Two methods for setting child-focused tuberculosis care targets

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Objective: To allocate resources for household contact investigations, tuberculosis (TB) programs need estimates of the numbers of child contacts requiring care.

Design: We developed two methods to estimate annual numbers of child contacts aged 0–14 years requiring evaluation and treatment. Method 1 combines local data using simple formulas. Using publicly available data, Method 2 uses a linear regression model based on Demographic and Health Survey and World Bank data to estimate the number of children per household, then combines these results with case notifications and risk estimates of disease and infection.

Results: Applying Method 1 to data from Malawi indicated that every year ~21 000 child contacts require evaluation and ~1900 should be diagnosed with TB. Applying Method 2 to all countries suggested that, globally, 2.41 million (95% uncertainty interval [UI] 2.36–2.46) children aged <5 years, and 5.07 million (95%UI 4.81–5.34) children aged 5–14 years live in households of adult patients with known TB. Of these, 239 014 (95%UI 118 649–478 581) and 419 816 (95%UI 140 600–1 268 805), respectively, will have TB. An additional 848 453 (95%UI 705 838–1 017 551) and 2 660 885 (95%UI 2 080 517–3 413 189), respectively, will be infected.

Conclusion: It is feasible to use available data to set programmatic evaluation and treatment targets to improve care for child contacts of patients with TB.

Although around 1 million children fall sick with tuberculosis (TB) each year, only 359 000 pediatric cases were notified in 2014.[1,2] Household contact investigations are an important method of finding children with TB and identifying contacts who would benefit from preventive therapy. Children living in the households of adult patients with TB are at high risk for tuberculous infection, TB disease, and death.[3–5] These children are accessible because the adult patients are already accessing care for TB. The World Health Organization (WHO) recommends an evaluation of household contacts of patients with TB in all settings,[6] and many country guidelines contain this recommendation, but routine implementation is variable.[7] In addition, many countries recommend preventive therapy for child contacts, although specific guidelines vary by country. To facilitate planning and resource allocation, national TB programs (NTPs) would benefit from estimates of the number of children they should expect to evaluate and treat for disease or infection if they were to perform household contact investigations routinely around adult patients with known TB.

We present an approach that countries, districts, or cities can use to set annual TB care targets based on the number of children to be evaluated via household contact investigations, the number of children expected to have TB disease, and the number who will require preventive therapy.

METHODS

We propose two methods, a preferred one that uses local data that are available in some settings, and a cruder method using publicly available data, which is applicable to any country. The general principle behind these methods is that multiplying the number of infectious adult cases with TB by the number of children likely to be found in each adult patient's household yields the number of children who require evaluation for TB.[8] Multiplying this number by appropriate risk estimates yields the number of children expected to have TB disease and tuberculous infection on contact investigation. All of these estimates are restricted to children in the households of adults who have been diagnosed with TB.

All statistical analyses were performed using SAS 9.3 (Statistical Analysis Software Institute, Cary, NC, USA) or R for Mac 3.0.2.

Method 1: Setting programmatic targets using locally available data
Potential data sources

Many countries conduct censuses that enumerate population counts by age group and number of households. Demographic and Health Surveys (DHS) (https://www.dhsprogram.com), which are population-representative surveys carried out periodically in certain countries, also provide household size data.

NTPs collect reports of all diagnosed TB cases in the country. Subnational data are usually available locally, as reports are collected at the health facility level and aggregated up to the national level for reporting to the WHO.[2] Furthermore, reporting forms in many countries include disaggregation of cases by age group and type of TB (e.g., pulmonary vs. extra-pulmonary). This makes it possible to determine the number of reported adult pulmonary TB cases, which represent the most infectious cases that have been diagnosed.

Country-specific estimates of TB disease and tuberculous infection risks among child contacts are usually unknown unless routine high-quality household contact investigations are being performed, or a population representative study has been carried out to determine this risk. If neither is the case, then generalized risk estimates can be used.[3,9]

TABLE 1 Formulas for estimating the number of children in households of adult patients with pulmonary TB who will require preventive therapy during a 1-year period, based on four policies

Policy recommendation after TB disease has been ruled out	Estimation method*
Preventive therapy given to all child contacts aged 0–14 years with a positive TST or IGRA result	$P = (E_{0-4} \times I_{0-4}) + (E_{5-14} \times I_{5-14})$
Preventive therapy given to all child contacts aged 0–4 years	$P = E_{0-4} - T_{0-4}$
Preventive therapy given to all child contacts aged 0–4 years, and child contacts aged 5–14 years with a positive TST or IGRA result	$P = (E_{0-4} - T_{0-4}) + (E_{5-14} \times I_{5-14})$
Preventive therapy given to all child contacts aged 0–4 years, and child contacts aged 5–14 years with HIV infection	$P = (E_{0-4} - T_{0-4}) + (E_{5-14} \times H_{5-14})$

*P = number of children estimated to require preventive therapy over a 1-year period.
$E_{\text{age group}}$ = number of children in specified age group estimated to require evaluation over a 1-year period
$I_{\text{age group}}$ = risk of tuberculous infection without disease among contacts in specified age group
$T_{\text{age group}}$ = number of children in specified age group estimated to require treatment over a 1-year period
$T_{\text{age group}}$ = number of children in specified age group expected to require treatment for TB disease following household contact investigation over a 1-year period
H = HIV prevalence in children 5–14 years old
TB = tuberculosis; TST = tuberculin skin test; IGRA = interferon gamma release assay; HIV= human immunodeficiency virus.

Child contacts requiring evaluation

The average number of children per household is estimated by dividing the number of children by the number of households. Multiplying the number of annually reported adult pulmonary TB cases by the average number of children per household estimates the number of child household contacts requiring evaluation in one year. This calculation assumes that all adult patients with TB live in households, and that there is only one adult patient per household. For a given region, this calculation is summarized as follows:

$$E_{age} = \frac{C_{age}}{H} \times A,$$

where E = the estimated number of child contacts in a specific age group requiring evaluation in one year, C = the number of children in the age group, H = the number of households, and A = the number of adult pulmonary TB cases reported in the previous year.

Child contacts expected to have tuberculosis disease

To estimate the number of child contacts requiring treatment, E is multiplied by the estimated proportion of child contacts with TB disease at the time of the contact investigation (D). If possible, this should be done separately for the 0–4 and 5–14 year age groups, as disease risk varies between younger and older children.[3] Therefore, in one year, the number of children expected to require treatment for TB disease following household contact investigation (T) is calculated as follows:

$$T = (E_{0-4} \times D_{0-4}) + (E_{5-14} \times D_{5-14}).$$

Child contacts expected to require preventive therapy

Multiplying E by the estimated proportion of child contacts who have tuberculous infection without disease at the time of contact investigation (I) yields the annual number of infected child contacts. However, national policies differ as regards the eligibility of child household contacts for preventive therapy, and not all require testing for tuberculous infection. Table 1 presents methods of estimating the number of children expected to require preventive therapy (P) in a 1-year period, according to four different policies.

Method 2: Crude national programmatic targets based on publicly available data
Children per household

We used DHS data to estimate the average number of children per household. For each country, we used the most recent survey that

included the household survey component. We calculated point estimates and 95% confidence intervals (95%CI) for the number of children aged 0–4 and 5–14 years (SAS 9.3 SURVEYMEANS procedure).

To estimate the average number of children per household in countries where DHS data were not available, we constructed linear regression models for the two age groups. We included countries with DHS data in the models, with point estimates for the average number of children per household as the response variable. Observations were weighted by the inverse of the standard error around these point estimates. Candidate predictor variables were demographic and socio-economic indicators that were available for all countries for 2012 from the World Bank (http://data.worldbank.org/indicator). We considered: fertility (births per woman), life expectancy, per cent of the population aged <15 years, per cent of the population that is female, per cent of the population living in rural areas, deaths among children aged <5 years per 100 live births, and gross national income per capita based on purchasing power parity. We used manual backward elimination with assessment for confounding to produce the final multivariable models, and used the final model to produce point estimates and 95% prediction intervals for the average number of children per household in countries without a DHS.

Child contacts requiring evaluation

We used the numbers of TB cases notified in 2014[10] to calculate the number of adult pulmonary TB cases diagnosed in each country. We calculated the proportion of all TB cases that were pulmonary, and applied this proportion to the total number of adult cases. For countries without age-disaggregated data, we assumed all notified pulmonary cases to be adult. For countries lacking 2014 case notification data, we used 2013 data.

For each country, we multiplied the assumed number of adult pulmonary TB cases by the estimated average number of children per household, by age group (0–4 and 5–14 years), to estimate the number of child contacts requiring evaluation in a 1-year period. To produce point estimates and their 95% uncertainty intervals (95%UI) for each country, we first drew 1000 different potential values for the average number of children per household based on the point estimate and its prediction interval (or confidence interval for DHS-based estimates), assuming that this variable was normally distributed. We then multiplied each of the 1000 potential values for each country and age group by the assumed number of adult pulmonary cases in that country (with no uncertainty). Hence, we produced 1000 estimates of the number of

TABLE 2 Pooled risks of TB disease and tuberculous infection without disease among child contacts at the time of contact evaluation, adapted from a 2013 meta-analysis[3]

Country income level	Child contact age years	Percentage with TB disease		Percentage with tuberculous infection without disease	
		Pooled estimate	(95%CI)	Pooled estimate	(95%CI)
Low/middle	0–4	10.0	(5.0–18.9)	35.5	(30.3–41.1)
	5–14	8.4	(2.8–22.6)	53.1	(42.0–63.9)
High	0–4	4.7	(3.4–6.4)	16.3	(9.2–27.0)
	5–14	2.9	(1.7–5.1)	18.4	(11.8–27.5)

TB= tuberculosis; CI = confidence interval.

child contacts requiring evaluation, taking the median of these estimates as the point estimate and the 2.5th and 97.5th percentiles as the lower and upper uncertainty bounds.

