R&D for **Tuberculosis**

How new tools can transform the fight

GHTC global health technologies coalition

Tuberculosis (TB) has burdened humanity for thousands of years. Today, it is the world's leading infectious disease killer: 10.8 million people fell ill with TB and 1.25 million died in 2023 alone. Additionally, growing resistance to available drugs is making the disease more deadly and difficult to treat.

To end the epidemic, new technologies to prevent, treat, and diagnose TB are urgently needed, including a new vaccine with better protective efficacy, shorter and safer treatment regimens, and improved diagnostics designed specifically for underserved populations and low-resource settings.

1.25 million
die annually from TB

400,000 people
develop MDR-TB each year

$16.7 trillion
cost of MDR-TB to global economy by 2050

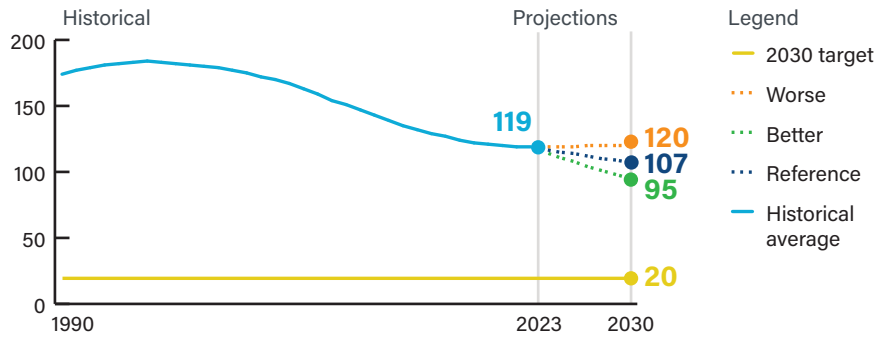
Research successes

Technologies have transformed the fight against TB:

- **Bedaquiline**, a drug for multidrug-resistant TB (MDR-TB) developed with NIH and USAID support, was approved by the FDA in 2012. A pediatric version was later approved in 2020.
- The **first child-friendly TB medicines**, developed with USAID support, were introduced in 2016. They are appropriately dosed, dissolvable, and fruit-flavored.
- Pretomanid, a **drug for highly drug-resistant TB** (DR-TB), developed with USAID and NIH support, was approved by the FDA in 2019. Pretomanid-based regimens have dramatically improved DR-TB treatment outcomes and reduced treatment time from up to two years to six months.
- A **shorter, four-month treatment regimen for drug-susceptible TB**, developed with CDC and NIH support, was endorsed by the World Health Organization in 2022, marking the first major advancement in drug-susceptible treatment in nearly 50 years.
- 3HP and 1HP, **short-course preventative regimens to stop latent TB** from becoming active, developed with CDC and NIH support, were introduced in 2011 and 2018, respectively, making treatment more tolerable and shorter (one to three months versus six).
- New **diagnostic innovations**, including the Xpert and Truenat rapid, automated molecular tests, which are suitable for lower-level health facilities.

Continued progress is possible, not inevitable

New cases of TB per 1,000 people



Key missing tools

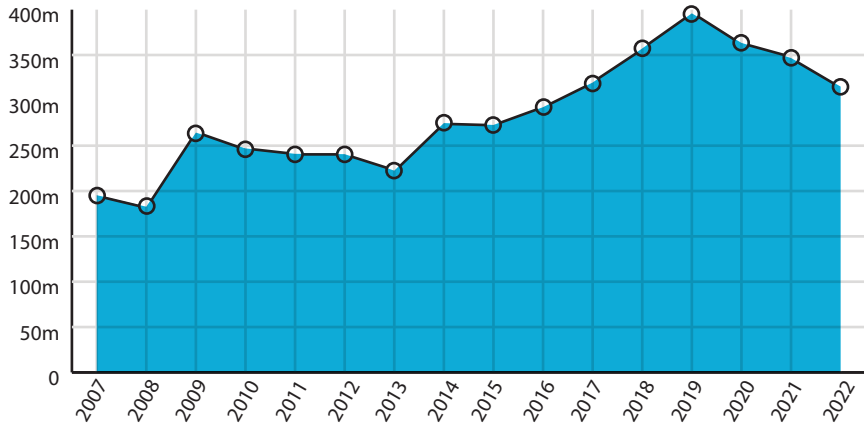
To end TB, we need new prevention and treatment tools, including:

