

Roadmap towards ending TB in children and adolescents

Second edition



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END TB

Preface to the first edition¹

The 2018 United Nations General Assembly High-Level Meeting on Tuberculosis (TB) and the current revision of the Roadmap for childhood tuberculosis together present an important moment to consolidate and advance advocacy, commitment, resource mobilization and joint efforts by all stakeholders to provide health care and address the burden of TB among children.

The first Roadmap, published five years ago, helped to draw the childhood TB epidemic into the global spotlight after decades of neglect. Today, we are closer to a generation of children free from TB. Armed with new knowledge about how 10% of all TB affects and manifests in children under 15 years of age, we have a clearer vision of what is needed, how to deliver it – and the priority actions and enhanced investments that are urgently required.

The 2018 Roadmap incorporates an additional critical population: adolescents. Despite making up 1 in 6 of the world's people, adolescents have been largely overlooked as global momentum to address TB has grown. Spanning the ages of 10–19 years, adolescents are both at risk of TB and represent an important population for TB control. They often present with infectious TB and frequently have multiple contacts in congregate settings, such as schools and other educational institutions. Nevertheless, few countries capture TB data in suitably age-disaggregated ways to allow full understanding of its impact in this group and even fewer provide the adolescent-friendly services our young people need to access diagnosis and care.

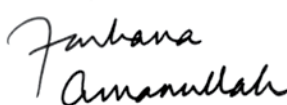
Given its global impact, comprehensive tackling of child and adolescent TB will make a substantial contribution to achievement of the Sustainable Development Goals (SDGs) and to universal health coverage. This cannot happen in an isolated way but through ongoing integration with other health services, such as those in HIV, nutrition, maternal, child and adolescent health. It also requires close alignment of TB priorities with strategic policy frameworks such as 'Every Woman Every Child'.

The new Roadmap towards ending tuberculosis in children and adolescents is intended for a broad audience, and we encourage its adaptation by countries in accordance with national contexts. It is anticipated that it will be used by global, regional and national policy-makers; national TB, maternal and child health, HIV and other primary health care programmes that formulate strategies and plans for health services. It will also be of value to health professionals in public and private services; civil society organizations and technical agencies engaged in support for TB programme implementation.



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¹ This second edition reflects the changes made to the roadmap following the United Nations General Assembly High-Level Meeting on the fight against tuberculosis on 26 September 2018.

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Abbreviations

AFRO	WHO Regional Office for Africa
AIDS	acquired immune deficiency syndrome
AMR	antimicrobial resistance
ANC	antenatal care
ART	antiretroviral treatment
BCG	Bacillus Calmette–Guérin
CHW	community health worker
DR-TB	drug-resistant tuberculosis
EPI	Expanded Programme on Immunization
EURO	WHO Regional Office for Europe
FDC	fixed-dose combination
GDF	Global Drug Facility
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GPW	General Programme of Work
HIV	human immunodeficiency virus
HLM	High-Level Meeting
iCCM	integrated community case management
IEC	information, education and communication
IGRA	interferon gamma release assay
IMCI	integrated management of childhood illnesses
LTBI	latent TB infection
M&E	monitoring and evaluation
MNCAH	maternal, newborn, child and adolescent health
MDR-TB	multidrug-resistant tuberculosis
NTP	national tuberculosis programme
PHC	primary health care
PNC	postnatal care
R&D	research and development
SDGs	Sustainable Development Goals
SEARO	WHO Regional Office for South-East Asia
TB	tuberculosis
TST	tuberculin skin test
UHC	universal health coverage
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WPRO	WHO Regional Office for the Western Pacific
XDR-TB	extensively drug-resistant tuberculosis

1 Child and adolescent TB: Setting the scene

The Sustainable Development Goals (SDGs) aim to “ensure that all human beings can fulfil their potential in dignity and equality in a healthy environment” (1). Underlying Agenda 2030 is the principle that the SDGs are universal, interlinked and indivisible: progress in one goal will be made only with simultaneous progress in other goals.

Ensuring healthy lives and well-being for all at all ages (SDG3) calls for equity and impact at country level, including achieving universal health coverage (UHC) and “ending epidemics,” as well as action and collaboration across sectors (2).

Ensuring that “no one is left behind” in relation to child and adolescent tuberculosis (TB), provides a good example of this type of essential cross-sectoral action. Preventing TB and addressing its long-term impacts on children, adolescents and families are closely linked to other areas of health and health systems strengthening, to learning and development, to ending poverty and hunger, and to promoting a rights-based approach to health (3,4).

Protecting and nurturing children is a cornerstone of social and family culture the world over, but when TB enters a household it undermines this foundation. It is typically introduced unknowingly by an adolescent or adult, then often spreads silently and undiscovered to the youngest and most vulnerable children, placing their health – and lives – in jeopardy. As a result, nearly 650 children die from TB every day, 80% of those before reaching their fifth birthday (5).

Even though TB is a preventable and curable disease, it continues to impact the lives and development of millions of children and adolescents. Many of the policies and tools needed to break down the continuous cycle of transmission and disease are already in place, but they need to be prioritized, strengthened and fully implemented to move us closer to ending TB.

Latest estimates suggest that 36% of TB patients are ‘missing,’ meaning that approximately 3.6 million TB patients may not have been diagnosed and properly treated (5). Finding and treating all TB cases – including among children and adolescents – is an urgent operational priority, particularly in high-burden countries

Tackling child and adolescent TB also requires some complex challenges to be understood and addressed: Collection and use of TB data must be more comprehensive if we are to enhance understanding of the multiple factors and determinants that influence the disease in children and adolescents; close linkages must be designed with other health programmes, and integrated frontline health systems are required to achieve and sustain UHC; and all the while, political will and adequate resourcing must drive and prioritize the most impactful, evidence-based approaches.

In November 2017, over 70 Ministers of Health and nearly 50 other national high-level representatives adopted the *Moscow Declaration to End TB* (6). It recognized the vulnerability of women and children to the consequences of TB due to gender- and age-related social and health inequalities. Commitments were made to prioritize high-risk groups and populations in vulnerable situations, including women and children, as a critical step towards TB elimination.

In May 2018, the World Health Assembly adopted the World Health Organization (WHO) General Programme of Work (GPW-13) 2019–2023 as well as a resolution including commitments to act faster to end TB, as current efforts to implement the End TB Strategy and to meet the SDG target of ending TB are falling short (2,7). The GPW-13 is based on the foundation of the SDGs and is relevant to all countries. GPW-13 includes two targets for TB: i) a reduction of the number of TB deaths by at least 50% between 2018 and 2023; and ii) at least 80% treatment coverage for people with drug-resistant TB by 2023.

