

### :: Box 3.3

## Updated and interim estimates of TB disease burden in India and plans for a national TB prevalence survey in 2017/2018

The estimates of TB disease burden in India published in the 2011–2015 global TB reports were based on the outcomes of a national consensus workshop held in Delhi in April 2011. This report includes estimates for India that have been revised substantially upwards compared with those published in 2011–2015, following accumulating evidence that the TB disease burden in India is higher than was estimated at that time.

The revised estimates of TB incidence (absolute numbers) are based on extrapolation of the results from a prevalence survey in one state (Gujarat). This survey used methods recommended by WHO and is the largest as well as the only state-wide prevalence survey implemented in India to date. It was assumed that the national prevalence of TB disease is the same as the prevalence in Gujarat, with incidence then estimated using a standard methodological approach recently reviewed by the WHO Global Task Force on TB Impact Measurement.<sup>a</sup> The trend in TB incidence is estimated as in global reports published 2011–2015; that is, using results from repeat tuberculin surveys (2000, 2010) and (to a lesser extent) trends in TB notifications in the districts where the Revised National TB Control Programme first implemented the DOTS strategy.

The revised estimates of TB mortality are derived from those published by IHME,<sup>b</sup> after adjustment for differences between WHO and IHME estimates of the total number of deaths each year.

These updated estimates of TB burden in India are considered *interim estimates*, pending results from a national TB prevalence survey that is scheduled to start in 2017 (see also [Section 3.4](#)).

The revised estimates, and how they compare with those published in the 2015 global TB report, can be summarized as follows:

- The updated estimate of incidence (new TB cases per year) is 2.8 million cases in 2015 (217 per 100 000 population), and 2.9 million (223 per 100 000 population) in 2014. These figures can be compared with notifications of 1.7 million new and relapse cases in 2015 (127 per 100 000 population) and 1.6 million new and relapse cases in 2014 (124 per 100 000 population). These figures suggest that 56% of incident cases were officially reported in 2014 and 59% in 2015. In the 2015 global TB report, the estimate for 2014 was that there were 2.2 million incident cases (167 per 100 000 population), with an estimated 74% of incident cases officially reported.
- The updated estimate of the number of TB deaths (excluding those in HIV-positive people, which are classified as deaths due to HIV/AIDS in ICD-10) is 478 000 in 2015 (36 per 100 000 population), and 483 000 (37

per 100 000 population) in 2014. In the 2015 global TB report, the estimate for 2014 was 220 000 (17 per 100 000 population).

- Estimated trends in TB incidence and mortality remain similar to those published in previous years, with incidence falling by 2% per year over 2000–2015 and mortality falling by 3.3% per year over the same period.

The six sources of evidence that the burden of TB is higher than estimated in April 2011 are summarized below.

### 1. Household survey in 30 districts of numbers of people on TB treatment, 2011

Starting in 2011, a TB project that aimed to increase civil society's support to the NTP in India and to engage communities and community-based care providers was implemented in 374 out of 650 districts.<sup>c</sup> The 374 districts were selected based on suspected low TB case detection or limited access of populations to health services. Funding for the project was from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund).

In a sample of 30 of the 374 districts, the number of people on TB treatment based on self-reporting was assessed using a dataset compiled as part of a survey of knowledge, attitudes and practices conducted from January to March 2011. Of the self-reported cases, 54% had not been officially reported to national authorities. The number of undetected cases could not be assessed because of the study design. For comparison, the estimate published in the 2015 global TB report was that 59% of incident cases were officially reported in 2010 (with the gap of 41% including both unreported and undetected cases).

### 2. Results from a state-wide prevalence survey in Gujarat state

In 2011, a prevalence survey was conducted in Gujarat. This was the country's first state-wide survey (other surveys have been conducted in districts that were not nationally representative). Results were shared with WHO in 2015, and indicated a prevalence (adjusted for all ages and all forms of TB) of 390 cases per 100 000 population. This is much higher than the national estimate published by WHO in the 2015 global TB report of 250 prevalent cases per 100 000 population. Gujarat is among the wealthiest states in India, and given the link between overall levels of income and the burden of TB disease it seems unlikely that TB prevalence in Gujarat would be higher than the national average.

### 3. A district level household and facility survey (DLHS-4)

A survey in 2012–2013 estimated prevalence based on interview screening at 592 cases per 100 000. However, this method for estimating prevalence is not recommended in the WHO handbook on TB prevalence surveys.

#### 4. A study of sales of anti-TB drugs, 2014

A study of sales of anti-TB drugs in 2014 was published in 2016.<sup>d</sup> The study indicated that there were 17.8 million patient-months of TB treatment in the private sector, twice as many as in the public sector. The authors noted that if 40–60% of private-sector TB diagnoses are correct, and if private-sector TB treatment lasts on average 2–6 months, then about 2.2 million (range 1.2 million to 5.3 million) TB cases were treated in the private sector in 2014.<sup>e</sup> This is 2–3 times higher than the level assumed when the April 2011 workshop on TB disease burden estimates (mentioned above) was held.