Child contacts expected to have tuberculosis disease and tuberculous infection

To estimate the numbers of children expected to have TB disease and tuberculous infection on contact investigations, we applied risk estimates from a 2013 meta-analysis[3] (Table 2) to the estimates of children requiring evaluation. This meta-analysis reported pooled estimates of the proportion of child contacts diagnosed with TB disease and the proportion of child contacts diagnosed with tuberculous infection without disease (using tuberculin skin testing) at the time of contact investigation, stratified by country income level. We used risk estimates for high-income or low-/middle-income countries based on the 2015 World Bank classification of country income level. We applied separate risk estimates for the 0–4 and 5–14 year age groups, and estimated children with disease and infection separately.

To produce point estimates and uncertainty intervals, we estimated the standard error of the natural logarithm of the risk estimates from their confidence intervals, assuming that they were normally distributed. We then produced 1000 estimates of the log-transformed risk estimate for each age group and country income level, assuming they were normally distributed. For each country and age group, we multiplied the 1000 estimates of the number of child contacts requiring evaluation by the 1000 exponentiated risk estimates, matching sequentially. We took the median of the resulting 1000 estimates as the point estimate and the 2.5th and 97.5th percentiles as the lower and upper uncertainty bounds.

RESULTS

Method 1: Example of care targets based on locally available data

In 2014, a total of 10 508 adult pulmonary TB cases (age ≥15 years) were reported to the Malawi NTP. According to the 2008 census, Malawi had 2 869 933 households,[11] 2 370 011 children aged 0–4 years, and 3 638 690 children aged 5–14 years.[12] Thus, each household had an average of 0.8 children aged 0–4 years and 1.2 children aged 5–14 years. Assuming minimal annual change in the number of diagnosed adult pulmonary cases and in average children per household, approximately 8414 child household contacts aged 0–4 years and 12 918 child household contacts aged 5–14 years require an evaluation each year.

Applying estimated risks of TB disease for low- and middle-income countries (Table 2) to all child contacts in the country suggests that, annually, around 841 children aged 0–4 years and 1085 children aged 5–14 years would have TB at the time of the con-

tact investigation. Malawi's NTP guidelines indicate that once TB disease has been ruled out, all child contacts aged 0–60 months, as well as older child contacts with the human immunodeficiency virus (HIV), should receive isoniazid preventive therapy.[13] Therefore, around 7572 child contacts aged 0–4 years are eligible for preventive therapy annually. The prevalence of HIV infection among children aged 5–14 years is unknown, but estimating a 2.7% prevalence (the prevalence reported among 15–17 year olds in the 2010 Malawi DHS,[14] which is likely to be higher than in the younger age group) would suggest an additional 319 child contacts requiring preventive therapy because of HIV infection.

The same data sources allowed us to make district-level estimates for the 28 districts of Malawi (data not shown), which the Malawi NTP is using to plan contact investigation activities.

Method 2: Crude national-level care targets

We used DHS data to estimate the average number of children per household for 69 countries. Multivariable models for the association between the number of children per household and demographic indicators in these countries (Table 3) indicated that the number of children aged 0–4 years per household was predictable based on fertility, percentage of the population aged 0–14 years, mortality rate in children aged <5 years, and life expectancy at birth (adjusted R^2 = 0.80). The number of children aged 5–14 years per household was predicted based on the percentage of the population aged 0–14 years, mortality rate in children aged <5 years, and life expectancy at birth (adjusted R^2 = 0.71). Estimates of the average number of children per household for all countries are provided in Appendix Table A.1.

Based on 2014 adult case notifications, we estimated that, globally, 2.41 million (95%UI 2.36–2.46) children aged <5 years, and 5.07 million (95%UI 4.81–5.34) children aged 5–14 years require evaluation annually because they live in households with a known adult patient with pulmonary TB (Table 4). Of these, 239 014 (95%UI 118 649–478 581) child contacts aged <5 years and 419 816 (95% UI 140 600–1 268 805) child contacts aged 5–14 years are expected to have TB disease at the time of the contact investigation (Table 5). An additional 848 453 (95%UI 705 838–1 017 551) child contacts aged <5 years and 2 660 885 (95%UI 2 080 517–3 413 189) child contacts aged 5–14 years are expected to have tuberculous infection without disease (Table 6). Estimates for all 184 countries and territories where data were available are provided in Appendix Table A.2.

In 30 (17%) of the 174 countries and territories that reported age-disaggregated TB data in 2014, the number of notified pediatric TB cases was less than 20% of the number expected. In 20 (11%) countries, the number of pediatric cases reported exceeded the upper bound of the estimated number of cases expected; 12 (60%) of these countries are classified as having low TB incidence (≤10 cases per 100 000).[2]

TABLE 3   Association between number of children per 100 households and demographic indicators among 69 countries with Demographic and Health Surveys

Parameter	Model for children aged 0–4 years*		Model for children aged 5–14 years†	
	Parameter estimate	(95% prediction interval)	Parameter estimate	(95% prediction interval)
Fertility (change for each birth per woman)	7.41	(1.54 to 13.30)	Not included in model	
Per cent population aged 0–14 years (change per 1% increase)	1.37	(0.55 to 2.19)	3.58	(2.68 to 4.49)
Death rate in children aged <5 years (change for each death per 100 live births)	2.10	(0.04 to 4.16)	5.12	(1.24 to 8.99)
Life expectancy at birth (change per year)	0.87	(0.06 to 1.69)	1.98	(0.40 to 3.55)
Intercept	–82.5	(–145.82 to –19.19)	–165.23	(–289.91 to –40.64)

*Adjusted R^2 = 0.80.
†Adjusted R^2 = 0.71.

DISCUSSION

Health systems currently collect abundant data on patients with TB, but these data are rarely used for any purpose other than reporting to an NTP or to the WHO. However, existing data can enable NTPs and their partners to plan interventions and monitor impact at local or national level.[15] The simple methods proposed are intended to support efforts to expand and improve contact investigations, which, if implementation is incomplete, represent millions of missed opportunities to find, treat, and prevent TB in children. Care targets can help to quantify the staffing, drug supply, and health system capacity required to treat the children who are consequently diagnosed with TB disease and tuberculous in-

fection. They can also help those NTPs already performing contact investigations to assess performance.

The methods proposed are meant to help programs reach the most accessible children at high risk for TB, i.e., those living in the homes of adult patients already in care for TB. They do not generate estimates of the true burden of childhood disease (separate methods exist for this[1,2,16]), as the true burden is likely to be much higher in places with incomplete detection of adult TB cases. We estimated that, in 2014, in the 22 high-burden countries, approximately 6.1 million children were living in households of adult patients who had been diagnosed with TB. In contrast, using a mechanistic model that simulated risks of household and community exposure to all prevalent TB cases, Dodd et al. es-

TABLE 4   Number of children in households of notified adult pulmonary TB patients estimated to have required evaluation in 2014, in the 22 high-burden countries and globally

	Children aged 0–4 years		Children aged 5–14 years	
	n	(95%UI)	n	(95%UI)
Afghanistan	19 866	(18 421–21 223)	36 944	(34 334–39 695)
Bangladesh	73 648	(71 599–75 859)	163 657	(160 038–167 251)
Brazil	23 803	(22 802–24 820)	57 430	(55 914–58 957)
Cambodia	9 245	(8 985–9 510)	19 026	(18 545–19 501)
China	179 999	(127 398–229 996)	429 710	(343 376–517 483)
Democratic Republic of Congo	97 195	(94 844–99 643)	154 535	(150 580–158 470)
Ethiopia	49 985	(47 890–52 028)	101 355	(98 545–104 154)
India	642 670	(631 556–653 748)	1 435 928	(1 417 581–1 454 530)
Indonesia	107 770	(104 923–110 489)	223 999	(219 333–228 445)
Kenya	43 584	(40 835–46 323)	80 625	(76 201–85 072)
Mozambique	39 658	(38 670–40 665)	68 734	(67 022–70 416)
Myanmar	30 880	(25 761–35 791)	72 531	(63 884–81 214)
Nigeria	59 756	(58 312–61 136)	100 319	(98 077–102 635)
Pakistan	205 348	(198 080–213 730)	395 563	(383 712–407 389)
Philippines	113 432	(110 278–116 566)	244 407	(238 815–250 201)
Russian Federation	12 784	(5 931–20 230)	31 684	(18 999–44 338)
South Africa	112 126	(107 848–116 705)	281 355	(272 034–290 774)
Tanzania	35 780	(34 408–37 254)	62 907	(60 852–64 939)
Thailand	11 883	(8 870–14 889)	31 281	(25 064–37 490)
Uganda	34 233	(32 946–35 443)	58 773	(56 351–61 244)
Viet Nam	26 372	(24 485–28 099)	82 628	(78 015–87 116)
Zimbabwe	14 396	(13 877–14 935)	27 537	(26 571–28 529)
Global	2 410 443	(2 356 655–2 463 239)	5 074 257	(4 080 623–5 343 926)

TB = tuberculosis; UI = uncertainty interval.