Linked to the GPW-13, the WHO Global TB Programme has defined two other targets: 40 million people with TB to be reached with care during the period 2018–2022, including 3.5 million children and 1.5 million people with drug-resistant TB; and, at least 30 million people to be reached with TB prevention services during the period 2018–2022 (5). To catalyse global efforts to support the achievement of these targets, WHO, the Stop TB Partnership and the Global Fund to Fight AIDS, Tuberculosis and Malaria have launched a joint initiative entitled 'Find. Treat. All.' (8).

The United Nations General Assembly High-Level Meeting (HLM) on TB, which took place on 26 September 2018, presented a critical opportunity for further mobilizing the political will and resources needed to pursue the actions laid out in this Roadmap, and to specifically pledge to prevent and tackle TB among children and adolescents. The commitments from the HLM related to child and adolescent TB are summarized in the box below (9).

We are all accountable for delivering against our leaders' commitments, as well as enabling and ensuring engagement and reliability of all partners. The *End TB Strategy* (10) is fully aligned with the goals and approach of Agenda 2030, and with those of the *Global Strategy for Women's, Children's and Adolescents' Health (2016–2030)* (11). This revised Roadmap builds on all of these links to define the key actions that are essential for our collective goals to be achieved.

The real measure of success will be the degree to which optimal child and adolescent TB prevention and treatment services reach the most vulnerable and neglected in any setting or society, where they live, without stigma and discrimination, and without suffering financial hardship.

Box 1. United Nations General Assembly HLM on TB commitments relevant to child and adolescent TB



Heads of State and Government and representatives of States and Governments commit to:

- Provide diagnosis and treatment with the aim of successfully treating 3.5 million children with TB, and 115 000 children with drug-resistant tuberculosis from 2018 to 2022.
- Prevent TB for those most at risk of falling ill through rapid scale up of access to testing for TB infection and provision of preventive treatment, with a focus on high burden countries, so that at least 30 million people, including 4 million children under five years of age, 20 million other household contacts of people affected by TB, and 6 million people living with human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS), receive preventive treatment by 2022.
- Global collaboration to ensure accelerated development of accessible and affordable diagnostic tools, and shorter and more effective oral regimens, including those that meet the unique needs of children.
- Address TB prevention, diagnosis, treatment and care in the context of child health and survival as an important cause of preventable childhood illness and death, including among children with HIV and as a comorbidity of other common childhood illnesses, especially pneumonia, meningitis and malnutrition.
- Enable child-friendly policies and an integrated, family-based approach to TB care and services, address the vulnerabilities faced by children affected by TB, support their caregivers, in particular women and the elderly, and provide related social protection.
- Promote equitable access to child-friendly formulations of medicines to optimize the prevention and treatment of drug-sensitive and drug-resistant TB among children.
- Commit to find the missing people with TB, and integrating TB efforts more fully into all relevant health services to increase access to TB services, recognizing that reaching undetected and untreated men, as well as empowering women and girls through community healthcare and outreach, is a critical part of the solution; and to consider responses appropriate for men and women, boys and girls.
- Provide special attention to the poor and those who are vulnerable, including infants, young children and adolescents, in accordance with the principle of social inclusion.
- Advance research for basic science, public health research and development of innovative products and approaches, which may include new, safe, effective, equitable, affordable, available vaccines, point-of-care and child-friendly diagnostics, drug susceptibility tests and safer and more effective drugs and shorter treatment regimens for adults, adolescents and children for all forms of TB and infection, as well as innovation to strengthen health systems such as information and communication tools and delivery systems for new and existing technologies, to enable integrated people-centred prevention, diagnosis, treatment and care of TB.

TB BURDEN IN CHILDREN AND ADOLESCENTS IS HUGE

TB among all ages

10 million



TB patients in 2017

7.5 million

children (0-14) infected with TB each year

(Dodd et al., 2014 (12))

1 million



children (0-14 years) developed TB in 2017

52% <5 year olds



727 000 adolescents

(10-19 year-olds) developed TB in 2012

(Snow et al., 2018 (13))

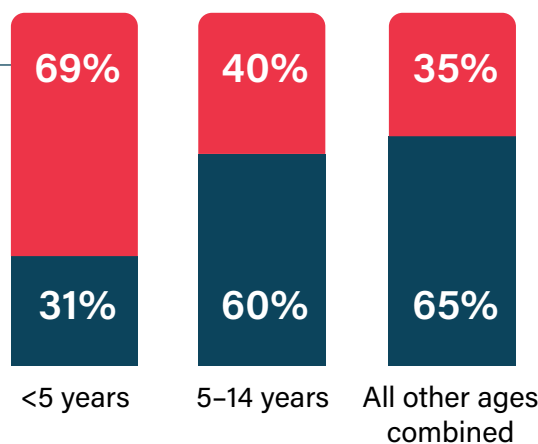
CASE DETECTION GAP

% of TB patients that are missed in different age groups

TB reporting gap is biggest among younger children

■ TB missed (under-diagnosis and under-reporting)

■ TB reported



Overall 55% of estimated children with TB (0-14 years) are **not reported** to national TB programmes



TB can be a cause or co-morbidity of common child illnesses, especially **pneumonia and malnutrition**. More specific tests are needed to improve diagnosis.

(Oliwa et al., 2015 (14); Patel and Detjen, 2017 (15))

1.6 million

TB deaths in 2017

233 000

children (0-14)
TB deaths in 2017

80% in
children
<5 years

96% of
deaths in
children who
did not access
TB treatment

39 000
(17%) deaths
among
children living
with HIV

(Dodd et al., 2017 (16))

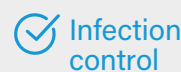
Globally in 2017,
over 75% (of 1.3 million
eligible household contacts
under 5 years of age)
did not access
preventive
therapy



WHO recommends TB prevention including:



Preventive
therapy



Infection
control
measures



BCG
vaccination

In the 158 countries for which
data on BCG coverage are
available, 120 reported coverage
of at least 90% in 2017

TB/HIV



Link between HIV and TB in
children and adolescents is well
known but not acted upon

TB is the most common opportunistic infection in people
living with HIV, including children and adolescents



Only around half of eligible children access
antiretroviral therapy, which significantly
reduces the risk of TB in children living with HIV.
(UNAIDS, 2018 (17))



TB preventive therapy is not fully
implemented as part of comprehensive HIV
care for children and adolescents
(UNAIDS, 2018 (17))

Children living with HIV who have severe immune
suppression (low CD4 count) have a **5-fold higher** risk of
TB compared to children with mild immune-suppression

(Dodd et al., 2017 (18))

MDR-TB



An estimated
25 000 children
<15 years fell ill
with MDR-TB
in 2014



Less than 10%
of them were
diagnosed and
had access to
treatment

(Dodd et al., 2016 (19);
Jenkins et al., 2014 (20))



Drug-resistant TB is a major contributor
to antimicrobial resistance

Sources: All data are sourced from WHO Global Tuberculosis Report 2018 (5) unless indicated otherwise.

