

## Tuberculosis: Disease Overview

Tuberculosis (TB) is a **bacterial infection** that spreads through lymph nodes and bloodstream and is **typically found in the lungs**; TB is one of the world's deadliest diseases.<sup>1</sup>

### Disease progression

*Infection:* As an **air-borne** disease, TB is typically spread through person-to-person interactions with an infected individual (esp. through coughing and sneezing).

#### Progression:

- *Latent TB:* Even after being infected with TB bacteria, **the majority of people do not show symptoms**. This is because TB bacteria can remain inactive for long periods of time. People with so-called latent TB (about one-third of the world) are unable to spread the disease to others; however, these people face a 10% likelihood of getting active TB in the course of their lifetime.<sup>2</sup>
- *Active TB:* For TB bacteria to cause major health damage or death, they have to become active. Typically that happens **when the immune system weakens** due to other factors (e.g., HIV/AIDS, malnutrition).<sup>3</sup> Typical symptoms, which can last for months, include fever, cough, weight loss, etc.

*Outcomes:* When left **untreated**, TB destroys affected tissue and leads to **death in two-thirds of people**.<sup>4</sup>

### Prevention, diagnosis, and treatment

TB is both preventable and curable.

*Prevention:* In most countries with significant TB prevalence (does not include the US), the basic prevention tool is the **BCG vaccine** that is administered to children.<sup>5</sup> In addition, medication can prevent latent TB bacteria from becoming active. Therefore, even people with latent TB should receive medical care. Finally, with 20% of TB attributable to smoking, cigarette avoidance is another key prevention tactic.<sup>6</sup>

*Diagnosis:* The most common ways to diagnose TB include a **skin test** (Mantoux reaction) and **blood test**. Individuals with positive test results (typically due to latent TB) undergo **X-rays** to test for TB disease.

*Treatment:* Typical treatment for TB involves a six-month course of **four antimicrobial drugs**.<sup>7</sup> Since compliance with the regimen is key to treatment effectiveness, the WHO recommends “directly observed therapy” (DOTS) where a patient consistently takes the medication in front of a healthcare worker.

A key problem in the recent years has been the emergence of **multi-drug resistant TB** (MDR-TB) and extensively drug-resistant TB (XDR-TB), which are caused by bacteria that do not respond to regular TB drugs. These forms of TB can be treated by more expensive second-line drugs, typically taken over the course of two years. MDR-TB is currently responsible for about 3-4% of all TB cases.<sup>8</sup>

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<sup>1</sup> WebMD. Lung Disease and Respiratory Health Center. “What is Tuberculosis?” Retrieved September 10, 2013.

(<http://www.webmd.com/lung/understanding-tuberculosis-basics>).

<sup>2</sup> WHO. “Tuberculosis”. Retrieved September 10, 2013. (<http://www.who.int/mediacentre/factsheets/fs104/en/index.html>).

<sup>3</sup> WebMD (ibid.)

<sup>4</sup> WHO (ibid.)

<sup>5</sup> CDC, “XDR-TB”, Retrieved September 11, 2013

<sup>6</sup> WHO (ibid.)

<sup>7</sup> WHO (ibid.)

<sup>8</sup> BIO Ventures for Global Health, “Global Health Primer”, Retrieved September 10, 2013.

(<http://www.bvgh.org/Biopharmaceutical-Solutions/Global-Health-Primer/Diseases/cid/ViewDetails/ItemID/14.aspx>).

## Worldwide burden of disease

TB is the **second-largest cause of infection-related deaths** worldwide, killing approximately 1.4M per year and leading to 8.7M new infections per year.<sup>9</sup> Although anyone can get TB, people with weakened immune systems are at greatest risk.

TB **prevalence has reduced drastically** since the introduction of antibiotics in the 1950s (with the number of deaths per year falling by 41% since 1990). The world is on track to meet the Millennium Development Goal of reversing the spread of TB by 2015.<sup>10</sup> Also, with the exception of Africa, most regions are on track to reduce TB mortality by 50% by 2015 relative to 1990 (one of the Stop TB Partnership targets).<sup>11</sup>

## Differences in incidence and care

*Geography:* **Twenty-two high-burden countries** (primarily in Asia and Africa but also including Russia and Brazil) account for 80% of TB cases. Among those **China and India** account for half of the cases.<sup>12</sup> Over 95% of deaths occur in low- and middle-income countries.

*Population groups:* TB is the leading cause of death for **HIV-infected** people, causing about a quarter of those deaths.<sup>13</sup> Risk of active TB is also correlated with other conditions that compromise the immune system. There are also gender inequalities: worldwide TB is the third-largest killer of **women** age 15-44.<sup>14</sup>

## Key success factors

As suggested by WHO's Stop TB strategy, the key inputs into managing the global TB burden include:

- Expanding and enhancing access to directly observed treatment;
- Addressing TB/HIV co-infection issues, MDR-TB, and the needs of vulnerable populations;
- Strengthening health systems with a focus on primary care;
- Engaging all providers to promote the standard of care for TB;
- Empowering TB patients and communities;
- Promoting and enabling research for new drugs, vaccines, and diagnostics as well as operational studies of current tools.<sup>15</sup>

## Conclusion

Though the world is on track to meet the TB MDG by 2015, problems persist. Almost 80% of people living with TB do not have access to the WHO-recommended DOTS strategy.<sup>16</sup> Moreover, the emergence of MDR-TB and XDR-TB means that cost of treatment can go up from about \$2K/person to almost \$250K/person. TB eradication will require sustained multilateral and bilateral efforts (incl. significant funding flows through organizations like The Global Fund) that include greater patient and provider engagement, a focus on health systems, and continued research investments.<sup>17</sup>

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<sup>9</sup> WHO (ibid.)

<sup>10</sup> WHO (ibid.)

<sup>11</sup> STOP TB Partnership. "About Us". Retrieved September 11, 2013. (<http://www.stoptb.org/about/>)

<sup>12</sup> BIO Ventures for Global Health (ibid.). Also WHO, "Global Tuberculosis Report 2012", ([http://www.who.int/tb/publications/global\\_report/en/index.html](http://www.who.int/tb/publications/global_report/en/index.html))

<sup>13</sup> WHO (ibid.)

<sup>14</sup> STOP TB Partnership (ibid.)

<sup>15</sup> BIO Ventures for Global Health (ibid.)

<sup>16</sup> WHO (ibid.)

<sup>17</sup> CDC (ibid.)

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