#### 5. A large increase in national case notifications in 2013–2015

India implemented a policy of mandatory TB notification in 2012 and has also rolled out a national web-based reporting system since 2012. In 2014, the number of notified cases increased by 29% compared with 2013, and the number of notified cases in 2015 was 34% higher than the level of 2013. Most of the increase is related to improved coverage of notifications from the private sector in a small number of districts.

#### 6. Analyses of TB mortality by IHME

IHME has used a large body of cause-of-death data from VR and verbal autopsy surveys, including data that are not yet accessible to WHO, to estimate TB mortality in India. The estimated number of TB deaths is much higher than previously published WHO estimates.

<sup>a</sup> Glaziou P, Sismanidis C, Pretorius C, Floyd K. Methods used by WHO to estimate the Global burden of TB disease. arXiv preprint arXiv:1603.00278. 2016;(http://arxiv.org/abs/1603.00278, accessed 24 August 2016).

<sup>b</sup> <http://vizhub.healthdata.org/cod>

<sup>c</sup> Satyanarayana S, Nair SA, Chadha SS, Shivashankar R, Sharma G, Yadav S et al. From where are tuberculosis patients accessing treatment in India? Results from a cross-sectional community based survey of 30 districts. PLoS One. 2011;6(9):e24160.

<sup>d</sup> Arinaminpathy N, Batra D, Khaparde S, Vualnam T, Maheshwari N, Sharma L et al. The number of privately treated tuberculosis cases in India: an estimation from drug sales data. Lancet Infect Dis. 2016;16:30259–30256 ([http://www.download.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(16\)30259-6.pdf](http://www.download.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(16)30259-6.pdf), accessed 25 August 2016).

<sup>e</sup> This is consistent with an earlier study of drug sales in 2008 and 2009. See Wells WA, Ge CF, Patel N, Oh T, Gardiner E, Kimerling ME. Size and usage patterns of private TB drug markets in the high burden countries. PLoS One. 2011;6(5):e18964. doi: 10.1371/journal.pone.0018964.

defines the standards that need to be met for notification data to provide a direct measure of TB incidence.<sup>1</sup> By August 2016, a total of 42 countries, including 19 of the 30 high TB burden countries (listed in [Table 3.2](#)) had completed the checklist, often in association with a TB epidemiological review or regional workshop focused on analysis of TB data ([Fig. 3.1](#)).

Methods currently used by WHO to estimate TB incidence can be grouped into four major categories, as follows ([Fig. 3.2](#)):

1. **Case notification data combined with expert opinion about case-detection gaps.** Expert opinion, elicited in regional workshops or country missions, is used to estimate levels of underreporting and underdiagnosis. Trends are estimated through mortality data, surveys of the annual risk of infection or exponential interpolation using estimates of case-detection gaps for 3 years. In this report, this method is used for 74 countries that accounted for 22% of the estimated global number of incident cases in 2015.
2. **Results from TB prevalence surveys.** Incidence is estimated using prevalence survey results and estimates of the duration of disease, with the latter derived from a model that accounts for the impact of HIV co-infection on the distribution of disease duration. This method is used for 20 countries, 19 of which have national survey data and one – India – that has a survey in one state. The 20 countries accounted for 62% of the estimated global number of incident cases in 2015.
3. **Notifications in high-income countries adjusted by a standard factor to account for underreporting and underdiagnosis.** This method is used for 118 countries: all high-income countries except the Netherlands and the United Kingdom, plus selected upper-middle income countries with low levels of underreporting, including Brazil and China. For three countries (France, Republic of Korea and Turkey) the adjustment was country specific, based on results from studies of underreporting. These 118 countries accounted for 15.5% of the estimated global number of incident cases in 2015.
4. **Results from inventory studies and capture-recapture analysis.** This method is used for five countries: Egypt, Iraq, the Netherlands, the United Kingdom and Yemen. These countries accounted for 0.5% of the estimated global number of incident cases in 2015.

Further details about these methods are provided in the [online technical appendix](#)<sup>2</sup> and in background documents prepared for the global review of methods used to produce TB burden estimates that was held in April 2015 ([Box 3.1](#)).<sup>3</sup>

<sup>1</sup> World Health Organization. Standards and benchmarks for tuberculosis surveillance and vital registration systems: checklist and user guide. Geneva: WHO; 2014 (<http://www.who.int/tb/publications/standardsandbenchmarks/en/>, accessed 24 August 2016).

<sup>2</sup> The online technical appendix is available at [www.who.int/tb/data](http://www.who.int/tb/data).

<sup>3</sup> All background documents are available at [www.who.int/tb/advisory\\_bodies/impact\\_measurement\\_taskforce/meetings/consultation\\_april\\_2015\\_tb\\_estimates\\_subgroup/en/](http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/consultation_april_2015_tb_estimates_subgroup/en/)