HIV were collected by the Joint United Nations Programme on HIV/AIDS (UNAIDS). These data were jointly validated by WHO and UNAIDS, and then uploaded into the WHO global TB database.

TABLE A2.1

Reporting of data in the 2024 round of global TB data collection

	COUNTRIES AND AREAS		WHO MEMBER STATES	
	NUMBER	NUMBER THAT REPORTED DATA	NUMBER	NUMBER THAT REPORTED DATA
African Region	47	47	47	47
Region of the Americas	45	40	35	34
South-East Asia Region	11	11	11	11
European Region	54	40	53	39
Eastern Mediterranean Region	22	21	21	20
Western Pacific Region	36	34	27	27
Global	**215**	**193**	**194**	**178**

Following review and follow-up with countries, the data used for the main part of this report were those that were available on **29 July 2024**. **Table A2.1** shows the number of countries and territories that had reported data by 29 July 2024.

Indicators in the Sustainable Development Goals (SDGs) associated with TB incidence were imported into the global TB database on **2 July 2024**. **Table A2.2** shows the data sources used.

Population estimates from the United Nations Population Division's 2024 revision of World Population Prospects[3] were imported into the global TB database on 2 July 2024 and used in the analyses for this report.

A2.2 Accessing TB data using the WHO website

Most of the data held in the WHO global TB database can be accessed via the WHO TB data web page.[4] This page provides comma-separated value (CSV) data files and data visualizations, as well as country, regional and global profiles.

[1] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups
[2] https://extranet.who.int/tme
[3] https://population.un.org/wpp/
[4] https://www.who.int/teams/global-tuberculosis-programme/data

TABLE A2.2

Data sources for indicators in the SDGs that are associated with TB incidence

SDG INDICATOR	DISPLAY NAME IN PROFILE	DATA SOURCE	NAME AT SOURCE	SOURCE URL
1.1.1	Population living below the international poverty line (% of population)	UN SDG database	Proportion of population below the international poverty line of US$1.90 per day	https://unstats.un.org/SDGAPI/v1/sdg/Series/Data?seriesCode=SI_POV_DAY1
1.3.1	Population covered by social protection floors/systems (% of population)	World Bank	Coverage of social protection and labor programs (% of population)	http://data.worldbank.org/indicator/per_allsp.cov_pop_tot
2.1.1 *(alternative)*	Prevalence of undernutrition (% of population aged ≥18 years)	WHO-GHO	Prevalence of underweight among adults, BMI <18.5 (crude estimate) (%)	https://ghoapi.azureedge.net/api/NCD_BMI_18C
3.3.1 *(alternative)*	HIV prevalence (% of population aged 15–49 years)	WHO-GHO	Prevalence of HIV among adults aged 15 to 49 (%)	https://ghoapi.azureedge.net/api/MDG_0000000029
3.4.1 *(alternative)*	Diabetes prevalence (% of population aged ≥18 years)	WHO-GHO	Raised fasting blood glucose (≥7.0 mmol/L or on medication) (age-standardized estimate)	https://ghoapi.azureedge.net/api/NCD_GLUC_04
3.5.2 *(alternative)*	Alcohol use disorders, 12 month prevalence (% of population aged ≥15 years)	WHO-GHO	Alcohol use disorders (15+), 12 month prevalence (%) with 95%	https://ghoapi.azureedge.net/api/SA_0000001462
3.a.1 *(alternative)*	Smoking prevalence (% of population aged ≥15 years)	WHO-GHO	Estimate of current tobacco smoking prevalence (%) (age-standardized rate)	https://ghoapi.azureedge.net/api/M_Est_smk_curr_std
3.8.1	UHC index of essential service coverage (based on 14 tracer indicators including TB treatment)	WHO-GHO	UHC index of essential service coverage	https://ghoapi.azureedge.net/api/UHC_INDEX_REPORTED
3.8.2	Greater than 10% of total household expenditure or income on health (% of population)	WHO-GHO	Catastrophic out-of-pocket health spending (SDG indicator 3.8.2)	https://ghoapi.azureedge.net/api/FINPROTECTION_CATA_TOT_10_POP
3.8.2 *(alternative)*	Health expenditure per capita, PPP (current international $)	World Bank	Current health expenditure per capita, PPP (current international $)	http://data.worldbank.org/indicator/SH.XPD.CHEX.PP.CD
7.1.2	Access to clean fuels and technologies for cooking (% of population)	World Bank	Access to clean fuels and technologies for cooking (% of population)	http://data.worldbank.org/indicator/EG.CFT.ACCS.ZS
8.1.1 *(alternative)*	GDP per capita, PPP (constant 2011 international $)	World Bank	GDP per capita, PPP (constant 2011 international $)	http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD
10.1.1 *(alternative)*	GINI index (0=perfect equality, 100=perfect inequality)	World Bank	GINI index (World Bank estimate)	http://data.worldbank.org/indicator/SI.POV.GINI
11.1.1	Population living in slums (% of urban population)	UN SDG database	Proportion of urban population living in slums (%)	https://unstats.un.org/SDGAPI/v1/sdg/Series/Data?seriesCode=EN_LND_SLUM