Definitions used: "Children" refers to children under the age of 15, currently reported to WHO in two age groups: (0-4) and (5-14).
"Adolescents" span the ages 10-19 years and are reported as part of the 15-24 age group. Further data-disaggregated data
collection is needed to improve understanding of the specific needs of various age groups.

BCG = Bacillus Calmette-Guérin, a vaccine used against TB; MDR-TB = multidrug-resistant tuberculosis.

2013 Roadmap: Unfinished business

After decades in the shadows, the childhood TB epidemic was finally drawn into the global spotlight with the publication of the first *Roadmap for childhood tuberculosis* in 2013 (21). The goal of a world without TB deaths in children was endorsed by the international TB community and the shared commitment drove many key stakeholders to strive for this goal.

The intervening five years have seen significant progress and greater understanding of the challenges faced in addressing TB in children (22)¹. But specific age- and disease-related challenges have also persisted. Opportunities to reduce the burden of TB in children have been missed.

Armed with greater awareness about enduring and emerging barriers to tackling child TB – and more knowledge about the hidden impact the disease has on some of the most vulnerable members of our societies – the urgency and importance of tackling child and adolescent TB is arguably even greater today than in 2013.

We now know that 10% of all TB affects and manifests in children – over half of that among children under five years of age. Greater understanding of specific age- and disease-related challenges of TB allows us a clearer vision of what is needed, how to deliver it, and the enhanced investments that are urgently required.

Progress has been made

But... gaps remain



1. Include the needs of children and adolescents in research, policy development and clinical practice

- Contact investigation and TB prevention included in national guidelines in most countries.
- Contact investigation and preventive therapy for TB infection not routinely implemented at scale.



2. Collect and report better data

- More countries reporting notification data disaggregated by age and sex, and reporting preventive treatment access.
- Adolescents (10–19 years) are recorded in age groups 5–14 years and 15–24 years. Currently no routine reporting on this specific age group.
- Inventory studies conducted to quantify missing cases of childhood TB.
- Lack of data to guide interventions that address the specific needs of adolescents.
- Initial estimates of TB in adolescents have been published.
- TB treatment outcome data for the age groups 0–4 and 5–14 years are not reported.



3. Develop training and reference materials on childhood TB

- Generic training materials, guidelines and tools are widely disseminated and freely available in multiple languages.
- Further capacity building required to ensure health worker knowledge and confidence in prevention, diagnosis and management of children and adolescents exposed to/with TB.
- Health professionals participate in regional and international trainings on childhood TB organised and supported by WHO and partners.



4. Foster local expertise and leadership among child health workers at all levels of the health care system

- Regional childhood TB Task Forces and national Working Groups established.
- Functionality of regional Task Forces and national Working Groups variable and not always optimal due to a lack of a secretariat and other support.

2 See: *Best practices in child and adolescent tuberculosis care*. Geneva: World Health Organization; 2018 (<http://apps.who.int/iris/bitstream/handle/10665/274373/9789241514651-eng.pdf>).



5. Do not miss critical opportunities for intervention

- Many countries implementing interventions to decentralize TB services and capacity, conduct contact investigation, and roll out child-friendly formulations of TB treatments.
- Use of GeneXpert MTB/RIF^a prioritized for TB diagnosis in children; improvement in sputum collection methods.
- Child-friendly methods to collect samples from children are increasingly being studied and implemented.
- In many settings, programmatic, sustainable scale up of successful projects and pilots yet to take place.
- Limited reach or integration of TB services beyond TB programmes.
- Further scale up of GeneXpert MTB/RIF and child-friendly sample collection.



6. Engage key stakeholders

- Engagement of key stakeholders at national level to provide essential services for children affected by TB.
- Limited country policies, guidance, capacity around drug-resistant TB in children.
- Inadequate access to new MDR-TB treatments.



7. Develop integrated family- and community-centred strategies to provide comprehensive and effective services at the community level

- Initiatives to incorporate TB into integrated management of childhood illnesses (IMCI), integrated community case management (iCCM) and seasonal malaria campaigns.
- Clear mandate required in most settings for TB to be addressed through maternal, newborn and child health (MNCAH) programmes.
- Need persists for successful integrated and sustainable models of care.
- No routine reporting of TB services in MNCAH, HIV and/or nutrition services.



8. Address research gaps

- Child-friendly fixed-dose combinations for first-line treatment of TB in children have been developed by TB Alliance with funding from Unitaid and USAID, and are available through the Global Drug Facility (GDF).
- (Earlier) inclusion of children in clinical trials to improve diagnostics and child-friendly regimens
- Various ongoing initiatives using different specimens to diagnose TB in children in less invasive ways
- National registration of child-friendly formulations and use of domestic resources for procurement slow/limited.
- Additional child-friendly formulations and regimens are also urgently needed for preventive treatment and drug-resistant TB.
- Need to develop and roll out child-friendly and sensitive point-of-care tests to diagnose TB in children earlier and at all levels of the health care system.



9. Close all funding gaps for childhood TB

- Increased funding for childhood TB available through international donors (e.g. Global Fund, USAID and Unitaid).
- Dependence of TB programmes on external funding.



10. Form coalitions and partnerships

- "Louder than TB" campaign launched on World TB Day 2015 reached over 10 million people globally.
- Advocacy needs to be sustained and grown to maintain momentum and be utilized at country level.

^a GeneXpert MTB/RIF is a diagnostic test that can identify *Mycobacterium tuberculosis* (MTB) DNA and resistance to rifampicin (RIF).

2 Persistent challenges and missed opportunities

The large and widespread TB prevention, case detection and treatment gaps seen among children and adolescents are not primarily the result of technological or policy constraints: They persist due to a lack of leadership, awareness and advocacy; as a result of gaps and poor innovation in service delivery and scale up of evidence-based interventions; because of verticalization of the TB response and the resulting lack of joint accountability; as well as gaps in data recording and reporting.

a. Insufficient advocacy, political leadership and stakeholder engagement

Insufficient awareness among global and national leaders, health policy-makers, service providers and communities about the specific needs of children and adolescents with TB hinders the steps that are essential to prioritization and allocation of sufficient technical and financial resources within TB and relevant linked programmes (especially HIV, MNCAH and nutrition). As a result, demand for appropriate and effective TB care is limited within affected areas, as is community engagement in TB control efforts. Within such a constrained environment, very little momentum is generated to drive integration in a systems-orientated fashion and/or through innovative service delivery models.

