



Caring for children with tuberculosis: how much will it cost?

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Childhood TB worldwide, 2011-2015
Total cost, US\$ million

	US\$ millions	2011	2012	2013	2014	2015	2011-2015
Prevention (EPI): BCG		36	37	39	43	48	202
New Vaccines		12	13	13	14	16	69
New drugs		23	24	25	27	31	129
New diagnostics		0.3	0.3	0.3	0.3	0.4	1
Global costs (total)		71	73	77	85	95	401
							0
Implementation (NTP)		81	82	85	91	98	437
WG operations		0.6	0.6	0.7	0.7	0.8	3
Implementation costs (total)		82	82	86	92	99	441
Total		153	155	164	177	194	842
ART/CPT		36	40	42	46	51	216
Total with ART		189	196	206	222	245	1058

Total costs per child managed following childhood TB guidelines, US\$ million
2011-2015

	% children amongst total notified Baseline	Childhood TB costs, US\$ million					2011-2015
		2011	2012	2013	2014	2015	
World	5%						
India	6%	\$12	\$12	\$13	\$14	\$14	\$66
South Africa	10%	\$15	\$14	\$14	\$14	\$14	\$72
Indonesia	9%	\$3	\$3	\$3	\$3	\$4	\$17
Pakistan	10%	\$5	\$4	\$5	\$5	\$5	\$23
Ethiopia	10%	\$2	\$2	\$2	\$2	\$2	\$9
DRC	13%	\$1	\$1	\$1	\$2	\$2	\$7
Bangladesh	3%	\$0.4	\$0.4	\$0.4	\$0.4	\$0.4	\$2
7 countries	7%	\$38	\$38	\$39	\$40	\$41	\$196
Rest of the World	4%	\$43	\$44	\$47	\$51	\$57	\$241
World, total	5%	81	82	85	91	98	\$437

under-notified?

if children with TB (world) = 10% amongst notified (average)

Evaluating the
cost of
managing
childhood TB

the methodology

The methodology to cost: implementation

- Country based: 7 countries in "detail" using an adapted version of **WHO Planning and Budgeting tool for TB control**
India, South Africa, Pakistan, Ethiopia, DRC, Indonesia and Bangladesh in detail using secondary sources
- **Ingredients approach**
i.e. the selected activities are outlined, bundled into appropriate delivery packages (for example, number of visits to a health center), and then estimates of costs are constructed using unit costs of specific activities such as X-pert testing or clinic visits for DOT, outpatient visits, and hospital days from a comprehensive source (such as the WHO CHOICE database at <http://www.int/choice/costs/en>).
- Following **"Guidance for national tuberculosis programmes on the management of tuberculosis in children"** (Oct. 2012)

The methodology to cost: R&D, BCG and WG operations

Global

- **BCG** :immunization coverage of live births
- **R&D**: Extraction from Global Plan to Stop TB 2011-2015
- **WG operations**: estimate of working group activities and funding

Zoom

into the method to cost Implementation:

the ingredients

approach

Quantities

Main sources:

Guidance for national tuberculosis programmes on the management of tuberculosis in children (Oct. 2012)

2012 WHO TB data collection

Systematic review

UNAIDS

Census

Default data included in WHO TB Planning and Budgeting tool

Etc.

Ingredients approach: quantities (1)

Implementation: interventions and population in need

Diagnostics

Smear microscopy

Notified number of ss+ age <15

X-ray

Notified number of ss- age <15

TST test (Mantoux method)

Notified number of ss- age <15

Needle biopsy of peripheral lymph node test

Notified number of ep age <5

Diagnosis for MDR (includes several tests for MDR
(cultures or LPA using solid/liquid/DST media)

Number of ss+/- age < 15 tested for MDR (estimated: 20 % are tested)

Xpert test (diagnosis for MDR)

Estimated number of MDR suspects (Number of ss+/- cases age < 15 who are resistant to FLD (DRS survey percentages used) and the estimated number of children of adult MDR cases) and HIV suspects amongst children < 15 with TB

Ingredients approach: quantities (2)

Implementation: interventions and population in need

Treatment

Kit 2HRZ/4RH (recommended, low HIV setting)	Notified number of ss- age <15
E100 if not included in the FDC	Notified number of ss+/ep age <15
Kit 2HRZE/4HR (recommended, low HIV setting)	Notified number of ss+/ep age <15 excluding those with meningitis (estimate)
Kit 2RHZE/4HR (recommended, High HIV setting)	Notified number of ss+/ss-/ep age <15
2RHZE/10HR (recommended)	Estimated number of ep age < 15 with Meningitis, as per studies 4% (Malawi)-23 % (Papua New Guinea)
Second-line drug treatment standardised regimen	Estimated number of <15 MDR-TB cases to treat
Drugs for adverse events	Estimated number of <15 MDR-TB cases to treat
HIV tests per patient	Estimated number of HIV exposed children who receive testing. Assumed current levels of testing at 8 % of HIV exposed infants receive testing (in 2010, UNAIDS) and progressive increase upto 58% in 2015 (target) as per Wafaa el Sadr/ Lugada E. et al, 2010
IPT per child for 6 months	75% of children living with adult 15-34 will need IPT as they are presumed PLHA (under pre-ART care).
Co-trimoxazole for 12 months	Same coverage as ART
Pediatric ART for 1 year (with nutritional supplementation and service delivery costs)	ART coverage is lower for children than for adults except in Latin America (WHO/UNICEF/UNAIDS), worldwide only 28% of estimated number of children with HIV are enrolled on ART. Regional coverage for ART for children with HIV only (not TB/HIV) is available.