Data reported by countries, such as time series for case notifications and treatment outcomes, and WHO's estimates of TB disease burden, can be downloaded as CSV files covering all years for which data are available. They can be imported into many applications such as spreadsheets, databases and statistical analysis software. These files are the primary resource for anyone interested in conducting their own analyses of the records in the global TB database. A data dictionary that defines each of the variables available in the CSV files is also available.

The CSV files are generated on demand directly from the WHO global TB database, and may therefore include updates received after publication of the *Global tuberculosis report 2024*.

A2.3 Accessing TB data using the WHO Global Health Observatory

The WHO Global Health Observatory (GHO)[5] is a portal that provides access to data and analyses for monitoring the global health situation; it includes a data repository.

Data from WHO's global TB database can be viewed, filtered, aggregated and downloaded from within the GHO data repository.[6]

There is also an application programme interface (API)[7] using the open data protocol. The API allows analysts and programmers to use GHO data directly in their software applications.

[5] https://www.who.int/data/gho
[6] https://www.who.int/data/gho/data/themes/tuberculosis
[7] https://www.who.int/data/gho/info/gho-odata-api

ANNEX 3

WHO global lists of high TB burden countries

A3.1 Background

During the period 1998 to 2015, the concept of a "high burden country" (HBC) became familiar and widely used in the context of tuberculosis (TB). The first global list developed by the World Health Organization (WHO) consisted of 22 HBCs with approximately 80% of the world's TB cases; this was established in 1998. Subsequently two other HBC lists, for HIV-associated TB and multidrug-resistant TB (MDR-TB), were defined.

In 2015, three WHO global lists of HBCs – for TB, TB/HIV and MDR-TB – were in use. With a new era of the United Nations (UN) Sustainable Development Goals (SDGs) and the WHO End TB Strategy starting in 2016, a thorough review of the three lists was undertaken by the WHO Global Tuberculosis Programme in 2015 *(1)*. This included consideration of whether the lists should be modified (and if so how) or whether they should be discontinued. The outcome of the review was the definition of three new global HBC lists, of 30 countries each, for the period 2016–2020: one for TB, one for TB/HIV and one for MDR-TB.

WHO conducted a consultation process in 2020 and early 2021, as the basis for defining updated global HBC lists for 2021–2025.

