

# Methods to estimate number of child household contacts less than 5 years old eligible for latent tuberculosis treatment

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## Background

Coverage of LTBI treatment among child household contacts less than 5 years old is one of top-10 indicators for monitoring implementation of the End TB Strategy. However, monitoring and evaluation of LTBI management is often challenging due to lack of standard indicators and reporting and reporting systems, involvement of multiple service providers, and difficulty in collecting denominators (i.e. number eligible for preventive treatment). In order to facilitate implementation of LTBI treatment and measuring progress both at the national and global levels, we estimated the number of child household contacts less than 5 years old eligible for LTBI treatment by country. The estimates were discussed and endorsed by the WHO LTBI Task Force.

## Methods

Low TB burden countries (LBC) are defined as 113 high-income or upper middle-income countries with an estimated incident rate of less than 100/100,000 population, which are primary targets of the WHO Guidelines on the management of LTBI.<sup>1</sup> The rest of the countries are defined as high TB burden countries (HBC).

In low TB burden countries, the number of child household contacts eligible for LTBI treatment is defined as number of children under 5 years of age who are household contacts of bacteriologically confirmed pulmonary TB cases and have LTBI. In high TB burden countries, the number eligible is defined as number of child household contacts without active TB based on the current WHO recommendations which do not require LTBI testing prior to preventive treatment in these countries.<sup>2</sup>  
<sup>3</sup> We did not provide estimates for countries or territories with populations < 300 000.

Table 1 shows parameters used in the estimates. Country specific values were used for the following parameters: number of notified bacteriologically confirmed pulmonary TB cases; national proportion of children <5 years of age; and national average household size. The other parameters were assumed to be constant across countries due to lack of country level data. Prevalence of LTBI among child household contacts < 5 years of age and average size of TB cluster per household were estimated by conducting systematic review of literature and meta-analyses. The proportion of children with active TB among those who had a household contact with TB cases was calculated using number of children sharing household with an individual with TB and number of children developing active TB disease estimated in a previous modelling study.<sup>4</sup>

**Table 1. Parameters and sources**

| Parameters  | Values   | Sources   |
|---|--|---|
| Number of notified bacteriologically confirmed pulmonary TB in 2015                                       | Differ by country                                  | WHO global TB database  |
| National proportion of children <5 years of age in 2015   | Differ by country                                  | 2015 Revision of World Population, United Nations Population Division ( <a href="https://esa.un.org/unpd/wpp/">https://esa.un.org/unpd/wpp/</a> ) |
| National average household size   | Differ by country                                  | National censuses, DHS statistical year books, or official websites of the national statistical authorities                                       |
| Prevalence of LTBI among child household contacts <5years old in LBC                                      | Constant across countries = 27.6% (19.2%-38.0%)    | Systematic review of literature from LBC up to Dec 2015 (unpublished)   |
| Average cluster size of active TB per household   | Constant across countries =1.06 (95%CI 1.04-1.08)  | Systematic review of literature between Jan 2005 and Dec 2015 (unpublished)   |
| Proportion of children < 5 years old with active TB among those who had a household contact with TB cases | Constant across countries =6.1% (95%CI 1.0%-16.3%) | Source: Dodd et al, Lancet Glob Health. 2014 <sup>4</sup>   |

The estimates were calculated as follows:

- 1) [Average number of children < 5 years old per household (A)]  

$$=[\text{Proportion of children} < 5 \text{ years old}] \times [\text{Average household size}]$$
- 2) [Number of households with at least one notified bacteriologically confirmed pulmonary TB case (B)]  

$$=[\text{Number of notified bacteriologically confirmed pulmonary TB}] \times [\text{Average cluster size of active TB per household}]$$
- 3) [Number of child household contacts < 5 years old (C)]  

$$=(A) \times (B)$$
- 4) [Number of child household contacts < 5 years old without active TB (D)]  

$$=(C) \times (1 - [\text{Proportion of children} < 5 \text{ years old with active TB among those who had a household contact with TB cases (0.061)}])$$
- 5) [Number of child household contacts < 5 years of age with LTBI]  

$$=(D) \times [\text{Prevalence of LTBI among child household contacts} < 5 \text{ years old (0.276)}]$$

The estimates incorporated the following sources of uncertainty: uncertainty in prevalence of LTBI, average size of TB cluster per household, and proportion of child household contacts with active TB. We used fixed population estimates from the United Nations Population Division and uncertainty in

the values was not incorporated. Ninety-five percent confidence intervals of the estimates were calculated assuming normal distribution.

1. World Health Organization Guidelines on the Management of Latent Tuberculosis Infection Geneva, Switzerland: WHO, 2015.
2. World Health Organization Recommendations for Investigating Contacts of Persons with Infectious Tuberculosis in Low- and Middle-Income Countries Geneva, Switzerland: WHO, 2012.
3. World Health Organization. Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource-constrained settings. Geneva, Switzerland: WHO, 2011.
4. Dodd PJ, Gardiner E, Coghlan R, Seddon JA. Burden of childhood tuberculosis in 22 high-burden countries: a mathematical modelling study. *Lancet Glob Health*. 2014;2(8):e453-9.