Financing the TB response is a continuous obstacle to progress. The TB programmes of many high-burden countries remain highly dependent on external financing, and domestic resources are not being allocated towards national TB programmes at the levels necessary to control TB. The result is a severe lack of investment, including in specific interventions needed by the youngest populations affected by TB.

b. Persistent policy–practice gaps in developing, implementing and scaling up evidence-based programmatic approaches

i. Preventing TB disease

Conducting contact investigation

Contact investigation is not routinely implemented at scale in most TB high-burden countries, and is often restricted to passive processes rather than active tracing, screening and evaluation of contacts of infectious TB patients, with limited or no community participation and engagement of front-line health workers.

Providing treatment for prevention to children and adolescents infected with TB

Linked to limited contact investigation, preventive treatment of TB infection is only provided to a small proportion of children who should receive it to prevent progression from TB infection to active TB disease (i.e. under 5 year-old TB contacts and HIV-infected children). There is a need to address this persistent policy–practice gap, build capacity of health workers to identify children who could benefit from preventive therapy, as well as expand preventive therapy to include TB contacts over 5 years of age (23).

Other preventive measures

Education of people with TB on how to protect their family members from being infected through simple household TB infection control measures is inadequate. BCG vaccination coverage is sub-optimal in some high-burden countries.

ii. Finding the missing TB cases among children and adolescents

Because many non-specific symptoms overlap with other common childhood diseases, TB is often not considered in children and frequently missed as a result. TB diagnosis can be challenging due to the lack of a sensitive point-of-care diagnostic test, low access to and use of available tests, difficulties of obtaining sputum specimens from children, as well as frequent negative bacteriological test results in young children with TB.

A clinical diagnosis can be made, although paediatric TB capacity is often highly centralized at secondary or tertiary levels of the health system and managed in a vertical, non-integrated way. Health workers, especially those working at the primary care level, often have little capacity and confidence in preventing, diagnosing and managing childhood TB. TB screening is not systematically incorporated in clinical algorithms for child health (e.g. iCCM and IMCI). There is even less capacity in diagnosis and management of paediatric MDR-TB at local levels and systematic screening and follow-up of MDR-TB contacts is very scarce. MDR-TB treatment facilities are rarely equipped to meet the needs of children, and child-friendly second-line formulations, although developed and available for purchase through the GDF, are not being widely used.

In many countries, private sector health facilities play an increasing role in TB diagnosis and treatment, especially as the first entry point for care of children. Such facilities and services need to be engaged with and adhere to country guidelines on TB including those covering routine reporting of the disease.

Specific age- and disease-related challenges

Challenges and opportunities related to likelihood of ongoing transmission, better prevention, risk of disease progression, clinical manifestation and improved treatment outcomes are summarized in the boxes here and on page 10.



Children <5 years

- Young children are at increased risk of developing severe forms of TB disease (e.g. disseminated TB, TB meningitis) with increased risk of death (especially children <2 years).
- They account for >50% of estimated childhood TB cases, and are the least likely to be diagnosed and treated.
- ~80% of child TB deaths occur in children under 5.
- Diagnosis can be challenging, due to symptomatic overlap with other common childhood diseases and difficulty of bacteriological confirmation.
- TB is frequently missed as underlying cause or co-morbidity of children presenting with pneumonia, malnutrition or meningitis.
- Young children usually access care at PHC services where there is little or no awareness and capacity for TB diagnosis or treatment.



Adolescents (10–19 years)

- Adolescent TB patients often present with bacteriologically infectious disease typical among adults (e.g. with cavities seen on chest X-ray) and therefore pose a high risk for transmission in 'congregate' settings such as schools as well as households.
- This age group faces unique challenges due to peer-pressure and fear of stigma, increasing prevalence of co-morbidities such as HIV, and risk behaviours such as alcohol, substance and tobacco use.
- 10–19 year-olds need adolescent-friendly services that include relevant psychosocial support and minimal disruption of education.
- Age-disaggregated data on adolescent TB are not routinely collected and reported (i.e. among those who are 10–14 and 15–19 years of age).

iii. Developing adolescent-responsive strategies for TB prevention and care

Currently, there is little data available, insufficient awareness and limited evidence generation on the increased risk for TB, treatment outcomes among adolescents, and their specific needs, creating a considerable gap in strategies and action in the response to TB (24).

c. Implementation of integrated, family and community-centred strategies

Finding the missing child TB cases requires a life cycle-based approach including targeted strategies for different age groups. It requires integrated, family- and community-centred strategies.

Non-existing or weak integration of child and adolescent TB services with other programmes and services – such as those focusing on MNCAH/reproductive health, HIV, nutrition, immunization, as well as antenatal and postnatal care – result in missed opportunities for contact tracing, TB prevention, timely detection and care of TB in pregnant women, new mothers, children, adolescents and their families (25).

There are multiple steps along a child's pathway from exposure to an adult/adolescent with TB, TB infection and progression to active TB disease (Figure 1). If the gaps and bottlenecks along this pathway are addressed consistently and systematically, transmission of TB can be reduced, prevention of TB infection can be expanded, and children with TB can be diagnosed earlier with better treatment outcomes. Achieving this continuum of care requires collaboration across service areas, practice disciplines and sectors, community engagement, as well as decentralization and integration of service delivery at the primary health care level.