A3.2 Global HBC lists being used by WHO, 2021–2025

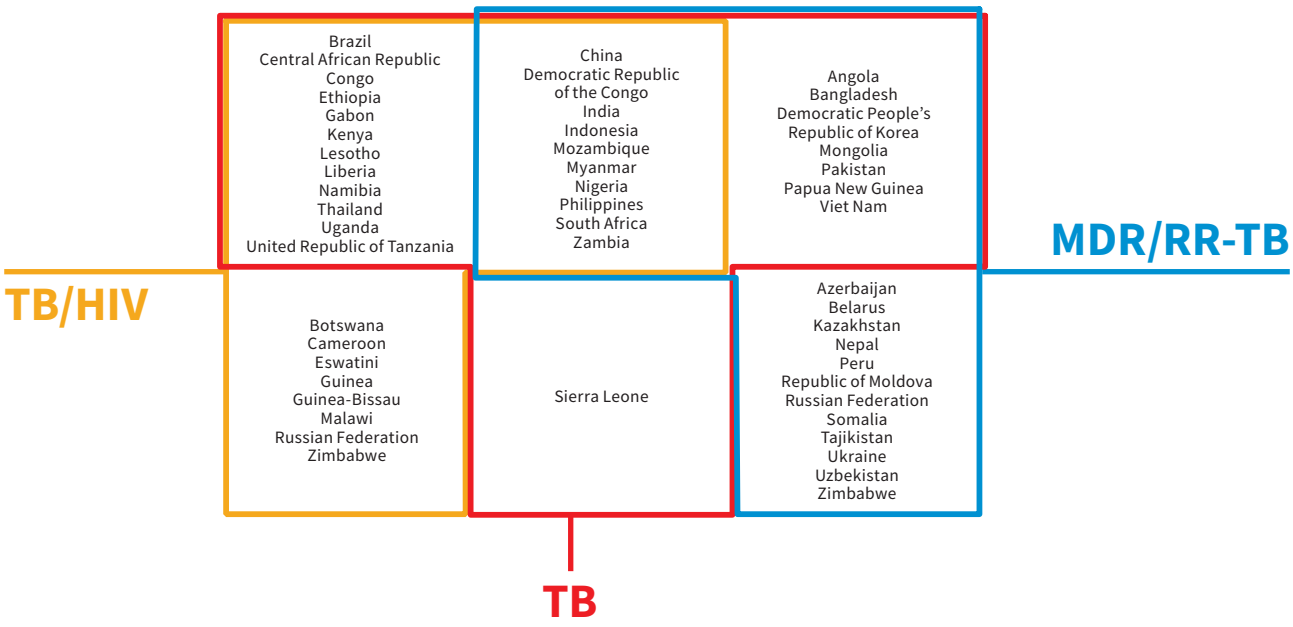
Three global HBC lists for 2021–2025 have been established: one for TB, one for HIV-associated TB and one for MDR/rifampicin-resistant TB (MDR/RR-TB). The lists were defined using the same criteria as those agreed for the 2016–2020 lists, in combination with the WHO estimates (for 2019) of the incidence of TB, HIV-associated TB and rifampicin-resistant TB that were published in WHO's *Global Tuberculosis Report 2020*. Full details are available in a background document *(2)*.

The criteria for all three lists are the same:

- the top 20 countries in terms of their estimated absolute number of new (incident) cases in 2019; plus
- the 10 countries with the most severe burden in terms of the incidence rate (new cases per 100 000 popula-

FIG. A3.1

The three global lists of high-burden countries for TB, HIV-associated TB and MDR/RR-TB being used by WHO in the period 2021–2025, and their areas of overlap



tion in 2019) that are not already in the top 20, and that meet a minimum threshold in terms of their absolute number of cases. The thresholds are 10 000 new cases per year for TB; and 1000 new cases per year for HIV-associated TB and rifampicin-resistant TB.

The 30 countries that are in each of the three lists are shown in **Fig. A3.1** and **Table A3.1**. There is overlap among the three lists, but 49 countries are in at least one of them. Each list accounted for 86–90% of the estimated global incidence in 2019.

The main changes compared with the previous lists for 2016–2020 were:

- **The 30 high TB burden countries.** Cambodia, the Russian Federation and Zimbabwe transitioned out of the list; Gabon, Mongolia and Uganda joined the list.
- **The 30 high TB/HIV burden countries.** Angola, Chad, Ghana and Papua New Guinea transitioned out of the list; Gabon, Guinea, the Philippines and the Russian Federation joined the list.
- **The 30 high MDR/RR-TB burden countries.** Ethiopia, Kenya and Thailand transitioned out of the list; Mongolia, Nepal and Zambia joined the list.

The lists provide a focus for global action on TB, HIV-associated TB and drug-resistant TB in the countries where progress is most needed to achieve the targets set in WHO's End TB Strategy, the UN SDGs and political declarations at UN high-level meetings on TB (**Box 1**, **Table 1**). They also help to build and sustain national political commitment and funding in the countries with the highest burden in terms of absolute numbers or severity and promote global monitoring of progress in a well-defined set of countries.