TABLE 5 Estimated number of children in households of notified adult pulmonary TB patients who would have had TB disease upon contact investigation in 2014, in the 22 high-burden countries and globally, and child cases reported by national governments in the same year

	Children aged 0–4 years			Children aged 5–14 years		
	n	(95%UI)	Reported cases*	*n*	(95%UI)	Reported cases*
Afghanistan	1976	(980–3973)	1876	3088	(1046–9502)	2578
Bangladesh	7378	(3651–14558)	928	13717	(4610–42227)	5334
Brazil	2382	(1185–4726)	990	4773	(1614–14872)	1378
Cambodia	923	(462–1855)	3118	1583	(521–4718)	8932
China	17736	(8134–37367)	305	35646	(11732–109830)	3859
Democratic Republic of Congo	9775	(4845–19306)	184	12999	(4289–38960)	3254
Ethiopia	4981	(2480–9978)	4037	8469	(2826–25375)	11880
India	64321	(32279–127494)	16845	119335	(40610–362612)	78864
Indonesia	10728	(5416–21807)	10425	18707	(6408–57738)	12745
Kenya	4361	(2195–8894)	3914	6741	(2226–20123)	4534
Mozambique	3947	(1966–7938)	†	5730	(1981–17367)	†
Myanmar	3096	(1502–6245)	15778	6164	(2019–19194)	20523
Nigeria	5992	(2960–11996)	1823	8371	(2750–25464)	3640
Pakistan	20462	(10327–40872)	8000	33632	(10870–100538)	19245
Philippines	11402	(5651–22402)	5573	20461	(6821–59784)	6618
Russian Federation	596	(261–1047)	1100	902	(436–1770)	2095
South Africa	11262	(5681–22650)	20793	23721	(7781–72967)	11184
Tanzania	3562	(1797–7105)	3132	5368	(1742–15592)	3331
Thailand	1181	(552–2406)	†	2601	(853–7872)	†
Uganda	3422	(1718–6834)	1506	4920	(1628–14671)	1810
Viet Nam	2639	(1306–5282)	19	6968	(2294–20938)	125
Zimbabwe	1453	(723–2862)	1116	2284	(765–6864)	1174
Global	239014	(118649–478581)	119342	419816	(140600–1268805)	237543

*World Health Organization, 2015.[2]
†Age-disaggregated notification data not available for 2014.
TB = tuberculosis; UI = uncertainty interval.

timated that 15 million children in these same countries lived in a household with a TB patient in 2010.[16] Focusing on children in households of known patients with TB allows us to generate realistic programmatic targets for contact investigations, but one should not forget that there are large numbers of children with TB outside these households.

Our estimates of child household contacts expected to have tuberculous infection without TB disease suggest how many children would benefit from preventive therapy. However, as country policies regarding eligibility for preventive therapy differ, these estimates do not correspond to the number of eligible children in a given setting under local guidelines.

While we aimed to present a simple approach that can be used easily, several of our simplifying assumptions limit its accuracy. We assumed that all adult patients with TB live in households. However, in some settings, a large proportion of patients with TB are in prisons,[17] where children are unlikely to be exposed; our method would tend to overestimate child contacts in such situations. We also assumed that each adult patient corresponds to a single household. However, some households have multiple patients with TB, and some patients move between different households, so the effect of this assumption is unclear and will vary by setting. Our assumption that the average number of children per household in a particular geographic region applies to TB patient households is another limitation, as TB cases are not randomly distributed through the population. For example, in many of the countries where the actual number of notified childhood TB cases exceeded the upper bound of our estimate,

large proportions of patients with TB are immigrants,[18–21] who may live in households with more children than the national average. Local estimates could avoid this limitation if data are routinely collected on the household size of TB patients through contact registers or rosters.

Finally, for simplicity, we proposed using generalized risk estimates for disease and infection, although this risk varies across settings. While the risk estimates we used do not take into account the differential infectiousness of index cases (e.g., smear-positive vs. smear-negative) or factors other than age that could affect the susceptibility of child contacts (e.g., HIV infection, malnutrition), it is possible to make more refined estimates using stratified risk estimates,[3] if data are available on the prevalence of these factors among patients with TB and their child contacts. In addition, more refined estimates could be produced if robust estimates of infection and disease risk were available for narrower pediatric age bands, as disease risk is known to be quite variable across infancy, childhood, and adolescence.[22]

Household contact investigations represent an efficient, targeted strategy to diagnose some of the most easily accessible of the roughly 640000 children with TB disease who are currently missed by health systems every year. NTPs need adequate resources and staffing to effectively implement household contact investigations and ensure that child contacts are treated for TB disease and infection. Transparent methods of estimating performance targets can be used to quantify resource gaps, engage partners, and advocate for the resources required to screen and treat this high-risk population. To begin this process, it is currently fea-

TABLE 6   Estimated number of children in households of notified adult pulmonary TB patients who would have had tuberculous infection without TB disease upon contact investigation in 2014, in the 22 high-burden countries and globally

	Children aged 0–4 years		Children aged 5–14 years	
	n	(95%UI)	n	(95%UI)
Afghanistan	7050	(5920–8356)	19591	(15309–25022)
Bangladesh	26122	(22238–30747)	86783	(68873–109598)
Brazil	8452	(7181–9960)	30468	(24131–38684)
Cambodia	3284	(2793–3866)	10086	(7978–12714)
China	63353	(43952–85845)	227199	(165337–307476)
Democratic Republic of Congo	34503	(29450–40410)	81971	(64733–103932)
Ethiopia	17743	(15077–20882)	53820	(42464–67981)
India	228182	(195045–267065)	760682	(602858–968505)
Indonesia	38298	(32583–44916)	119144	(94016–150656)
Kenya	15495	(13010–18405)	42766	(33592–54596)
Mozambique	14056	(11969–16511)	36409	(28704–46155)
Myanmar	10926	(8626–13620)	38475	(29738–49934)
Nigeria	21173	(18022–24902)	53176	(42172–67578)
Pakistan	72972	(61762–86065)	209453	(166097–266432)
Philippines	40164	(34173–47100)	129789	(103272–164246)
Russian Federation	2036	(794–4335)	5749	(2933–10197)
South Africa	39838	(33835–46720)	149324	(117905–190040)
Tanzania	12712	(10824–14955)	33421	(26313–42254)
Thailand	4219	(3021–5589)	16591	(11973–22219)
Uganda	12162	(10331–14299)	31237	(24509–39353)
Viet Nam	9340	(7861–11112)	43944	(34468–55809)
Zimbabwe	5111	(4336–5999)	14588	(11509–18562)
Global	848453	(705838–1017551)	2660885	(2080517–3143189)

TB = tuberculosis; UI = uncertainty interval.

sible, in many locations, to use available data to set programmatic evaluation and treatment targets focused on improving care for these vulnerable children.

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APPENDIX

APPENDIX TABLE A.1   Estimated children per household and child contacts of notified tuberculosis patients needing evaluation in 2014

Country	Children aged <5 years per household Point estimate (95%CI)	Children aged 5–14 years per household Point estimate (95%CI)	Source of children per household estimates	Calculated notified adult pulmonary TB cases in 2014*	Annual child contacts aged <5 years needing evaluation Point estimate (95%UI)	Annual child contacts aged 5–14 years needing evaluation Point estimate (95%UI)
Afghanistan	0.94 (0.87–1.01)	1.75 (1.62–1.88)	Model†	21 079	19 866 (18 421–21 223)	36 944 (34 334–39 695)
Albania	0.20 (0.18–0.21)	0.68 (0.65–0.72)	DHS‡	249	50 (46–53)	170 (162–178)
Algeria	0.43 (0.39–0.47)	0.86 (0.80–0.93)	Model	8781	3771 (3398–4157)	7579 (7003–8171)
Angola	1.08 (0.94–1.22)	1.95 (1.68–2.22)	Model	49 141	53 134 (46 523–60 331)	95 923 (82 963–108 751)
Antigua and Barbuda	0.36 (0.31–0.40)	0.80 (0.72–0.89)	Model	3	1 (1–1)	2 (2–3)
Argentina	0.36 (0.31–0.41)	0.80 (0.71–0.89)	Model	7210	2603 (2253–2949)	5732 (5093–6372)
Armenia	0.22 (0.20–0.24)	0.43 (0.41–0.46)	DHS	1054	233 (214–251)	456 (430–483)
Australia	0.30 (0.21–0.39)	0.67 (0.53–0.82)	Model	822	246 (175–319)	552 (433–667)
Austria	0.19 (0.10–0.29)	0.49 (0.34–0.64)	Model	449	87 (47–127)	219 (153–287)
Azerbaijan	0.31 (0.29–0.32)	0.74 (0.70–0.77)	DHS	4806	1476 (1400–1555)	3540 (3385–3692)
Bahamas	0.29 (0.24–0.34)	0.67 (0.58–0.76)	Model	47	14 (11–16)	32 (27–36)
Bahrain	0.29 (0.22–0.36)	0.62 (0.52–0.72)	Model	150	42 (32–53)	93 (78–108)
Bangladesh	0.50 (0.48–0.51)	1.10 (1.08–1.12)	DHS	148 723	73 648 (71 599–75 859)	163 657 (160 038–167 251)
Barbados	0.26 (0.19–0.32)	0.59 (0.48–0.70)	Model	3	1 (1–1)	2 (1–2)
Belarus	0.14 (0.06–0.22)	0.34 (0.20–0.48)	Model	3526	494 (224–817)	1201 (714–1699)
Belgium	0.25 (0.16–0.34)	0.56 (0.43–0.70)	Model	585	144 (93–196)	330 (251–408)
Belize	0.53 (0.47–0.58)	1.13 (1.03–1.22)	Model	60	31 (28–35)	67 (62–73)
Benin	0.81 (0.79–0.83)	1.61 (1.58–1.64)	DHS	3473	2820 (2752–2883)	5578 (5469–5686)
Bhutan	0.41 (0.37–0.44)	0.91 (0.84–0.97)	Model	568	230 (208–251)	515 (480–550)
Bolivia	0.47 (0.45–0.48)	1.05 (1.02–1.08)	DHS	6123	2853 (2754–2959)	6418 (6240–6598)
Bosnia and Herzegovina	0.17 (0.10–0.24)	0.47 (0.35–0.59)	Model	1036	176 (114–246)	490 (368–613)
Botswana	0.34 (0.17–0.51)	0.73 (0.42–1.04)	Model	4662	1629 (818–2378)	3385 (1979–4830)
Brazil	0.38 (0.37–0.40)	0.92 (0.90–0.94)	DHS	62 426	23 803 (22 802–24 820)	57 430 (55 914–58 957)
Brunei Darussalam	0.38 (0.33–0.43)	0.87 (0.77–0.97)	Model	162	62 (53–70)	141 (124–158)
Bulgaria	0.14 (0.06–0.23)	0.36 (0.22–0.51)	Model	1237	175 (70–283)	448 (276–625)
Burkina Faso	1.02 (0.99–1.04)	1.75 (1.71–1.80)	DHS	4815	4904 (4783–5026)	8442 (8240–8650)
Burundi	0.88 (0.86–0.91)	1.35 (1.32–1.39)	DHS	4750	4199 (4095–4304)	6431 (6259–6602)
Cabo Verde	0.47 (0.42–0.52)	1.04 (0.95–1.13)	Model	213	99 (90–109)	221 (203–240)
Cambodia	0.52 (0.50–0.53)	1.07 (1.04–1.09)	DHS	17 823	9245 (8985–9510)	19 026 (18 545–19 501)
Cameroon	0.83 (0.80–0.86)	1.40 (1.35–1.45)	DHS	21 978	18 206 (17 539–18 839)	30 753 (29 669–31 833)
Canada	0.24 (0.15–0.33)	0.57 (0.42–0.72)	Model	1076	256 (162–352)	610 (452–765)
Central African Republic	0.80 (0.77–0.84)	1.46 (1.40–1.52)	DHS	8329	6691 (6394–7004)	12 162 (11 683–12 635)
Chad	1.00 (0.96–1.04)	1.72 (1.64–1.79)	DHS	9616	9660 (9298–10 055)	16 523 (15 812–17 208)
Chile	0.31 (0.25–0.38)	0.73 (0.61–0.85)	Model	1873	588 (466–710)	1368 (1152–1592)
China	0.23 (0.16–0.29)	0.55 (0.43–0.66)	Model	782 935	179 999 (127 398–229 996)	429 710 (343 376–517 483)
Colombia	0.33 (0.32–0.33)	0.74 (0.72–0.75)	DHS	9110	2979 (2912–3046)	6699 (6583–6813)
Comoros	0.76 (0.72–0.79)	1.43 (1.36–1.50)	DHS	116	88 (83–92)	166 (158–174)
Congo, Democratic Republic	1.04 (1.02–1.07)	1.66 (1.61–1.70)	DHS	93 372	97 195 (94 844–99 643)	154 535 (150 580–158 470)
Congo, Republic	0.74 (0.71–0.76)	1.11 (1.07–1.15)	DHS	7473	5500 (5273–5693)	8286 (8009–8570)
Costa Rica	0.35 (0.29–0.41)	0.83 (0.71–0.95)	Model	378	133 (109–155)	314 (270–359)
Côte d'Ivoire	0.80 (0.77–0.84)	1.41 (1.36–1.46)	DHS	17 733	14 197 (13 590–14 823)	24 966 (24 037–25 891)
Croatia	0.17 (0.09–0.25)	0.43 (0.30–0.56)	Model	452	78 (43–114)	194 (136–251)
Cuba	0.21 (0.14–0.29)	0.54 (0.41–0.67)	Model	636	135 (84–183)	343 (259–425)
Cyprus	0.22 (0.15–0.29)	0.56 (0.43–0.68)	Model	35	8 (5–10)	19 (15–24)
Czech Republic	0.17 (0.09–0.25)	0.43 (0.30–0.57)	Model	403	68 (34–102)	174 (123–228)
Denmark	0.25 (0.17–0.33)	0.58 (0.45–0.71)	Model	219	4 (37–73)	127 (99–155)
Djibouti	0.58 (0.54–0.62)	1.13 (1.06–1.21)	Model	1206	696 (654–738)	1368 (1283–1451)
Dominican Republic	0.34 (0.32–0.36)	0.69 (0.66–0.71)	DHS	3880	1323 (1258–1389)	2669 (2567–2772)