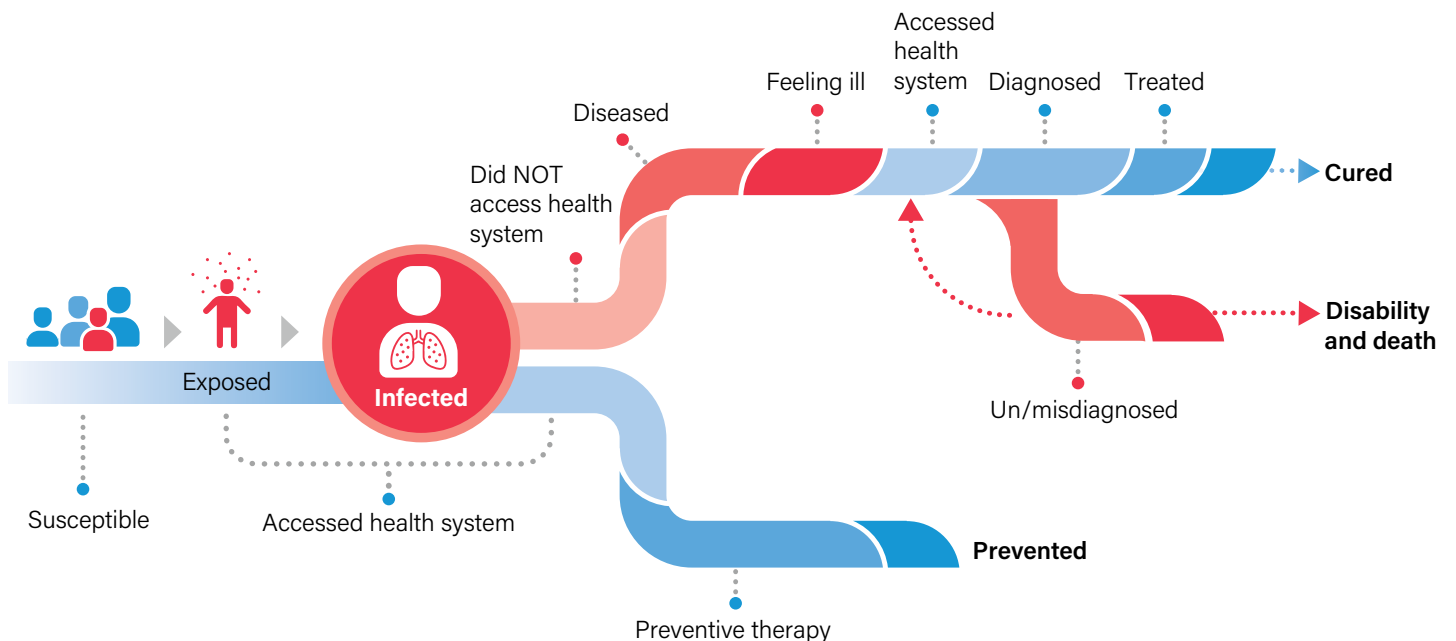


Figure 1. Pathway through TB exposure, infection and disease (26, 27)

d. Improving recording and reporting of detected TB cases, TB-related deaths and prevention

Recording of TB cases at health facilities, reporting to national TB programmes, data analysis and use at all levels is typically insufficient and inconsistent. Data on TB in the specific age group of adolescents (10–19 years) is not collected separately, making understanding the extent of the problem impossible. Children managed in private sector facilities/services are often not notified to national TB programmes. Fatal cases of TB that present as severe pneumonia, HIV, malnutrition or meningitis are attributed to these conditions. As a consequence, vital registration data often under-report TB as a cause of death. In most TB high-burden countries, information on TB-related symptoms and contact screening beyond the national TB programme is not captured.

e. Limited research and development related to paediatric TB

At the global level, funding for paediatric TB research and development remains constrained and stagnant at around 3% of total TB research funding (US\$ 29 million of US\$ 726 million in 2016). If funding for paediatric TB research were to be allocated in proportion to the burden of the disease among children (i.e. 10%), funders should be investing up to US\$ 72.5 million annually – more than doubling existing funding levels. If commensurate with TB deaths among children, the proportion of research focusing on child TB would be 15% (or US\$ 108 million).

Despite existing interventions to prevent, diagnose and treat TB either not meeting the needs of children or not being available where they are most needed, there is insufficient ongoing investment in child and adolescent TB research, including late inclusion of children in clinical trials of new health technologies.

Specific age- and disease-related challenges (contd.)



TB/HIV co-infection

- TB in pregnant women living with HIV increases the risk for TB and HIV transmission to the infant, and is associated with increased risk of premature delivery, stillbirth, low birth weight, and overall infant mortality.
- HIV infection is associated with TB disease and poorer TB treatment outcomes among children and adolescents.
- TB is the leading cause of death among people living with HIV, including children and adolescents.
- Routine screening for TB (including TB exposure of the child) is often missed as an opportunity for services targeting mothers, e.g. during antenatal (ANC) or postnatal care (PNC), and among children known to be living with HIV.
- Early HIV diagnosis and immediate initiation of antiretroviral (ART) medicines (irrespective of clinical staging or CD4 count) is essential in pregnant mothers and newborn babies with HIV.
- TB/HIV co-infection impacts already constrained ART access due to drug interactions and/or lack of safety and efficacy data in co-infected child/adolescent patients.
- In many settings, TB preventive therapy is rarely provided for children/adolescents, even though it substantially reduces TB and mortality risk and is recommended as part of comprehensive HIV care.



Multidrug-resistant TB (MDR-TB) in children and adolescents

- Young children acquire MDR-TB mainly through transmission from close contact with an infectious adult or adolescent with MDR-TB.
- Treatment initiation is often based on bacteriological confirmation and drug susceptibility testing, but this is challenging and of low yield, especially in young children.
- Treatment can be started without bacteriological confirmation in children in whom MDR-TB is strongly suspected.
- Children usually tolerate second-line treatment well and treatment outcomes are generally favourable but treatment can be challenging, with frequent permanent hearing loss due to side-effects of injectable medicines. Children should benefit from shorter, safer, effective and tolerable (injectable-free) regimens for MDR-TB.
- Long-term hospitalization may impact development and education and therefore unnecessary hospitalization should be avoided.
- Age-disaggregated data are not routinely reported, making the extent of MDR-TB among children/adolescents uncertain.

3 The Roadmap towards ending TB in children and adolescents: Key actions

The following priority actions call for the engagement of all relevant stakeholders at global, regional and national levels, from those already engaged in TB to those engaged in the HIV, nutrition and maternal and child health agendas. These actions respond to the challenges, bottlenecks and limitations highlighted in the previous section. They are critical to ensuring that children and adolescents receive priority in all TB prevention and control activities, and to accelerating efforts towards ending TB in children and adolescents.



1. Strengthen advocacy at all levels

Targeting: Political leaders, global, regional and national advocacy partnerships, civil society, religious leaders, public figures/ opinion leaders

To sustain advocacy at all levels it is vital to:

- Ensure that child and adolescent TB remain firmly located in global, regional and national health agendas, based on latest data and evidence on burden, descriptions of existing challenges, opportunities and the need for urgent investments, and through all relevant forums and communication platforms.
- Act on the child and adolescent TB-related commitments made by national leaders and heads of state during high-level intergovernmental forums, and actively follow up with UN agencies, health development partners and funding agencies.
- Engage policy-makers – including ministers of health, finance and foreign affairs – and members of parliament to develop sustainable approaches to prevent and tackle child and adolescent TB.
- Advocate for research and innovation to end TB in children and adolescents.



2. Foster national leadership and accountability

Targeting: Policy-makers, national and district level programme managers, civil society, communities

Achieving the goal of ending TB among children and adolescents requires high-level political will, strong leadership and accountability in order to attain intended outcomes within given time frames and designated resources. Leadership should recognize the importance of practical steps to: allocate adequate national resources; strengthen capacity of programmes and health workers; ensure linkages with and accountabilities for critical services (e.g. MNCAH, HIV, nutrition etc.); and position institutions and actors within the health sector and beyond to effectively target resources and sustain efforts to end TB.

Key actions include the following:

- Build institutional capacity to plan, manage and lead child and adolescent TB programmes using child and adolescent TB assessment and benchmark tools (including operational guidance) at national and sub-national levels.
- Strengthen focal points and expand working groups for child and adolescent TB within national TB control programme to include vital stakeholders (e.g. paediatric societies, MNCAH and immunization programmes, etc.).