The 30 high TB burden countries are given particular attention in the report. Where estimates of disease burden and assessment of progress in the response are for HIV-associated TB or MDR/RR-TB specifically, the countries in the other two lists are given particular attention. Country profiles for all countries are available online, including in the report mobile app.

A3.3 Global TB watchlist

Alongside the three updated global HBC lists, WHO established a "global TB watchlist". This consists of the three countries that exited the global list of 30 high TB burden countries in 2021, but which nonetheless warrant continued attention and will remain a priority in terms of support from WHO. The three countries in the watchlist are Cambodia, the Russian Federation and Zimbabwe.

TABLE A3.1

Countries in the three global lists of high-burden countries for TB, HIV-associated TB and MDR/RR-TB being used by WHO in the period 2021–2025.

The red square indicates that a country is in a list.

COUNTRY	TB	TB/HIV	MDR/RR-TB
Angola	■		■
Azerbaijan			■
Bangladesh	■		■
Belarus			■
Botswana		■	
Brazil	■	■	
Cameroon		■	
Central African Republic	■	■	
China	■	■	■
Congo	■	■	
Democratic People's Republic of Korea	■		■
Democratic Republic of the Congo	■	■	■
Eswatini		■	
Ethiopia	■	■	
Gabon	■	■	
Guinea		■	
Guinea-Bissau		■	
India	■	■	■
Indonesia	■	■	■
Kazakhstan			■
Kenya	■	■	
Kyrgyzstan			■
Lesotho	■	■	
Liberia	■	■	
Malawi		■	
Mongolia	■		■
Mozambique	■	■	■
Myanmar	■	■	■
Namibia	■	■	
Nepal			■
Nigeria	■	■	■
Pakistan	■		■
Papua New Guinea	■		■
Peru			■
Philippines	■	■	■
Republic of Moldova			■
Russian Federation		■	■
Sierra Leone	■		
Somalia			■
South Africa	■	■	■
Tajikistan			■
Thailand	■	■	
Uganda	■	■	
Ukraine			■
United Republic of Tanzania	■	■	
Uzbekistan			■
Viet Nam	■		■
Zambia	■	■	■
Zimbabwe		■	■

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1. World Health Organization. Use of high burden country lists for TB by WHO in the post-2015 era (discussion paper). Geneva: World Health Organization; 2015 (https://www.who.int/publications/m/item/who-htm-tb-2015-29).
2. World Health Organization. WHO global lists of high burden countries for tuberculosis (TB), TB/HIV and multidrug/rifampicin-resistant TB (MDR/RR-TB), 2021–2025: background document. Geneva. World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/341980).

ANNEX 4

Updates to estimates of TB disease burden

The report includes estimates of tuberculosis (TB) incidence and mortality for the period 2010–2023, estimates of TB incidence and mortality disaggregated by age and sex for 2023, and estimates of the incidence of rifampicin-resistant TB (RR-TB) for the period 2015–2023. The methods used to produce these estimates were similar to those used for the *Global tuberculosis report 2023 (1)*; minor updates that were made are explained below.

The main data sources currently available to inform estimates of TB disease burden in the 30 high TB burden countries and three global TB watchlist countries (**Annex 3**) are summarized in **Table A4.1**.

Details about the methods used for all countries are provided in the report webpages[1] and the technical appendix.

Country-specific updates

A dynamic model previously used for Uzbekistan to estimate TB incidence and mortality in the period 2020–2022 was no longer considered necessary. This followed extensive review of data and discussions between the World Health Organization (WHO) and Uzbekistan's national TB programme (NTP) during a country mission. Estimates of TB incidence and TB mortality previously published for 2020–2022 have been revised downwards.

The Ministry of Health in Saudi Arabia reported new data on TB mortality to WHO. These data were extensively discussed with the NTP; they were assessed to be of high quality and were used to produce estimates of TB mortality for the period 2010–2023, replacing estimates published by the Institute for Health Metrics and Evaluation (IHME) that had previously been relied upon. Estimates have been revised downwards.

New data on the level of underreporting of people newly diagnosed with TB in China and associated discussions between WHO and national counterparts were used to estimate TB incidence in China in 2023.

Several additional countries made corrections to previously reported data or reported historical data that were previously missing, but these changes had limited or negligible impact on updated estimates.