APPENDIX TABLE A.1   *(continued)*

Country	Children aged <5 years per household Point estimate (95%CI)	Children aged 5–14 years per household Point estimate (95%CI)	Source of children per household estimates	Calculated notified adult pulmonary TB cases in 2014*	Annual child contacts aged <5 years needing evaluation Point estimate (95%UI)	Annual child contacts aged 5–14 years needing evaluation Point estimate (95%UI)
Ecuador	0.49 (0.44–0.55)	1.06 (0.95–1.16)	Model	4060	1997 (1812–2230)	4293 (3879–4692)
Egypt	0.51 (0.50–0.53)	1.01 (0.99–1.03)	DHS	4600	2367 (2303–2436)	4637 (4535–4737)
El Salvador	0.42 (0.37–0.47)	0.95 (0.87–1.03)	Model	1765	741 (652–833)	1682 (1543–1823)
Equatorial Guinea	0.74 (0.68–0.8)	1.29 (1.18–1.40)	Model	973	722 (667–782)	1254 (1155–1357)
Eritrea	0.77 (0.71–0.83)	1.39 (1.28–1.49)	Model	1410	1087 (1006–1160)	1955 (1812–2097)
Estonia	0.18 (0.10–0.25)	0.44 (0.32–0.56)	Model	222	40 (23–57)	98 (71–124)
Ethiopia	0.71 (0.68–0.74)	1.43 (1.39–1.47)	DHS	70793	49985 (47890–52028)	101355 (98545–104154)
Fiji	0.42 (0.38–0.46)	0.88 (0.81–0.95)	Model	237	100 (91–109)	209 (193–225)
Finland	0.24 (0.15–0.33)	0.54 (0.41–0.68)	Model	186	45 (28–61)	101 (76–126)
France	0.30 (0.20–0.40)	0.66 (0.50–0.81)	Model	3108	928(623–1249)	2039(1578–2515)
Gabon	0.61 (0.58–0.64)	1.01 (0.95–1.06)	DHS	4734	2885 (2744–3017)	4759 (4487–5026)
Gambia	0.90 (0.84–0.97)	1.54 (1.45–1.63)	Model	2343	2116 (1972–2263)	3613 (3397–3825)
Georgia	0.22 (0.15–0.30)	0.51 (0.40–0.63)	Model	2437	553 (380–706)	1252 (982–1533)
Germany	0.17 (0.07–0.27)	0.44 (0.28–0.60)	Model	3201	538 (234–854)	1407 (917–1915)
Ghana	0.50 (0.48–0.51)	1.02 (0.99–1.05)	DHS	12831	6353 (6115–6605)	13048 (12674–13423)
Greece	0.19 (0.10–0.27)	0.49 (0.34–0.64)	Model	397	74 (39–108)	194 (135–252)
Grenada	0.36 (0.32–0.41)	0.81 (0.73–0.89)	Model	0	N/A	N/A
Guatemala	0.83 (0.81–0.86)	1.49 (1.45–1.54)	DHS	2559	2135 (2061–2205)	3818 (3699–3936)
Guinea	0.99 (0.96–1.03)	1.99 (1.92–2.05)	DHS	8933	8872 (8552–9196)	17745 (17196–18292)
Guinea-Bissau	0.85 (0.77–0.94)	1.56 (1.40–1.71)	Model	2085	1778 (1610–1938)	3250 (2928–3571)
Guyana	0.36 (0.34–0.39)	0.89 (0.85–0.93)	DHS	477	173 (160–187)	424 (403–444)
Haiti	0.54 (0.52–0.56)	1.05 (1.02–1.08)	DHS	12735	6855 (6596–7118)	13365 (12933–13799)
Honduras	0.50 (0.49–0.51)	1.08 (1.06–1.10)	DHS	2305	1159 (1131–1186)	2491 (2442–2541)
Hungary	0.14 (0.06–0.22)	0.39 (0.26–0.52)	Model	769	108 (49–166)	298 (198–396)
Iceland	0.34 (0.25–0.43)	0.74 (0.59–0.89)	Model	6	2 (1–3)	4 (4–5)
India	0.51 (0.50–0.52)	1.14 (1.13–1.16)	DHS	1254718	642670 (631556–653748)	1435928 (1417581–1454530)
Indonesia	0.38 (0.37–0.39)	0.80 (0.78–0.81)	DHS	281394	107770 (104923–110489)	223999 (219333–228445)
Iran	0.32 (0.28–0.36)	0.74 (0.66–0.83)	Model	7071	2266 (1931–2580)	5252 (4668–5841)
Iraq	0.71 (0.65–0.76)	1.35 (1.24–1.45)	Model	4831	3414 (3166–3689)	6504 (6017–6985)
Ireland	0.33 (0.26–0.41)	0.74 (0.61–0.86)	Model	180	59 (46–73)	133 (111–155)
Israel	0.50 (0.41–0.59)	0.97 (0.83–1.11)	Model	246	122 (98–144)	239 (206–272)
Italy	0.20 (0.10–0.31)	0.51 (0.34–0.68)	Model	2235	444 (233–700)	1135 (775–1518)
Jamaica	0.40 (0.36–0.44)	0.88 (0.81–0.95)	Model	73	29 (26–32)	64 (59–70)
Japan	0.19 (0.08–0.30)	0.48 (0.30–0.65)	Model	15322	2861 (1223–4605)	7278 (4583–9953)
Jordan	0.61 (0.59–0.64)	1.15 (1.10–1.20)	DHS	207	127 (121–133)	239 (228–249)
Kazakhstan	0.27 (0.25–0.30)	0.81 (0.77–0.84)	DHS	13268	3624 (3289–3984)	10685 (10174–11194)
Kenya	0.66 (0.61–0.70)	1.22 (1.15–1.28)	DHS	66342	43584 (40835–46323)	80625 (76201–85072)
Kiribati	0.56 (0.51–0.61)	1.17 (1.07–1.26)	Model	277	155 (142–170)	323 (297–349)
Korea, Democratic Republic	0.29 (0.24–0.34)	0.66 (0.56–0.75)	Model	79843	23054 (19269–26772)	52367 (44741–59750)
Korea, Republic	0.20 (0.11–0.28)	0.52 (0.37–0.67)	Model	33057	6541 (3696–9473)	17301 (12426–22134)
Kuwait	0.38 (0.32–0.44)	0.76 (0.68–0.84)	Model	491	187 (157–214)	373 (333–413)
Kyrgyz Republic	0.55 (0.52–0.58)	0.83 (0.79–0.86)	DHS	4439	2452 (2335–2573)	3682 (3527–3833)
Lao PDR	0.64 (0.56–0.71)	1.34 (1.21–1.47)	Model	3790	2419 (2154–2711)	5088 (4607–5563)
Latvia	0.14 (0.06–0.22)	0.37 (0.24–0.51)	Model	647	91 (41–142)	241 (156–327)
Lebanon	0.30 (0.23–0.36)	0.75 (0.63–0.87)	Model	399	118 (94–143)	299 (251–348)
Lesotho	0.44 (0.42–0.46)	1.00 (0.96–1.03)	DHS	7166	3184 (3050–3324)	7160 (6907–7409)
Liberia	0.79 (0.75–0.82)	1.46 (1.40–1.51)	DHS	1715	1349 (1297–1406)	2497 (2401–2593)
Libya	0.44 (0.40–0.49)	0.97 (0.88–1.05)	Model	723	320 (290–355)	699 (637–759)
Lithuania	0.16 (0.07–0.24)	0.38 (0.25–0.51)	Model	1352	207 (105–317)	510 (341–686)
Luxembourg	0.24 (0.16–0.33)	0.59 (0.45–0.73)	Model	16	4 (3–5)	10 (7–12)
Macedonia	0.18 (0.12–0.25)	0.47 (0.36–0.59)	Model	205	37 (23–50)	97 (74–120)
Madagascar	0.74 (0.71–0.76)	1.47 (1.44–1.50)	DHS	22808	16788 (16281–17293)	33487 (32732–34247)
Malawi	0.79 (0.77–0.80)	1.47 (1.45–1.49)	DHS	10386	8179 (8034–8323)	15270 (15012–15521)
Malaysia	0.36 (0.31–0.40)	0.83 (0.74–0.91)	Model	20396	7269 (6354–8283)	16866 (15161–18532)