Ingredients approach: quantities (3)

Implementation: interventions and population in need

Default and contact tracing

Incentives for MDR patients to complete their treatment (fuel)	Estimated number of MDR-TB cases to treat
Incentives for MDR patients to complete their treatment (monetary allowance for public transportation)	Estimated number of MDR-TB cases to treat
Incentive for FTE health worker per visit	Estimated number of FTE health workers. The number of FTE is estimated based on coverage needed for household suspects of ss+ notified or MDR patient on treatment age < 5 years
Daily travel allowance for community members	Estimated number of FTE health workers
Training (2-3 hours) for symptom screening	Global

Ingredients approach: quantities (4)

Implementation: interventions and population in need

Delivery platforms

Inpatient child-specific testing (DS-TB)- tertiary hospital	1 day for sputuum induction
Inpatient treatment (DS-TB)- primary hospital	Estimated percentage of cases that are hospitalised and length of stay as reported use of GHS (WHO TB data collection) or 60 days
Inpatient treatment (MDR)- tertiary hospital	Estimated percentage of cases that are hospitalised and length of stay as reported use of GHS (WHO TB data collection) or 180 days
Outpatient DOT treatment and monitoring(DS-TB)	50% DOT (ss+) and 49%(ss-/ep) or reported use of GHS (WHO TB data collection)
Outpatient treatment and monitoring (MDR)	24 visits to health facility or reported use of GHS (WHO TB data collection)

Unit costs

Main sources:

2012 WHO TB data collection

Systematic review, The Global Plan to Stop TB 2011-2015,
Global Drug Facility,

International Drug Price Indicator Guide, 2011

UNAIDS

CHOICE

Default data included in WHO TB Planning and Budgeting tool

Ingredients approach: unit costs (1)

Implementation: interventions and unit costs

Diagnostics	Unit cost
Smear microscopy	\$2
X-ray	\$14
TST test (Mantoux method)	\$4
Needle biopsy of peripheral lymph node test	\$4
Diagnosis for MDR (includes several tests for MDR (cultures or LPA using solid/liquid/DST media)	\$59
Xpert test (diagnosis for MDR)	\$22

Ingredients approach: unit costs (2)

Implementation: interventions and unit costs

Treatment	Unit cost
Kit 2HRZ/4RH (recommended, low HIV setting)	\$19
E100 if not included in the FDC	\$3
Kit 2HRZE/4HR (recommended, low HIV setting)	\$31
Kit 2RHZE/4HR (recommended, High HIV setting)	\$31
2RHZE/10HR (recommended)	\$48
	\$0
Second-line drug treatment standardised regimen	\$2404-\$3939
Drugs for adverse events	\$21 (Peru), \$13(Estonia), \$192 (Philippines)
HIV tests per patient	\$9 (lo) and \$15 (hi)
IPT per child for 6 months	\$8
Co-trimoxazole for 12 months	\$10
Pediatric ART for 1 year (with nutritional supplementation and service delivery costs)	\$884

Ingredients approach: unit costs (3)

Implementation: interventions and unit costs

Default and contact tracing	Unit cost
Incentives for MDR patients to complete their treatment (fuel)	\$20
Incentives for MDR patients to complete their treatment (monetary allowance for public transportation)	\$5
Incentive for FTE health worker per visit	\$2
Daily travel allowance for community members	\$5
Training (2-3 hours) for symptom screening	\$470

Ingredients approach: unit costs (4)

Implementation: interventions and unit costs

Delivery platforms	Unit cost
Inpatient child-specific testing (DS-TB)- tertiary hospital	\$2.95 (lo)-\$58.25 (hi)
Inpatient treatment (DS-TB)- primary hospital	\$1.7 (lo)-\$32.7 (hi)
Inpatient treatment (MDR)- tertiary hospital	\$2.95 (lo)-\$58.25 (hi)
Outpatient DOT treatment and monitoring(DS-TB)	\$0.31(lo)-\$3.93(hi)
Outpatient treatment and monitoring (MDR)	\$0.31(lo)-\$3.93(hi)

Conclusion

- Implementing the "Guidance for national tuberculosis programmes on the management of tuberculosis in children (Oct. 2012)" in 7 selected countries costs per child from US\$ 84 – US\$ 391. This taking into account current levels of technology used (Xpert, X-rays, thin biopsy needle etc) or level of testing (DST, HIV etc) increasing progressively to meet Global Plan 2015 targets.
- For 7 countries representing over 64% of the notifications of children with TB, implementing the guidelines over 2011-2015 would mean investing US\$ 196 million.
- Extrapolating this effort to the rest of the world with the current level of under-reported notifications, it would mean roughly US\$ 241 million in addition, hence a total of US\$ 437 million worldwide.
- These funding estimates should be taken with caution due to the many caveats of the costing calculations.

Caveats

of the costing methods and results

Caveats of the costing calculations (1)

- Using secondary source data for unit costs and resource consumption
- Assumptions applied should be checked further by experts in the field
- Country costs have not been tested with corresponding countries (lack of field testing due to time and budget constraints)
- Notifications of children ss+/ss-/ep age <15 in the world: 5% of total notifications?

2012 WHO data collection collected for the first time notifications for children <5, <14. Is the data collected representative of the real burden of childhood TB or is the burden more around 10% of total notified TB patients as data as it is the case in the 6 of the 7 countries studied in detail?

Caveats of the costing calculations (2)

- No cost drivers have been identified (further work needed)
- No sensitivity analysis has been performed (further work needed)
- No epidemiology projections have been performed for 2011-2015 except for the 7 countries studies where basic projections were used
- R&D working group has not been consulted on the assumptions used to extract costs from Global Plan to Stop TB