General updates

In July 2024, the Joint United Nations Programme on HIV/AIDS (UNAIDS) published updated estimates of HIV prevalence and mortality *(2)* and the UN Population Division published updated population estimates *(3)*. These were used in replacement of previous estimates.

Since the publication of the *Global tuberculosis report 2023 (1)*, WHO has published updated estimates of all-cause and cause-specific mortality. These now extend to 2021 (instead of 2019). In this report, the 2021 estimates were used when comparing the number of deaths caused by TB with the numbers from other causes.

Anticipated updates

A repeat national inventory study was implemented in Indonesia in 2023 and results are now available.[2] Joint work between WHO and the NTP is planned so that the results can be directly used in the production of TB incidence estimates.

A third national TB prevalence survey was completed in Cambodia in July 2024. The final results (not available at the time of writing) will be used alongside findings from previous surveys (completed in 2002 and 2012) to update incidence estimates for the period 2010–2024, for publication in the 2025 edition of the global TB report.

Other updates in 2025 will be based on the outcomes of a meeting of the WHO Global Task Force on TB Impact Measurement in September 2024,[3] and associated follow-on work.

References

1. Global tuberculosis report 2023. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240083851).
2. The urgency of now: AIDS at a crossroads. Geneva: Joint United Nations Programme on HIV/AIDS; 2024 (https://www.unaids.org/en/resources/documents/2024/global-aids-update-2024).
3. 2024 revision of world population prospects. Geneva: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat; 2024 (https://population.un.org/wpp/).

[1] See in particular Box 1.1.1 in section 1.1 and Box 1.2.1 in section 1.2.

[2] See the "featured topics" component of the report webpages.

[3] https://www.who.int/groups/global-task-force-on-tb-impact-measurement

TABLE A4.1

Sources of data available to inform estimates of TB disease burden in the 30 high TB burden countries and the 3 global TB watchlist countries, 2010–2023.[a] Blue indicates that a source is available, orange indicates it will be available in the near future, and red indicates that a source is not available.

COUNTRY	NOTIFICATION DATA	STANDARDS AND BENCHMARK ASSESSMENT[b]	NATIONAL INVENTORY STUDY[c]	NATIONAL TB PREVALENCE SURVEY[d]	NATIONAL DRUG RESISTANCE SURVEY OR SURVEILLANCE[e]	NATIONAL VR DATA OR MORTALITY SURVEY[f]
Angola	2000–2023	2019, 2023	–	–	*2022*	–
Bangladesh	2000–2023	2019, 2022	–	2015	2011, 2019	–
Brazil	2000–2023	2018	–	NA	2008	2000–2022
Cambodia	2000–2023	2018, 2022	–	2002, 2011 | 2023–2024	2001, 2008, 2017	[g]
Central African Republic	2000–2023	2019, 2022	–	–	2009	–
China	2000–2023	–	2018, 2022	2000, 2010	2007, 2013, *2020*, *2022*	2004–2021
Congo	2000–2023	2019, 2022	–	–	–	
Democratic People's Republic of Korea	2000–2023	2017	–	2016	2014	
Democratic Republic of the Congo	2000–2023	2019, 2022	–	–	2017	–
Ethiopia	2000–2023	2016, 2023	–	2011	2005, 2018, *2018*, *2020*	–
Gabon	2000–2023	2018, 2020	–	–	–	–
India	2000–2023	2019	2016	2019–2021	2016, *2020*	2000–2019
Indonesia	2000–2023	2019, 2022	2017, 2023	2013–2014	2018	2006–2007, 2009–2015
Kenya	2000–2023	2017, 2021	2013	2015	2014, 2020	–
Lesotho	2000–2023	2017, 2022	–	2019	2014, *2019–2022*	–
Liberia	2000–2023	2015, 2019	–	–	–	–
Mongolia	2000–2023	2015, 2018	2025	2014–2015	2007, 2016, *2018–2022*	2016–2019
Mozambique	2000–2023	2013	–	2017–2019	2007, 2022, *2021–2022*	–
Myanmar	2000–2023	2017, 2022	–	2009, 2018	2003, 2008, 2013, *2018*, *2020*	–
Namibia	2000–2023	2019, 2022	–	2017–2018	2008, 2015, 2018, *2020–2022*	
Nigeria	2000–2023	2020, 2023	–	2012	2010, *2022*	–
Pakistan	2000–2023	2019, 2022	2012, 2017	2011	2013, *2019–2020*	2006, 2007, 2010
Papua New Guinea	2000–2023	2017, 2023	–	–	2014, *2019–2020*	–
Philippines	2000–2023	2016, 2019	2025	2007, 2016	2004, 2012, 2019, *2021–2022*	2000–2014, 2016–2019
Russian Federation	2000–2023	2017	–	NA	*2016–2022*	2000–2023
Sierra Leone	2000–2023	2015, 2020	–	–	–	–
South Africa	2000–2023	2019, 2022	2022	2017–2019	2002, 2014, *2021–2022*	2000–2017
Thailand	2000–2023	2013	–	2012	2001, 2006, 2012, 2018	2000, 2002–2019
Uganda	2000–2023	2019, 2023	–	2014–2015	2011, *2018–2019*	–
United Republic of Tanzania	2000–2023	2018, 2023	–	2012	2007, 2018, *2021–2022*	–
Viet Nam	2000–2023	2019, 2023	2017	2007, 2017–2018	2006, 2012, *2018*, *2020–2022*	–
Zambia	2000–2023	2016, 2020	–	2014	2000, 2008, 2020, *2018–2021*	–
Zimbabwe	2000–2023	2019, 2022	–	2014	2016, *2018–2020*, *2022*	–