APPENDIX TABLE A.1   *(continued)*

Country	Children aged <5 years per household Point estimate (95%CI)	Children aged 5–14 years per household Point estimate (95%CI)	Source of children per household estimates	Calculated notified adult pulmonary TB cases in 2014*	Annual child contacts aged <5 years needing evaluation Point estimate (95%UI)	Annual child contacts aged 5–14 years needing evaluation Point estimate (95%UI)
Maldives	0.73 (0.70–0.77)	1.28 (1.24–1.33)	DHS	80	59 (56–61)	103 (99–106)
Mali	1.06 (1.04–1.09)	1.87 (1.83–1.91)	DHS	4546	4830 (4713–4943)	8498 (8301–8695)
Malta	0.20 (0.11–0.29)	0.51 (0.36–0.67)	Model	33	7 (4–10)	17 (12–22)
Mauritania	0.81 (0.75–0.87)	1.48 (1.37–1.59)	Model	1725	1387 (1297–1490)	2547 (2363–2734)
Mauritius	0.23 (0.18–0.28)	0.60 (0.50–0.70)	Model	116	27 (20–32)	69 (58–81)
Mexico	0.44 (0.39–0.49)	0.99 (0.89–1.09)	Model	16661	7369 (6482–8237)	16500 (14860–18172)
Micronesia	0.59 (0.55–0.63)	1.18 (1.12–1.25)	Model	130	77 (72–82)	154 (145–163)
Moldova	0.15 (0.14–0.16)	0.40 (0.38–0.42)	DHS	3611	555 (523–584)	1444 (1380–1511)
Mongolia	0.38 (0.34–0.42)	0.82 (0.74–0.89)	Model	2537	973 (870–1061)	2073 (1884–2253)
Montenegro	0.22 (0.16–0.28)	0.53 (0.43–0.64)	Model	100	22 (16–28)	53 (43–64)
Morocco	0.52 (0.51–0.54)	1.18 (1.14–1.21)	DHS	15302	8010 (7760–8265)	17999 (17467–18537)
Mozambique	0.77 (0.75–0.79)	1.33 (1.30–1.37)	DHS	51497	39658 (38670–40665)	68734 (67022–70416)
Myanmar	0.34 (0.28–0.40)	0.80 (0.71–0.90)	Model	90169	30880 (25761–35791)	72531 (63884–81214)
Namibia	0.58 (0.55–0.60)	1.03 (0.99–1.08)	DHS	6770	3904 (3741–4063)	7001 (6705–7300)
Nepal	0.49 (0.45–0.52)	1.15 (1.10–1.20)	DHS	26433	12867 (11999–13774)	30325 (29019–31675)
Netherlands	0.25 (0.16–0.34)	0.59 (0.45–0.73)	Model	424	107 (72–143)	250 (191–309)
New Zealand	0.32 (0.24–0.41)	0.71 (0.58–0.85)	Model	174	57 (43–70)	123 (101–147)
Nicaragua	0.64 (0.62–0.66)	1.46 (1.42–1.51)	DHS	2269	1451 (1404–1497)	3324 (3230–3413)
Niger	1.16 (1.03–1.29)	1.85 (1.71–1.98)	Model	9060	10478 (9339–11606)	16733 (15507–17969)
Nigeria	0.78 (0.76–0.80)	1.31 (1.28–1.34)	DHS	76538	59756 (58312–61136)	100319 (98077–102635)
Norway	0.28 (0.20–0.37)	0.64 (0.50–0.78)	Model	260	74 (51–95)	167 (132–202)
Oman	0.41 (0.33–0.49)	0.79 (0.70–0.88)	Model	237	98 (79–116)	187 (165–208)
Pakistan	0.90 (0.86–0.93)	1.73 (1.68–1.78)	DHS	228785	205348 (198080–213730)	395563 (383712–407389)
Panama	0.46 (0.41–0.52)	1.00 (0.89–1.11)	Model	1080	501 (442–566)	1079 (965–1190)
Papua New Guinea	0.66 (0.63–0.69)	1.28 (1.22–1.34)	Model	10838	7153 (6759–7502)	13833 (13214–14473)
Paraguay	0.73 (0.70–0.76)	1.34 (1.29–1.39)	DHS	1868	1364 (1304–1419)	2503 (2410–2594)
Peru	0.46 (0.45–0.47)	1.08 (1.06–1.10)	DHS	23379	10754 (10481–11061)	25237 (24676–25800)
Philippines	0.50 (0.48–0.51)	1.08 (1.05–1.10)	DHS	227235	113432 (110278–116566)	244407 (238815–250201)
Poland	0.16 (0.08–0.23)	0.43 (0.30–0.56)	Model	6099	959 (494–1377)	2603 (1832–3388)
Portugal	0.18 (0.10–0.27)	0.49 (0.35–0.64)	Model	1543	280 (144–410)	759 (535–983)
Qatar	0.21 (0.09–0.33)	0.42 (0.27–0.57)	Model	153	32 (13–49)	64 (42–87)
Romania	0.17 (0.09–0.25)	0.43 (0.29–0.56)	Model	12108	2030 (1076–3007)	5150 (3612–6740)
Russian Federation	0.14 (0.06–0.22)	0.35 (0.21–0.49)	Model	90656	12784 (5931–20230)	31684 (18999–44338)
Rwanda	0.72 (0.70–0.73)	1.26 (1.24–1.28)	DHS	4616	3298 (3222–3383)	5813 (5704–5921)
Samoa	0.68 (0.61–0.75)	1.24 (1.13–1.36)	Model	17	12 (10–13)	21 (19–23)
Sao Tome and Principe	0.59 (0.56–0.63)	1.08 (1.01–1.14)	DHS	128	76 (71–80)	138 (130–146)
Saudi Arabia	0.47 (0.42–0.52)	0.99 (0.90–1.07)	Model	2381	1127 (1017–1231)	2350 (2142–2554)
Senegal	1.49 (1.43–1.56)	2.52 (2.42–2.62)	DHS	11499	17196 (16431–17917)	28934 (27776–30078)
Serbia	0.17 (0.10–0.23)	0.46 (0.34–0.58)	Model	1434	238 (151–342)	660 (490–828)
Seychelles	0.32 (0.26–0.38)	0.65 (0.56–0.74)	Model	8	3 (2–3)	5 (5–6)
Sierra Leone	0.97 (0.94–1.00)	1.72 (1.67–1.76)	DHS	11839	11519 (11167–11865)	20330 (19808–20850)
Singapore	0.22 (0.13–0.30)	0.58 (0.43–0.73)	Model	1843	399 (256–557)	1061 (792–1337)
Slovak Republic	0.16 (0.08–0.23)	0.43 (0.30–0.56)	Model	227	36 (21–51)	97 (68–127)
Slovenia	0.19 (0.09–0.29)	0.45 (0.31–0.60)	Model	101	19 (10–29)	46 (31–61)
Solomon Islands	0.68 (0.62–0.74)	1.29 (1.18–1.40)	Model	192	132 (120–142)	247 (226–268)
Somalia	1.11 (0.98–1.24)	1.89 (1.67–2.12)	Model	7914	8810 (7746–9860)	14974 (13244–16787)
South Africa	0.46 (0.44–0.48)	1.15 (1.11–1.19)	DHS	244168	112126 (107848–116705)	281355 (272034–290774)
South Sudan	0.82 (0.77–0.87)	1.47 (1.38–1.56)	Model	6711	5492 (5151–5812)	9861 (9236–10471)
Spain	0.21 (0.11–0.30)	0.54 (0.38–0.71)	Model	3299	679 (373–983)	1789 (1261–2309)
Sri Lanka	0.36 (0.31–0.41)	0.76 (0.68–0.85)	Model	6373	2290 (1997–2587)	4879 (4351–5381)
St Lucia	0.33 (0.29–0.38)	0.77 (0.69–0.85)	Model	6	2 (2–2)	5 (4–5)
St Vincent and the Grenadines	0.35 (0.31–0.39)	0.80 (0.73–0.87)	Model	5	2 (2–2)	4 (4–4)