- Ensure strategic planning at national level to provide a framework for coordination of activities among diverse partners.
- Ensure that strategic planning – with clear targets, timelines and earmarked budgets – covers the specific needs of children and adolescent TB prevention, care and treatment.
- Ensure that child and adolescent TB - related services (including diagnostic services) are free of charge.
- Establish social support for vulnerable families.
- Enhance civil society engagement to hold health workers, national programmes, policy-makers and leaders accountable to commitments and targets.



3. Foster functional partnerships for change

Targeting: Government, academia, donors, implementing partners, civil society, members of affected communities, private sector partners

Effective collaboration and communication between health sector and other sectors and stakeholders, including engagement of patients and their families, is a key component for successful implementation of child and adolescent TB interventions. A multisectoral approach is critical.

The following strategies are recommended to enhance functional partnerships:

- Strengthen coordination and communication among TB and other programmes.
- Engage relevant stakeholders outside of the health sector (e.g. education, social and developmental etc.) to increase awareness and mobilize support.
- Foster partnership(s) between the public and private sectors.
- Involve adolescents and families affected by TB in related awareness programmes and outreach campaigns at the community level.
- Establish coalitions and partnerships with relevant stakeholders to: Promote equitable access to child and adolescent health care; plan and conduct implementation research; support advocacy; and mobilize resources for scaling up proven interventions, monitoring progress and sharing best practices.
- Collaborate with industry, academia, intergovernmental agencies, nongovernmental organizations, professional associations (e.g. paediatric societies), faith-based and other organizations to develop new tools and approaches.
- Conduct research through multi-site collaborations.



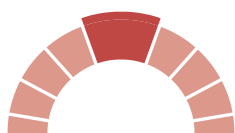
4. Increase funding for child and adolescent TB programmes

Targeting: Advocacy partners, donors, government leaders, policy-makers

Ending the TB epidemic will require substantial investments in the development of novel diagnostic, treatment and prevention tools, and for ensuring their accessibility and optimal uptake in countries alongside better and wider use of existing technologies. Relative to the estimated overall annual need of US\$ 1.8 billion per year (as in *Global Plan to End TB 2016–2020 (28)*), investments in paediatric TB research require US\$ 180 million per year, in accordance with the estimated global burden of 10% of all TB.

The following actions are important in enhancing resource mobilization:

- Make an investment case based on global and national child and adolescent TB data, showing the cost of **not** addressing TB in these age groups. This will help increase awareness of the need for additional resources and secure buy-in from political leaders and decision-makers.
- Coordinate and harmonize donor and country interests and investments with increased flexibility and the opportunity to move from disease-specific to an integrated, system-focused approach towards achieving universal health coverage.
- Ensure health financing becomes progressively less donor dependent and more equitable, by moving from successful pilot projects to more integrated and sustainable programmatic scale up at all levels, including continuous quality improvement efforts and use of paediatric TB-specific indicators.
- Invest in capacity and skills building among programme managers and health workers, including retention strategies – such as appropriate remuneration – helping to ensure strong leadership in distribution and efficiency in utilization of resources and aligning of TB services.
- Invest in child and adolescent TB research.
- As TB is a disease of poverty, encourage poverty reduction strategies and social protection expansion to improve support for children and adolescents with TB and their families. This also helps to alleviate the impact of catastrophic costs often faced by TB-affected families.
- Move with urgency towards the global goal of universal health coverage.



5. Bridge the policy–practice gap

Targeting: Policy-makers, managers of relevant programmes at national and district level, implementing partners

Maximizing utilization of available and new tools to reach end-TB targets and to bridge the gap between policy and practice will require national programmes to:

- Widely disseminate and enhance use of capacity-building tools on child and adolescent TB to train health workers to diagnose and manage children and adolescents with TB infection and/or disease with an emphasis on TB prevention.
- Strengthen skills of child-care providers on specimen collection methods and on the use of available diagnostic tools (e.g. digital chest radiography, GeneXpert MTB/RIF).
- Establish supportive supervision and mentoring at all levels.
- Scale up successful pilot projects to become integral parts of routine TB and child health programmes.
- Ensure implementation of guidelines on TB prevention.
- Scale up locally-developed communication materials to raise awareness on the importance of TB prevention among health workers and the general population.
- Sensitize the public and private sectors to the importance of mandatory TB notification and implement user-friendly reporting tools (e.g. mobile apps and social media).



6. Implement and expand interventions for prevention

Targeting: Policy-makers, relevant health programmes including TB, HIV, primary health care and community health, implementing partners

The *End TB Strategy (10)* and recent expansion of the WHO recommendations on TB infection management, and the increasing evidence to support implementation of shorter and safer treatment regimens, provide an unprecedented opportunity to narrow the policy–practice gap in contact screening and management (23).

Essential actions to expand prevention interventions include:

- Develop national and sub-national targets for TB prevention based on adult notification data.
- Provide comprehensive coverage and timely use of neonatal BCG vaccine in collaboration with immunization and maternity services, in order to prevent severe forms of TB in infants and young children.
- Strengthen community health systems and engage with broader community systems to provide education on the rationale, effectiveness and safety of contact investigation and TB preventive therapy.
- Implement active contact screening, family-integrated TB treatment and preventive therapy through engagement with and support for community and primary health care providers.
- Introduce and scale up shorter and safer regimens to treat TB infection in children and adolescents who are contacts of patients with drug-susceptible TB.
- Routinely evaluate contacts of patients with drug-resistant TB according to policy guidelines for treatment for disease and prevention of transmission.
- Implement infection control measures in high-risk settings for TB transmission, especially in health facilities, and also in households, to reduce risk of transmission.
- Promote preventive therapy for outbreaks in congregate settings such as educational institutions.



7. Scale up child and adolescent TB case-finding and treatment

Targeting: National policy-makers, donors, relevant programmes in ministries of health (e.g. TB, HIV, MNCAH, nutrition), district health programme managers, technical partners, private sector partners, health care workers

Strategies to ensure that children and adolescents with TB are detected and treated include the following:

- Develop clear national child and adolescent TB targets based on latest WHO TB estimates.
- Systematically implement TB screening for children and adolescents at public and private in- and outpatient settings, including facilities focusing on: adult and paediatric chest and TB; nutrition; HIV; adolescent health; ANC; immunization clinics; and dedicated screening events, followed by appropriate management or referral to TB preventive, treatment and care services.
- Train all health workers in the public and private sectors (e.g. general physicians, nurses, nutritionists, triage technicians, laboratory and radiology technicians) to be aware of and able to identify TB risk factors and symptoms, and on evaluation, diagnosis, management and reporting of children and adolescents with TB.
- Develop strategies and mechanisms for support services (e.g. telephone calls, messaging, or home visits) to encourage treatment adherence.
- In both the public and private health sectors, ensure availability of child-friendly formulations of TB medicines for all children with TB, and of preventive treatment regimens for children at risk, including uninterrupted quality-assured supply with functional quantification and forecasting systems.