NA, not applicable; VR, vital registration

[a] Data for the period 2000–2009 can inform estimates for the period 2010–2023 and are shown for this reason. The 3 global TB watchlist countries are Cambodia, the Russian Federation and Zimbabwe.

[b] The WHO TB surveillance checklist of standards and benchmarks is designed to assess the quality and coverage of notification data, VR data and surveillance data related to drug-resistant TB, HIV co-infection and childhood TB. The second edition of the WHO TB surveillance checklist also includes an assessment of surveillance related to TB care and TB prevention. If more than two assessments have been done, the years of the last two only are shown.

[c] Studies are planned in Mongolia, the Philippines and Viet Nam for 2025. Prioritization of TB inventory studies is recommended in countries where a large share of TB care is provided to people with TB outside the existing NTP network.

[d] Brazil does not meet the following criteria recommended by the WHO Global Task Force on TB Impact Measurement for implementing a national prevalence survey: TB incidence ≥150 per 100 000 population per year, no VR system and under-5 mortality rate (probability of dying by age of 5 per 1000 live births) is >10.

[e] Data points are shown for people without a history of previous TB treatment only. Data are available from continuous surveillance (indicated by italics in blue cell) based on routine diagnostic testing in Angola, China, Ethiopia, India, Kenya, Lesotho, Mongolia, Mozambique, Myanmar, Namibia, Pakistan (subnational only), the Philippines, South Africa, Uganda, the United Republic of Tanzania, Viet Nam, Zambia and Zimbabwe.

[f] Years of data availability for Indonesia, Mongolia, Pakistan and South Africa were provided to WHO by IHME.

[g] Input data used to inform the covariates for estimating TB mortality in Cambodia available here: Ma, J., Vongpradith, A., Ledesma, J.R. et al. Progress towards the 2020 milestones of the end TB strategy in Cambodia: estimates of age and sex specific TB incidence and mortality from the Global Burden of Disease Study 2019. BMC Infect Dis 22, 904 (2022). https://doi.org/10.1186/s12879-022-07891-5.

ANNEX 5

The WHO TB-SDG monitoring framework

In 2017, the World Health Organization (WHO) developed a framework for monitoring of indicators in the United Nations (UN) Sustainable Development Goals (SDGs) that are strongly associated with tuberculosis (TB) incidence. This was done as part of the preparations for the first global ministerial conference on TB *(1)*, building on previously published work that identified clear linkages between a range of social, economic and health-related indicators and TB incidence *(2–4)*.

In 2024, the framework was updated, with undernutrition replacing undernourishment as the selected indicator for SDG 2. This followed the publication of a systematic review related to the risk of TB in people with and without undernutrition *(5)*.

The TB-SDG monitoring framework comprises 14 indicators under seven SDGs (**Table A5.1**).