APPENDIX TABLE A.1 *(continued)*

Country	Children aged <5 years per household Point estimate (95%CI)	Children aged 5–14 years per household Point estimate (95%CI)	Source of children per household estimates	Calculated notified adult pulmonary TB cases in 2014*	Annual child contacts aged <5 years needing evaluation Point estimate (95%UI)	Annual child contacts aged 5–14 years needing evaluation Point estimate (95%UI)
Sudan	0.78 (0.74–0.82)	1.46 (1.38–1.54)	Model	13 054	10 169 (9 617–10 715)	19 051 (18 038–20 054)
Suriname	0.39 (0.36–0.43)	0.87 (0.80–0.93)	Model	117	46 (42–50)	101 (93–109)
Swaziland	0.66 (0.63–0.70)	1.35 (1.28–1.41)	DHS	4 385	2 914 (2 766–3 067)	5 896 (5 601–6 192)
Sweden	0.26 (0.16–0.36)	0.58 (0.43–0.72)	Model	335	88 (52–120)	193 (145–241)
Switzerland	0.22 (0.12–0.32)	0.53 (0.37–0.70)	Model	294	65 (35–93)	157 (110–205)
Syrian Arab Republic	0.56 (0.51–0.62)	1.17 (1.06–1.28)	Model	1 493	845 (760–925)	1 745 (1 583–1 905)
Tajikistan	0.86 (0.83–0.90)	1.40 (1.36–1.45)	DHS	4 132	3 558 (3 419–3 696)	5 791 (5 608–5 977)
Tanzania	0.83 (0.80–0.87)	1.46 (1.42–1.51)	DHS	42 936	35 780 (34 408–37 254)	62 907 (60 852–64 939)
Thailand	0.21 (0.15–0.26)	0.55 (0.44–0.65)	Model	57 377	11 883 (8 870–14 889)	31 281 (25 064–37 490)
Timor-Leste	0.88 (0.86–0.90)	1.74 (1.70–1.78)	DHS	2 803	2 461 (2 403–2 523)	4 880 (4 776–4 983)
Togo	0.69 (0.66–0.72)	1.37 (1.32–1.43)	DHS	2 117	1 465 (1 404–1 529)	2 902 (2 787–3 019)
Tonga	0.63 (0.56–0.70)	1.18 (1.06–1.30)	Model	13	8 (7–9)	15 (14–17)
Trinidad and Tobago	0.25 (0.19–0.30)	0.58 (0.48–0.69)	Model	218	54 (41–66)	127 (105–150)
Tunisia	0.34 (0.29–0.39)	0.75 (0.66–0.83)	Model	1 219	417 (355–478)	908 (803–1 018)
Turkey	0.37 (0.35–0.38)	0.79 (0.76–0.82)	DHS	8 192	2 997 (2 858–3 155)	6 441 (6 205–6 679)
Turkmenistan	0.43 (0.38–0.48)	0.96 (0.88–1.04)	Model	2 155	930 (820–1 033)	2 062 (1 893–2 228)
Uganda	0.93 (0.89–0.96)	1.59 (1.52–1.65)	DHS	37 005	34 233 (32 946–35 443)	58 773 (56 351–61 244)
Ukraine	0.09 (0.09–0.10)	0.23 (0.22–0.25)	DHS	28 617	2 658 (2 431–2 887)	6 731 (6 340–7 115)
United Arab Emirates	0.19 (0.10–0.29)	0.43 (0.29–0.57)	Model	39	8 (4–11)	17 (11–22)
United Kingdom	0.28 (0.18–0.37)	0.61 (0.47–0.76)	Model	3 397	928 (612–1 259)	2 076 (1 603–2 567)
United States	0.28 (0.21–0.36)	0.64 (0.53–0.76)	Model	6 712	1 897 (1 409–2 336)	4 322 (3 565–5 083)
Uruguay	0.32 (0.26–0.38)	0.72 (0.62–0.82)	Model	727	234 (191–278)	522 (452–593)
Uzbekistan	0.65 (0.61–0.70)	1.32 (1.24–1.40)	DHS	12 389	8 116 (7 609–8 644)	16 353 (15 393–17 321)
Vanuatu	0.60 (0.54–0.66)	1.19 (1.07–1.30)	Model	53	32 (29–35)	63 (57–69)
Venezuela	0.43 (0.39–0.47)	0.93 (0.85–1.01)	Model	4 968	2 140 (1 914–2 334)	4 627 (4 240–5 025)
Vietnam	0.32 (0.30–0.34)	1.01 (0.95–1.06)	DHS	82 113	26 372 (24 485–28 099)	82 628 (78 015–87 116)
West Bank and Gaza	0.72 (0.65–0.79)	1.36 (1.23–1.50)	Model	34	24 (22–27)	46 (42–51)
Yemen	1.16 (1.13–1.19)	2.33 (2.27–2.39)	DHS	5 576	6 466 (6 298–6 630)	12 992 (12 678–13 314)
Zambia	0.89 (0.86–0.91)	1.50 (1.46–1.54)	DHS	27 238	24 104 (23 391–24 898)	40 859 (39 627–42 065)
Zimbabwe	0.61 (0.58–0.63)	1.16 (1.12–1.20)	DHS	23 756	14 396 (13 877–14 935)	27 537 (26 571–28 529)

All child contact estimates rounded to nearest whole number; all non-zero values <0.5 represented as <1. UI where both bounds are <0.5 are represented as (<1).
*Adult notifications calculated based on 2014 case notifications, or 2013 notifications if 2014 data unavailable (see http://www.who.int/tb/country/data/download/en).
†Estimates predicted using regression model described in manuscript.
‡Estimates based on data from the most recent available Demographic Health Survey (see http://www.dhsprogram.com).
TB = tuberculosis; DHS = Demographic Health Survey; CI = confidence interval; UI = uncertainty interval.

APPENDIX TABLE A.2   Child contacts of notified TB patients estimated to have had tuberculosis disease and infection in 2014

Country	Annual child contacts aged <5 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged <5 years expected to have tuberculous infection Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have tuberculous infection Point estimate (95%CI)
Afghanistan	1 976 (980–3 973)	3 088 (1 046–9 502)	7 050 (5 920–8 356)	19 591 (15 309–25 022)
Albania	5 (2–10)	14 (5–43)	18 (15–21)	90 (71–114)
Algeria	381 (188–772)	636 (210–1 841)	1 341 (1 109–1 612)	4 021 (3 144–5 134)
Angola	5 306 (2 618–10 673)	8 004 (2 685–24 104)	18 819 (15 269–23 063)	50 921 (38 692–67 091)
Antigua and Barbuda	<1 (<1)	<1 (<1)	<1 (<1)	<1 (0–1)
Argentina	260 (127–529)	483 (160–1 465)	924 (748–1 134)	3 042 (2 352–3 953)
Armenia	23 (11–47)	38 (13–115)	82 (69–98)	241 (191–308)
Australia	12 (7–17)	16 (9–29)	40 (21–76)	101 (62–165)
Austria	4 (2–7)	6 (3–12)	14 (6–29)	40 (23–68)
Azerbaijan	148 (73–294)	297 (101–891)	523 (442–617)	1 880 (1 483–2 386)
Bahamas	1 (0–1)	1 (1–2)	2 (1–4)	6 (4–9)
Bahrain	2 (1–3)	3 (1–5)	7 (4–13)	17 (11–27)
Bangladesh	7 378 (3 651–14 558)	13 717 (4 610–42 227)	26 122 (22 238–30 747)	86 783 (68 873–109 598)
Barbados	<1 (<1)	<1 (<1)	<1 (<1)	<1 (0–1)
Belarus	49 (17–116)	99 (30–314)	174 (78–296)	631 (363–971)
Belgium	7 (4–11)	9 (5–17)	23 (12–45)	60 (37–100)
Belize	3 (2–6)	6 (2–17)	11 (9–14)	36 (28–46)
Benin	284 (141–567)	467 (155–1 404)	1 000 (853–1 175)	2 960 (2 347–3 742)
Bhutan	23 (11–46)	43 (15–127)	81 (67–98)	272 (214–348)
Bolivia	284 (140–570)	537 (179–1 643)	1 011 (862–1 193)	3 406 (2 693–4 321)
Bosnia and Herzegovina	17 (8–38)	41 (13–127)	62 (39–90)	260 (180–363)
Botswana	159 (61–358)	277 (86–921)	575 (282–873)	1 793 (1 007–2 756)
Brazil	2 382 (1 185–4 726)	4 773 (1 614–14 872)	8 452 (7 181–9 960)	30 468 (24 131–38 684)
Brunei Darussalam	3 (2–4)	4 (2–7)	10 (6–18)	26 (16–41)
Bulgaria	17 (6–41)	37 (11–120)	62 (25–104)	237 (140–358)
Burkina Faso	492 (244–988)	719 (234–2 115)	1 739 (1 485–2 040)	4 479 (3 559–5 676)
Burundi	420 (209–845)	543 (180–1 655)	1 489 (1 271–1 754)	3 416 (2 701–4 319)
Cabo Verde	10 (5–20)	19 (6–57)	35 (29–43)	117 (91–150)
Cambodia	923 (462–1 855)	1 583 (521–4 718)	3 284 (2 793–3 866)	10 086 (7 978–12 714)
Cameroon	1 818 (917–3 670)	2 591 (848–7 813)	6 471 (5 486–7 599)	16 326 (12 925–20 729)
Canada	12 (7–19)	18 (10–33)	41 (20–81)	112 (66–184)
Central African Republic	671 (330–1 325)	1 028 (338–3 151)	2 378 (2 009–2 799)	6 450 (5 092–8 199)
Chad	970 (479–1 967)	1 374 (457–4 096)	3 425 (2 904–4 054)	8 778 (6 881–11 154)
Chile	28 (19–41)	40 (22–71)	95 (52–176)	252 (155–403)
China	17 736 (8 134–37 367)	35 646 (11 732–109 830)	63 353 (43 952–85 845)	227 199 (165 337–307 476)
Colombia	298 (150–592)	563 (193–1 696)	1 059 (904–1 242)	3 565 (2 834–4 500)
Comoros	9 (4–18)	14 (5–41)	31 (26–37)	88 (69–112)
Congo, Democratic Republic	9 775 (4 845–19 306)	12 999 (4 289–38 960)	34 503 (29 450–40 410)	81 971 (64 733–103 932)
Congo, Republic	552 (273–1 100)	694 (235–2 106)	1 954 (1 658–2 290)	4 411 (3 472–5 606)
Costa Rica	13 (7–27)	27 (9–80)	47 (37–59)	167 (126–219)
Côte d'Ivoire	1 414 (703–2 853)	2 061 (675–6 282)	5 031 (4 253–5 957)	13 237 (10 452–16 937)
Croatia	4 (2–6)	6 (3–10)	13 (6–25)	36 (20–59)
Cuba	13 (6–29)	28 (9–88)	48 (30–67)	181 (127–249)
Cyprus	<1 (0–1)	1 (0–1)	1 (1–2)	4 (2–6)
Czech Republic	3 (2–5)	5 (3–9)	11 (5–22)	32 (18–54)
Denmark	3 (2–4)	4 (2–7)	9 (4–17)	23 (14–38)
Djibouti	70 (35–140)	114 (38–335)	247 (208–294)	725 (568–922)
Dominican Republic	132 (66–264)	225 (76–667)	469 (397–554)	1 417 (1 114–1 789)
Ecuador	200 (99–400)	356 (122–1 073)	710 (586–856)	2 276 (1 770–2 932)
Egypt	237 (118–468)	389 (129–1 207)	841 (714–987)	2 462 (1 946–3 107)
El Salvador	74 (36–148)	141 (48–419)	263 (214–320)	893 (694–1 144)
Equatorial Guinea	34 (24–48)	36 (21–64)	117 (67–211)	230 (147–363)
Eritrea	108 (54–218)	165 (55–478)	386 (323–460)	1 039 (816–1 335)
Estonia	2 (1–3)	3 (1–5)	6 (3–13)	18 (10–30)
Ethiopia	4 981 (2 480–9 978)	8 469 (2 826–25 375)	43 (15 077–20 882)	53 820 (42 464–67 981)
Fiji	10 (5–20)	18 (6–53)	35 (30–42)	111 (86–143)