- **Shorter, safer, and simpler treatment regimens** for active TB that include both novel drugs and next-generation versions of existing drugs to improve tolerability, acceptability, adherence, and treatment outcomes and address rising drug resistance.
- **Specifically dosed and formulated treatment regimens** for pregnant people and children.
- **New vaccines** for prevention and treatment that are cost-effective, safe for pregnant people, and protect across ages. The current vaccine, developed in 1921, is effective at preventing some types of TB in infants, but it offers inconsistent protection in adults against pulmonary TB.
- **Rapid, non-sputum-based, point-of-care diagnostics** that are accurate, affordable, and suitable for use in low-resource settings and primary health care facilities, as well as **rapid DR-TB tests** that enable treatment to be tailored to individuals and help safeguard against drug resistance.

Breakthroughs on the brink

- **Twenty-two new or repurposed drugs for TB are in clinical development**, including 11 from a new class or with a new mechanism of action. Ongoing research will determine how to optimally combine this next generation of new drugs to further shorten the duration and improve the efficacy and safety of TB treatment regimens and preserve the longevity of new agents and drug classes against the development of drug resistance.
- There are **17 potential preventative and therapeutic TB vaccines in development**, including a vaccine candidate, M72/AS01E, currently in a Phase 3 trial, that shows promise in preventing pulmonary TB in adolescents and adults and, if proven successful, could become the first new TB vaccine in more than 100 years.

US government investment in TB R&D for low-resource settings (in 2022) US$ millions



- **New approaches and strategies for TB vaccine research** are invigorating the field, including research on new routes of administration, such as using inhaled, aerosolized TB vaccines and mRNA technology, and new models for vaccine testing, including preclinical animal and in vitro models that can mirror humans.
- **New, innovative methods to administer treatment**, such as long-acting injectable agents, microarray patches, and implants, may lower the cost and burden of treatment by reducing the frequency and number of treatments that patients need. Nanomedicine is another area that could have the potential to reduce drug doses and side effects, improving treatment compliance.
- More portable and affordable **chest X-ray screening devices**, **point-of-care ultrasound devices**, **digital stethoscopes**, and **cough apps** that use **artificial intelligence** are in the research pipeline, along with **less-expensive, next-generation urine- and swab-based molecular tests**, all of which could contribute to bringing care closer to patients and improving diagnostics access for underserved populations.

US Government R&D efforts

The US government is leading efforts to advance research and development (R&D) to end the TB epidemic through a whole-of-government approach:

- **National Institutes of Health** (NIH) conducts basic, translational, and clinical research to accelerate the development of new tools to diagnose, prevent, and treat TB.
- **US Agency for International Development** (USAID) supports R&D for new TB diagnostics and drugs. The agency also works with CDC and NIH to support basic and applied R&D for MDR-TB as part of the National Action Plan for Combating Multidrug-Resistant Tuberculosis.
- **Centers for Disease Control and Prevention** (CDC) supports clinical and epidemiological research for TB through national and international partnerships, such as the TB Trials Consortium, which has supported the development and implementation of new TB technologies and significantly improved global TB treatment and prevention guidelines.
- **Department of Defense** has funded research on TB vaccines, drugs, and diagnostics through the Congressionally Directed Medical Research Programs (CDMRP) and other contracts, but, to enable the former, TB must be added each year to the CDMRP list of eligible diseases.
- **Food and Drug Administration** (FDA) administers the Tropical Disease Priority Review Voucher Program to incentivize investment in products for neglected diseases, including TB, and implements an expedited approval pathway for antibiotics that can apply to DR-TB products.

Scan this code or visit ghtcoalition.org/resources-item/healthareas for a list of data references.

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