For SDG 3, the framework includes seven indicators:

- coverage of essential health services;
- proportion of the population with large household expenditures on health as a share of total household expenditure or income;
- current health expenditure per capita;
- HIV prevalence;
- prevalence of smoking;
- prevalence of diabetes; and
- prevalence of alcohol use disorders.

For SDGs 1, 2, 7, 8, 10 and 11, the seven indicators selected for monitoring are:

- proportion of the population living below the international poverty line;
- proportion of the population covered by social protection floors or systems;
- prevalence of undernutrition;
- proportion of the population with primary reliance on clean fuels and technology;
- gross domestic product (GDP) per capita;
- Gini index for income inequality; and
- proportion of the urban population living in slums.

Collection and reporting of data for the 14 indicators does not require any additional data collection and reporting efforts by national TB programmes (NTPs). Nor does it require data collection and reporting efforts that go beyond those to which countries have already committed in the context of the SDGs. At the global level, the UN has established a monitoring system for SDG indicators, and countries are expected to report data on an annual basis via the appropriate UN agencies (including WHO). Therefore, analysis of the status of, and trends in, the 14 indicators related to TB can be based primarily on data held in the UN's SDG database.

In some cases, the official SDG indicator was not considered the best metric, and a better (but closely related) alternative was identified and justified (one under SDG 2, five under SDG 3, one under SDG 8 and one under SDG 10). In such cases, the data sources are one of the following: WHO, the Organisation for Economic Co-operation and Development (OECD), the Joint United Nations Programme on HIV/AIDS (UNAIDS) or the World Bank.

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1. Monitoring and evaluation of TB in the context of the Sustainable Development Goals in Policy Briefs: WHO Global Ministerial Conference Ending TB in the Sustainable Development Era: Multisectoral Response. Geneva: World Health Organization; 2017. (https://www.who.int/publications/m/item/moscow-conference---policy-brief).
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TABLE A5.1

TB-SDG monitoring framework: indicators to monitor within SDG 3

SDG 3: Ensure healthy lives and promote well-being for all at all ages					
SDG TARGETS FOR 2030	**SDG INDICATORS**	**ALTERNATIVE INDICATORS TO MONITOR**	**RATIONALE**	**DATA SOURCE**	**COLLECT DATA FOR TB PATIENTS SPECIFICALLY?**
3.3 End the epidemics of AIDS, TB, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	**3.3.1** Number of new HIV infections per 1000 uninfected population **3.3.2** TB incidence per 100 000 population	HIV prevalence	HIV is a strong risk factor for development of TB disease and is associated with poorer treatment outcomes. HIV prevalence is selected in preference to HIV incidence because it is directly measured.	UNAIDS WHO	Yes, already routinely collected. NA
3.4 Reduce premature mortality by one third from non-communicable diseases and promote mental health and well-being	**3.4.1** Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease	Prevalence of diabetes	Diabetes is a strong risk factor for development of TB disease, although a link with TB incidence at the national (as opposed to individual) level has been difficult to establish due to confounding. Diabetes prevalence is more relevant than mortality for TB since it directly influences the risk of developing TB.	WHO	Could be considered at country level, to inform planning of care for comorbidities.
3.5 Strengthen prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol	**3.5.2** Alcohol consumption per capita per year (in litres of pure alcohol) among those aged ≥15 years (harmful level defined nationally)	Prevalence of alcohol use disorders	Alcohol use is a strong risk factor for TB disease and poorer treatment outcomes at the individual level, although a link with TB incidence at the national (as opposed to individual) level has been hard to establish due to confounding. The prevalence of alcohol use disorders is the most relevant indicator in the context of TB.	WHO	Could be considered at country level, to inform planning of care for comorbidities.
3.8 Achieve Universal Health Coverage (UHC), including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	**3.8.1** Coverage of essential health services (defined as the average coverage of essential services based on 16 tracer interventions). **3.8.2** Proportion of population with large household expenditures on health as a share of total household expenditure or income	NA NA	Achieving UHC is required to achieve the three high-level targets of the End TB Strategy for reductions in the TB incidence rate, reductions in the number of TB deaths and elimination of catastrophic total costs for TB-affected households (defined as >20% of household income).	WHO	TB treatment coverage has been monitored for years and is one of the 14 tracer indicators that have been selected to measure SDG indicator 3.8.1. There is a TB-specific indicator that is complementary to 3.8.2 (see **Box 3** of the main report).
3.a Strengthen implementation of the WHO Framework Convention on Tobacco Control	**3.a.1** Age-standardized prevalence of current tobacco use among those aged ≥15 years	Prevalence of smoking among those aged ≥15 years (%)	Smoking is a strong risk factor for TB disease at the individual level, although a link with TB incidence at the national (as opposed to individual) level has been difficult to establish due to confounding.	WHO	Could be considered (e.g. to inform access to smoking cessation interventions).
3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States	**3.c.1** Health worker density and distribution	Current health expenditure per capita	Health expenditure per capita is negatively correlated with TB incidence.	WHO	No