APPENDIX TABLE A.2   *(continued)*

Country	Annual child contacts aged <5 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged <5 years expected to have tuberculous infection Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have tuberculous infection Point estimate (95%CI)
Finland	2 (1–3)	3 (2–5)	7 (3–14)	18 (11–31)
France	44 (27–68)	59 (32–107)	151 (76–289)	373 (224–615)
Gabon	287 (144–571)	400 (133–1 223)	1 024 (864–1 212)	2 518 (1 989–3 196)
Gambia	212 (105–428)	303 (100–921)	750 (632–893)	1 916 (1 502–2 438)
Georgia	54 (25–116)	104 (35–326)	195 (131–264)	663 (471–906)
Germany	25 (10–45)	40 (20–77)	85 (33–183)	256 (139–445)
Ghana	632 (320–1 251)	1 093 (363–3 260)	2 257 (1 921–2 665)	6 931 (5 473–8 753)
Greece	3 (2–6)	6 (3–10)	12 (5–24)	35 (20–59)
Grenada	0 (N/A)	0 (N/A)	0 (N/A)	0 (N/A)
Guatemala	214 (106–425)	315 (104–947)	757 (643–892)	2 024 (1 606–2 564)
Guinea	892 (441–1 799)	1 497 (493–4 607)	3 148 (2 676–3 709)	9 422 (7 443–11 918)
Guinea-Bissau	177 (88–358)	274 (89–813)	631 (522–761)	1 725 (1 340–2 229)
Guyana	17 (9–35)	36 (12–105)	61 (51–73)	225 (177–287)
Haiti	688 (346–1 383)	1 111 (374–3 370)	2 432 (2 069–2 863)	7 100 (5 572–8 975)
Honduras	116 (58–229)	208 (67–634)	411 (351–483)	1 323 (1 049–1 665)
Hungary	11 (4–25)	25 (8–77)	38 (17–61)	158 (99–229)
Iceland	<1 (<1)	<1 (<1)	<1 (0–1)	<1 (0–1)
India	64 321 (32 279–127 494)	119 335 (40 610–362 612)	228 182 (195 045–267 065)	760 682 (602 858–968 505)
Indonesia	10 728 (5 416–21 807)	18 707 (6 408–57 738)	38 298 (32 583–44 916)	119 144 (94 016–150 656)
Iran	225 (110–450)	432 (145–1 290)	804 (644–984)	2 778 (2 139–3 601)
Iraq	340 (166–679)	544 (178–1 658)	1 214 (1 010–1 448)	3 447 (2 689–4 420)
Ireland	3 (2–4)	4 (2–7)	10 (5–18)	24 (15–39)
Israel	6 (4–8)	7 (4–12)	20 (11–36)	44 (27–70)
Italy	21 (10–36)	33 (17–63)	71 (30–149)	207 (116–355)
Jamaica	3 (1–6)	5 (2–16)	10 (9–12)	34 (27–44)
Japan	133 (55–245)	208 (102–403)	460 (174–1 008)	1 327 (712–2 312)
Jordan	13 (6–26)	20 (7–60)	45 (38–53)	127 (100–160)
Kazakhstan	363 (181–738)	894 (303–2 630)	1 285 (1 064–1 541)	5 672 (4 489–7 195)
Kenya	4 361 (2 195–8 894)	6 741 (2 226–20 123)	15 495 (13 010–18 405)	42 766 (33 592–54 596)
Kiribati	15 (8–31)	27 (9–81)	55 (46–66)	171 (133–219)
Korea, Democratic Republic	2 305 (1 128–4 697)	4 390 (1 433–13 280)	8 165 (6 431–10 217)	27 763 (21 039–36 303)
Korea, Republic	305 (160–500)	500 (260–925)	1 047 (473–2 101)	3 134 (1 821–5 315)
Kuwait	9 (6–12)	11 (6–19)	30 (17–55)	68 (43–109)
Kyrgyz Republic	247 (125–498)	311 (100–938)	870 (736–1 029)	1 954 (1 537–2 475)
Lao PDR	241 (121–487)	428 (141–1 261)	858 (704–1 043)	2 696 (2 096–3 469)
Latvia	4 (2–7)	7 (3–13)	15 (6–30)	44 (24–76)
Lebanon	12 (6–25)	25 (8–76)	42 (32–54)	158 (119–210)
Lesotho	318 (160–634)	602 (201–1 813)	1 129 (959–1 333)	3 792 (2 997–4 806)
Liberia	135 (67–269)	213 (71–643)	479 (407–564)	1 324 (1 047–1 677)
Libya	32 (16–65)	59 (19–177)	114 (95–137)	371 (288–474)
Lithuania	10 (4–17)	15 (7–28)	33 (14–71)	93 (51–162)
Luxembourg	<1 (<1)	<1 (0–1)	1 (0–1)	2 (1–3)
Macedonia	4 (2–8)	8 (3–25)	13 (8–19)	51 (36–71)
Madagascar	1 676 (843–3 340)	2 802 (922–8 426)	5 951 (5 058–7 009)	17 806 (14 086–22 480)
Malawi	825 (405–1 658)	1 277 (424–3 871)	2 898 (2 477–3 402)	8 110 (6 409–10 223)
Malaysia	726 (361–1 469)	1 413 (468–4 132)	2 584 (2 094–3 156)	8 952 (6 936–11 565)
Maldives	6 (3–12)	9 (3–26)	21 (18–24)	55 (43–69)
Mali	480 (237–960)	711 (237–2 112)	1 715 (1 462–2 017)	4 497 (3 559–5 709)
Malta	<1 (0–1)	<1 (0–1)	1 (0–2)	3 (2–5)
Mauritania	138 (70–277)	216 (71–648)	493 (415–588)	1 353 (1 056–1 736)
Mauritius	3 (1–5)	6 (2–18)	9 (7–12)	37 (28–49)
Mexico	736 (361–1 487)	1 390 (459–4 315)	2 607 (2 139–3 185)	8 774 (6 771–11 293)
Micronesia	8 (4–15)	13 (4–40)	27 (23–32)	82 (64–104)
Moldova	55 (28–110)	121 (41–369)	197 (166–233)	767 (604–977)
Mongolia	97 (48–198)	174 (58–532)	344 (284–414)	1 099 (855–1 406)
Montenegro	2 (1–5)	4 (1–14)	8 (6–10)	28 (21–38)