8. Implement integrated family- and community-centred strategies

Targeting: Policy-makers, managers of relevant programmes at national and district level, implementing partners, civil society

Recognizing TB as a disease that directly and indirectly impacts the survival and healthy development of entire households, appropriate strategies need to be in place to prevent, identify and manage TB in families.

The following actions provide an approach to integrate child and adolescent TB into family- and community-centred care:

- Acknowledge the contribution of TB to child morbidity and mortality – particularly among young children and children living with HIV – and the linkages between TB and common childhood conditions.
- Strengthen global and country-level collaboration and coordination across all health-related programmes engaged in woman, adolescent, and child health – especially reproductive health, MNCAH, nutrition, HIV, primary and community health – with clearly defined roles, responsibilities, and joint accountability.
- Decentralize and integrate successful models of care for TB screening, prevention and diagnosis with other existing service delivery platforms for maternal and child health (i.e. ANC, iCCM, IMCI etc.) as well as other related services (e.g. HIV, nutrition, immunization).
- Ensure children and adolescents with other common co-morbidities (e.g. meningitis, malnutrition, pneumonia, chronic lung disease and HIV infection) are routinely evaluated for TB.
- Ensure community health strategies integrate child and adolescent TB education, screening, prevention and case finding into the training and service delivery activities.
- Increase awareness of and demand for child and adolescent TB services in communities and among front line health workers.
- Empower communities to engage actively in the TB response and strengthen social accountability mechanisms.
- Encourage use of contextualized local solutions in response to issues of concern regarding TB and integration approaches, with a focus on prevention and sharing of best-practice models.
- Ensure focused actions at community level for prevention of discrimination and stigma with relevant communication strategies; address legal and human rights barriers for TB care in children.



9. Improve data collection, reporting and use

Targeting: Policy-makers, programme managers, health workers, monitoring and evaluation staff

Comprehensive information about child and adolescent TB burden at national and sub-national levels enables national TB programmes (NTP) to address the needs of children and adolescents with TB and mobilize appropriate resources. Given that the majority of children present to non-NTP health services, reporting from both public and private health facilities is vital to estimating the true burden of TB. Mandatory notification policies, as well as collaboration between NTPs and other health facilities, as well as other sectors including paediatric associations, will help ensure comprehensive and age-disaggregated reporting of TB cases and TB treatment outcomes, important for monitoring progress and focusing interventions and resources.

The following steps should be undertaken to ensure completeness and quality of data on child and adolescent TB:

- Ensure surveillance systems and mandatory notification legislation and/or policies include reporting on child and adolescent TB.
- Develop robust systems for quantifying the number of child TB contacts and other children with TB infection.
- Routinely record, evaluate and report contact screening and provision and outcomes of TB preventive treatment and/or TB treatment.
- Develop TB reporting forms with national standard case definitions, disease type, HIV status, and treatment outcome, and make available to all health care facilities in the country (e.g. public and private hospitals, nongovernmental facilities, primary care clinics and health posts).
- Implement electronic and case-based surveillance to facilitate reporting of children and adolescent data and analysis disaggregated by age (ideally 0–4; 5–9; 10–14; and 15–19 and 20–24 years).

- Collaborate with WHO and other partners in developing and improving vital registration systems.
- Build capacity in countries for quality data collection, reporting and analysis, as well as use of data for strategic planning, procurement and supply management and policy formulation.
- Conduct national inventory studies to assess the extent of under-reporting.³



10. Encourage child and adolescent TB research

Targeting: Policy-makers, academia, donors, implementing partners, private sector

In order to end TB in children and adolescents, it is vital to:

- Ensure continued investments in research (29).⁴
- Establish regulatory and policy environments conducive to research and the rapid translation and implementation of research findings.
- Dedicate specific attention to the following priority areas to improve prevention, diagnosis and management of TB in children and adolescents:
 - Developing a TB vaccine with enhanced and longer-lasting protective efficacy.
 - Developing accurate, non-sputum-based point-of-care diagnostics tests for TB disease and infection.
 - Developing shorter, safer and more child-friendly regimens for TB prevention and treatment of both drug-susceptible and drug-resistant TB.
 - Understanding determinants of TB and key barriers faced by adolescents to access TB diagnostic and treatment services.
 - Conducting implementation research on a range of potential child and adolescent TB-related service models for prevention, contact investigation, diagnosis and treatment.

³ TB inventory studies are studies to quantify case detection and reporting gaps. They have two broad objectives: (i) to directly measure levels of under-reporting of detected TB cases; and (ii) to estimate TB incidence (under certain conditions).

⁴ See: *Research priorities for paediatric tuberculosis*. New York: Treatment Action Group and Child and Adolescent Working Group; 2018 (http://www.treatmentactiongroup.org/sites/default/files/pediatric_tb_research_priorities_9_24.pdf).