AIDS, acquired immune deficiency syndrome; HIV, human immunodeficiency virus; NA, not applicable; SDG, Sustainable Development Goal; TB, tuberculosis; UHC, universal health coverage; UNAIDS, Joint United Nations Programme on HIV/AIDS; WHO, World Health Organization.

TB-SDG monitoring framework: indicators to monitor beyond SDG 3

SDG TARGETS FOR 2030	SDG INDICATORS	ALTERNATIVE INDICATORS TO MONITOR	RATIONALE	DATA SOURCE	COLLECT DATA FOR TB PATIENTS SPECIFICALLY?
SDG 1: End poverty in all its forms everywhere					
1.1 Eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	**1.1.1** Proportion of population living below the international poverty line	NA	Poverty is a strong risk factor for TB, operating through several pathways. Reducing poverty should also facilitate prompt health-care seeking. Countries with higher levels of social protection have lower TB burden. Progress on both indicators will help to achieve the End TB Strategy target to eliminate catastrophic costs for TB patients and their households.	UN SDG database, World Bank	No
1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and achieve substantial coverage of the poor and vulnerable	**1.3.1** Proportion of population covered by social protection floors/ systems	NA			Could be considered (e.g. to facilitate access to social protection).
SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture					
2.1 End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food year-round	**2.1.1** Prevalence of undernourishment	Prevalence of undernutrition among those aged ≥18 years (%)	Prevalence of undernutrition among those aged ≥18 years (%). A recent systematic review published in 2024 has provided estimates of the relative risk of TB among people with and without undernutrition (defined as a body mass index of <18.5 kg/m^2 among those aged ≥18 years).	WHO	Should be considered (e.g. weight collected from all TB patients to inform the need for nutritional support).
SDG 7: Ensure access to affordable, reliable, sustainable, and modern energy for all					
7.1 Ensure universal access to affordable, reliable and modern energy services	**7.1.2** Proportion of population with primary reliance on clean fuels and technology	NA	Indoor air pollution is a risk factor for TB disease at the individual level. There has been limited study of ambient air pollution but it is plausible that it is linked to TB incidence.	WHO	No
SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all					
8.1 Sustain per capita growth in accordance with national circumstances and, in particular, at least 7% GDP growth per year in the least developed countries	**8.1.1** Annual growth rate of real GDP per capita	GDP per capita	Historic trends in TB incidence are closely correlated with changes in the absolute level of GDP per capita (but not with the growth rate).	World Bank	No
SDG 10: Reduce inequality within and among countries					
10.1 Achieve and sustain income growth of the bottom 40% of the population at a rate higher than the national average	**10.1.1** Growth rates of household expenditure or income per capita, overall and for the bottom 40% of the population	Gini index for income inequality	TB is a disease of poverty. Decreasing income inequalities combined with economic growth should have an effect on the TB epidemic.	World Bank OECD	No
SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable					
11.1 Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	**11.1.1** Proportion of urban population living in slums, informal settlements or inadequate housing	NA	Living in a slum is a risk factor for TB transmission due to its link with overcrowding. It is also a risk factor for developing TB disease, due to links with air pollution and undernutrition.	UN SDG database	No

GDP, gross domestic product; NA, not applicable; OECD, Organisation for Economic Co-operation and Development; SDG, Sustainable Development Goal; TB, tuberculosis; UN, United Nations; WHO, World Health Organization.

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