APPENDIX TABLE A.2   *(continued)*

Country	Annual child contacts aged <5 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged <5 years expected to have tuberculous infection Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have tuberculous infection Point estimate (95%CI)
Morocco	804 (409–1 598)	1 536 (505–4 396)	2 844 (2 421–3 343)	9 562 (7 516–12 069)
Mozambique	3 947 (1 966–7 938)	5 730 (1 981–17 367)	14 056 (11 969–16 511)	36 409 (28 704–46 155)
Myanmar	3 096 (1 502–6 245)	6 164 (2 019–19 194)	10 926 (8 626–13 620)	38 475 (29 738–49 934)
Namibia	390 (194–786)	583 (196–1 748)	1 388 (1 177–1 635)	3 712 (2 939–4 722)
Nepal	1 293 (636–2 601)	2 516 (856–7 604)	4 571 (3 855–5 440)	16 105 (12 727–20 417)
Netherlands	5 (3–8)	7 (4–13)	17 (9–33)	46 (27–75)
New Zealand	3 (2–4)	4 (2–6)	9 (5–17)	23 (14–36)
Nicaragua	145 (72–291)	279 (93–829)	515 (437–607)	1 760 (1 392–2 234)
Niger	1 043 (519–2 084)	1 397 (469–4 288)	3 725 (3 063–4 523)	8 879 (6 917–11 329)
Nigeria	5 992 (2 960–11 996)	8 371 (2 750–25 464)	21 173 (18 022–24 902)	53 176 (42 172–67 578)
Norway	3 (2–5)	5 (3–9)	12 (6–22)	31 (19–50)
Oman	5 (3–7)	5 (3–10)	16 (9–29)	34 (22–54)
Pakistan	20 462 (10 327–40 872)	33 632 (10 870–100 538)	72 972 (61 762–86 065)	209 453 (166 097–266 432)
Panama	50 (25–101)	91 (30–271)	178 (145–216)	572 (439–742)
Papua New Guinea	713 (349–1 453)	1 152 (382–3 470)	2 542 (2 151–3 005)	7 315 (5 807–9 312)
Paraguay	136 (67–275)	210 (71–633)	484 (410–569)	1 331 (1 052–1 683)
Peru	1 069 (536–2 121)	2 122 (719–6 329)	3 813 (3 259–4 472)	13 401 (10 602–16 949)
Philippines	11 402 (5 651–22 402)	20 461 (6 821–59 784)	40 164 (34 173–47 100)	129 789 (103 272–164 246)
Poland	44 (22–73)	75 (39–140)	152 (66–308)	476 (272–804)
Portugal	13 (6–22)	22 (12–41)	45 (20–91)	138 (78–23)
Qatar	1 (1–3)	2 (1–4)	5 (2–11)	12 (6–20)
Romania	201 (79–448)	428 (137–1 340)	722 (366–1 102)	2 721 (1 782–3 931)
Russian Federation	596 (261–1 047)	902 (436–1 770)	2 036 (794–4 335)	5 749 (2 933–10 197)
Rwanda	331 (165–659)	488 (162–1 469)	1 171 (998–1 370)	3 094 (2 439–3 918)
Samoa	1 (1–2)	2 (1–5)	4 (3–5)	11 (9–14)
Sao Tome and Principe	8 (4–15)	11 (4–34)	27 (23–32)	73 (57–93)
Saudi Arabia	53 (38–74)	68 (38–119)	184 (103–324)	432 (274–678))
Senegal	1 719 (835–3 456)	2 423 (809–7 338)	6 099 (5 181–7 199)	15 354 (12 132–19 539)
Serbia	23 (10–51)	55 (18–170)	84 (52–125)	348 (241–488)
Seychelles	<1 (0–1)	<1 (0–1)	1 (1–1)	3 (2–4)
Sierra Leone	1 150 (578–2 307)	1 718 (565–5 230)	4 086 (3 478–4 814)	10 789 (8 536–13 640)
Singapore	19 (11–30)	31 (16–57)	64 (32–127)	194 (115–323)
Slovak Republic	2 (1–3)	3 (1–5)	6 (3–12)	18 (3–12)
Slovenia	1 (0–2)	1 (1–3)	3 (1–6)	8 (10–30)
Solomon Islands	13 (7–26)	21 (7–61)	47 (39–56)	131 (101–167)
Somalia	875 (430–1 780)	1 253 (413–3 825)	3 117 (2 544–3 806)	7 929 (6 125–10 296)
South Africa	11 262 (5 681–22 650)	23 721 (7 781–72 967)	39 838 (33 835–46 720)	149 324 (117 905–190 040)
South Sudan	549 (278–1 090)	836 (279–2 438)	1 949 (1 644–2 309)	5 242 (4 101–6 655)
Spain	32 (16–52)	51 (27–97)	109 (49–221)	327 (184–551)
Sri Lanka	229 (113–456)	415 (139–1 240)	813 (656–998)	2 589 (1 995–3 319)
St Lucia	<1 (<1)	<1 (0–1)	1 (1–1)	2 (2–3)
St Vincent and the Grenadines	<1 (<1)	<1 (0–1)	1 (1–1)	2 (2–3)
Sudan	(509–2 034)	1 599 (548–4 843)	3 609 (3 051–4 271)	10 102 (7 908–12 842)
Suriname	5 (2–9)	8 (3–26)	16 (13–19)	54 (42–69)
Swaziland	292 (145–583)	495 (164–1 475)	1 035 (880–1 225)	3 132 (2 459–3 981)
Sweden	4 (2–7)	6 (3–10)	14 (7–27)	35 (21–59)
Switzerland	3 (2–5)	4 (2–8)	10 (5–21)	29 (16–48)
Syrian Arab Republic	84 (42–170)	147 (48–438)	299 (247–360)	926 (716–1 195)
Tajikistan	356 (177–715)	490 (160–1 454)	1 264 (1 070–1 485)	3 074 (2 419–3 898)
Tanzania	3 562 (1 797–7 105)	5 368 (1 742–15 592)	12 712 (10 824–14 955)	33 421 (26 313–42 254)
Thailand	1 181 (552–2 406)	2 601 (853–7 872)	4 219 (3 021–5 589)	16 591 (11 973–22 219)
Timor-Leste	245 (122–491)	406 (136–1 227)	874 (745–1 027)	2 594 (2 047–3 282)
Togo	146 (74–295)	245 (81–727)	520 (441–614)	1 541 (1 219–1 963)
Tonga	1 (0–2)	1 (0–4)	3 (2–3)	8 (6–10)
Trinidad and Tobago	3 (2–4)	4 (2–7)	9 (5–16)	23 (14–38)
Tunisia	41 (21–84)	75 (25–229)	147 (118–182)	482 (369–625)

APPENDIX TABLE A.2   *(continued)*

Country	Annual child contacts aged <5 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have TB disease Point estimate (95%CI)	Annual child contacts aged <5 years expected to have tuberculous infection Point estimate (95%CI)	Annual child contacts aged 5–14 years expected to have tuberculous infection Point estimate (95%CI)
Turkey	301 (148–607)	545 (180–1 629)	1 064 (899–1 255)	3 417 (2 704–4 312)
Turkmenistan	92 (45–187)	171 (58–520)	329 (271–398)	1 093 (856–1 396)
Uganda	3 422 (1 718–6 834)	4 920 (1 628–14 671)	12 162 (10 331–14 299)	31 237 (24 509–39 353)
Ukraine	265 (133–535)	562 (187–1 718)	944 (787–1 128)	3 566 (2 801–4 570)
United Arab Emirates	<1 (0–1)	<1 (0–1)	1 (1–3)	3 (2–5)
United Kingdom	44 (25–69)	60 (33–109)	151 (75–291)	377 (230–619)
United States	89 (57–132)	125 (69–225)	306 (162–571)	792 (485–1 282)
Uruguay	11 (8–16)	15 (8–27)	38 (21–69)	95 (61–151)
Uzbekistan	810 (410–1 587)	1 381 (466–4 094)	2 879 (2 432–3 414)	8 670 (6 826–11 008)
Vanuatu	3 (2–6)	5 (2–16)	11 (9–13)	33 (26–43)
Venezuela	214 (106–424)	385 (126–1 153)	757 (627–909)	2 457 (1 911–3 157)
Vietnam	2 639 (1 306–5 282)	6 968 (2 294–20 938)	9 340 (7 861–11 112)	43 944 (34 468–55 809)
West Bank and Gaza	2 (1–5)	4 (1–12)	9 (7–10)	25 (19–32)
Yemen	642 (322–1 290)	1 097 (364–3 307)	2 293 (1 957–2 700)	6 899 (5 463–8 696)
Zambia	2 390 (1 208–4 793)	3 445 (1 153–10 120)	8 560 (7 304–10 033)	21 703 (17 163–27 375)
Zimbabwe	1 453 (723–2 862)	2 284 (765–6 864)	5 111 (4 336–5 999)	14 588 (11 509–18 562)

TB = tuberculosis; CI = confidence interval.

Objectif : Pour allouer des ressources aux recherches de contacts domiciliaires, les programmes de lutte contre la tuberculose (TB) ont besoin d'estimations du nombre d'enfants contacts nécessitant une prise en charge.

Schéma : Nous avons élaboré deux méthodes afin d'estimer les nombres annuels d'enfants contacts âgés de 0–14 ans requérant une évaluation et un traitement. La Méthode 1 combine des données locales utilisant des formules simples. En utilisant les données disponibles publiquement, la Méthode 2 se sert d'un modèle de régression linéaire basé sur les données de l'Enquête Démographie et Santé et celles de la Banque Mondiale afin d'estimer le nombre d'enfants dans chaque famille, puis de combiner ces résultats avec ceux de la déclaration des cas et des estimations de risque de maladie et d'infection.

Résultats : En appliquant la Méthode 1 aux données du Malawi, nous avons abouti à ce que ~21 000 enfants contacts par an requéraient une évaluation et ~1900 devraient avoir un diagnostic de TB. Appliquer la Méthode 2 à tous les pays a suggéré que, dans le monde, 2,41 millions d'enfants âgés de <5 ans (intervalle d'incertitude [II] à 95% 2,36–2,46 millions) et 5,07 millions (II95% 4,81–5,34 millions) d'enfants âgés de 5–14 ans vivent dans des foyers comprenant un patient adulte atteint de TB chaque année. Parmi eux, 239 014 (II95% 118 649–478 581) et 419 816 (II95% 140 600–1 268 805), respectivement, auront la TB et 848 453 autres enfants (II95% 705 838–1 017 551) et 2 660 885 (II95% 2 080 517–3 413 189) seront infectés.

Conclusion : Il est possible d'utiliser les données disponibles pour établir des objectifs d'évaluation programmatique et de traitement afin d'améliorer la prise en charge des enfants contacts de patients tuberculeux.

Objetivo: Para designar los recursos necesarios para la evaluación de contactos de pacientes con tuberculosis (TB), los programas necesitan estimados de cuántos contactos niños requieren atención.

Diseño: Desarrollamos dos métodos de estimar cuántos contactos que tienen 0–14 años requieren evaluación y tratamiento cada año. Método 1 usa información local y fórmulas sencillas. Usando información pública, Método 2 usa un modelo de regresión lineal basado en datos de las Encuestas Demográficas y de Salud y del Banco Mundial para estimar el número de niños en cada domicilio, y luego combina estos resultados con números reportados de casos de TB y con estimados del riesgo de enfermedad e infección con TB.

Resultados: Aplicando el Método 1 a datos de Malawi indica que cada año, ~21 000 contactos niños deben ser evaluados y ~1900 deben ser diagnosticados con TB. Aplicando el Método 2 a datos de todos los países del mundo indica que cada año, al nivel mundial, hay 2,41 millón (intervalo de incertidumbre [II] de 95% 2,36–2,46 millón) de niños de edad <5 años, y 5,07 millón (II95% 4,81–5,34 millón) de niños que tienen 5–14 años, quienes viven en domicilios de adultos que se sabe son pacientes con TB. De estos niños, 239 014 (II95% 118 649–478 581) y 419 816 (II95% 140 600–1 268 805), respectivamente, estarán enfermos con TB. Además, 848 453 (II95% 705 838–1 017 551) y 2 660 885 (II95% 2 080 517–3 413 189) estarán infectados con TB pero no enfermos.

Conclusión: Es factible usar datos disponibles para generar metas programáticas para la evaluación y el tratamiento, con el fin de mejorar la atención a los contactos niños de pacientes con TB.