Roadmap towards ending TB in children and adolescents



Milestones in implementation of the key actions of the revised Roadmap



*As part of overall monitoring of the UN High-Level Meeting declaration

References

1. The Sustainable Development Agenda (website). New York: United Nations (<https://www.un.org/sustainabledevelopment/development-agenda>, accessed 10 September 2018).
2. WHO thirteenth general programme of work, 2019–2023. Geneva: World Health Organization; 2018.
3. Basu Roy R, Brandt N, Moodie N, Motlagh M, Rasanathan K, Seddon JA et al. Why the Convention on the Rights of the Child must become a guiding framework for the realization of the rights of children affected by tuberculosis. *BMC Int Health Hum Rights*. 2016;16(1):32. doi:10.1186/s12914-016-0105-z.
4. Silent epidemic. A call for action against child tuberculosis. 2018. Paris: The Union; 2018.
5. Global tuberculosis report 2018. Geneva: World Health Organization; 2018 (<http://apps.who.int/iris/handle/10665/274453>, accessed 20 September 2018).
6. Moscow Declaration to End TB. Moscow: Ministry of Health of the Russian Federation and World Health Organization; 2017.
7. Resolution WHA71.3. Preparation for a high-level meeting of the General Assembly on ending tuberculosis. Geneva: World Health Organization; 2018 (http://apps.who.int/gb/ebwha/pdf_files/WHA71/A71_R3-en.pdf, accessed 9 September 2018).
8. Joint Initiative: “FIND. TREAT. ALL. #ENDTB” (website). Geneva: World Health Organization; 2018 (<http://www.who.int/tb/joint-initiative/en/>, accessed 10 September 2018).
9. United to End Tuberculosis: An Urgent Global Response to a Global Epidemic. Political declaration on the fight against tuberculosis. United Nations, New York; 2018 (<https://www.un.org/pga/72/wp-content/uploads/sites/51/2018/09/Co-facilitators-Revised-text-Political-Declaration-on-the-Fight-against-Tuberculosis.pdf>, accessed 3 October 2018).
10. The END TB Strategy. Global strategy and targets for tuberculosis prevention, care and control after 2015. Geneva: World Health Organization; 2014.
11. Every Woman Every Child. The global strategy for women’s, children’s and adolescents’ health (2016–2030). Survive, thrive, transform. Geneva: World Health Organization; 2018.
12. 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–e9. doi:10.1016/s2214-109x(14)70245-1.
13. Snow KJ, Sismanidis C, Denholm J, Sawyer Susan M, Graham SM. The incidence of tuberculosis among adolescents and young adults: a global estimate. *Eur Respir J*. 2018;51(2). doi:10.1183/13993003.02352-2017.
14. Oliwa JN, Karumbi JM, Marais BJ, Madhi SA, Graham SM. Tuberculosis as a cause or comorbidity of childhood pneumonia in tuberculosis-endemic areas: a systematic review. *Lancet Respir Med*. 2015;3(3):235–43. doi:10.1016/s2213-2600(15)00028-4.
15. Patel LN, Detjen AK. Integration of childhood TB into guidelines for the management of acute malnutrition in high burden countries. *Public Health Action*. 2017;7(2):110–115. doi:10.5588/pha.17.0018.
16. Dodd PJ, Yuen CM, Sismanidis C, Seddon JA, Jenkins HE. The global burden of tuberculosis mortality in children: a mathematical modelling study. *Lancet Glob Health*. 2017;5(9):e898–e906. doi:10.1016/s2214-109x(17)30289-9.
17. Miles to go: closing gaps, breaking barriers, righting injustices. Global AIDS update. Geneva: Joint United Nations Programme on HIV/AIDS; 2018.
18. Dodd PJ, Prendergast AJ, Beecroft C, Kampmann B, Seddon JA. The impact of HIV and antiretroviral therapy on TB risk in children: a systematic review and meta-analysis. *Thorax*. 2017;72(6):559–75. doi:10.1136/thoraxjnl-2016-209421.
19. Dodd PJ, Sismanidis C, Seddon JA. Global burden of drug-resistant tuberculosis in children: a mathematical modelling study. *Lancet Infect Dis*. 2016;16(10):1193–201. doi:10.1016/S1473-3099(16)30132-3.
20. Jenkins HE, Tolman AW, Yuen CM, Parr JB, Keshavjee S, Pérez-Vélez CM et al. Incidence of multidrug-resistant tuberculosis disease in children: systematic review and global estimates. *Lancet*. 2014;383(9928):1572–9. doi:10.5588/ijtld.17.0357.
21. Roadmap for childhood tuberculosis: towards zero deaths. Geneva: World Health Organization; 2013 (<http://apps.who.int/iris/handle/10665/89506>, accessed 4 October 2018).

22. Best practices in child and adolescent tuberculosis care. Geneva: World Health Organization; 2018 (<http://apps.who.int/iris/handle/10665/274373>, accessed 4 October 2018).
23. Latent tuberculosis infection: updated and consolidated guidelines for programmatic management. Geneva: World Health Organization; 2018 (<http://apps.who.int/iris/handle/10665/260233>, accessed 4 October 2018).
24. Strategic investments for adolescents in HIV, tuberculosis and malaria programs. Maximizing impact by addressing adolescents' needs in Global Fund concept notes. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2016.
25. Strengthening community and primary health systems for TB: a consultation on childhood TB integration. New York: United Nations Children's Fund; 2016 ([https://www.unicef.org/health/files/2016_UNICEF_Strengthening_PHC_systems_for_TB_FINAL_report_\(Web\).pdf](https://www.unicef.org/health/files/2016_UNICEF_Strengthening_PHC_systems_for_TB_FINAL_report_(Web).pdf), accessed 4 October 2018).
26. Enarson DA, Ait-Khaled N. Tuberculosis. In: Annesi-Maesano I, Gulsvik A, Viegi G, editors. Respiratory Epidemiology in Europe. European Respiratory Monographs 2000.
27. Summary of Childhood TB seminar on LeaderNet. Arlington: Management Sciences for Health; 2016.
28. The paradigm shift. 2016–2020 Global Plan to Stop TB. Geneva: Stop TB Partnership; 2015.
29. Research priorities for paediatric tuberculosis. New York: Treatment Action Group and Child and Adolescent TB Working Group; 2018 (http://www.treatmentactiongroup.org/sites/default/files/pediatric_tb_research_priorities_9_24.pdf, accessed 4 October 2018).

Selected resources on child and adolescent TB

Guidance and guidelines

- Guidance for national tuberculosis programmes on the management of tuberculosis in children. Second edition. Geneva: World Health Organization; 2014. (WHO/HTM/TB/2014.03. <http://apps.who.int/medicinedocs/documents/s21535en/s21535en.pdf>, accessed 10 September 2018).
- Rapid Communication: Key changes to treatment of multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB). Geneva: World Health Organization; 2018. (http://www.who.int/tb/publications/2018/WHO_RapidCommunicationMDRTB.pdf?ua=1, accessed 10 September 2018).
- Desk guide for diagnosis and management of TB in children. Paris: The Union; 2015. (<https://www.theunion.org/what-we-do/publications/technical/desk-guide-for-diagnosis-and-management-of-tb-in-children3>, accessed 10 September 2018).
- Compendium of WHO guidelines and associated standards: ensuring optimum delivery of the cascade of care for patients with tuberculosis. Second edition - June 2018. Available from: Geneva: World Health Organization; 2018 (<http://apps.who.int/iris/bitstream/handle/10665/272644/9789241514101-eng.pdf?ua=1>, accessed 10 September 2018).
 - Also available as mobile application from: <http://thecompendium.info>. Direct hyperlinks to the apps in the app stores:
iTunes: <https://itunes.apple.com/us/app/the-compendium/id1355153408>
Android: <https://play.google.com/store/apps/details?id=com.gisvcs.thecompendium>

Online training

- Childhood TB portal (with childhood TB online courses and resources). Paris: The Union (<https://childhoodtb.theunion.org/>, accessed 10 September 2018).

Planning and programme management

- KNCV Tuberculosis Benchmarking tool for Childhood TB policies, practice and planning (website). Den Haag: KNCV Tuberculosis Foundation. (<https://www.kncvtbc.org/kb/kncv-benchmarking-tool-for-childhood-tb-policies-practice-and-planning/>, accessed 10 September 2018).

Paediatric drug-resistant TB

- The Sentinel Project on Pediatric Drug-Resistant Tuberculosis. Resources, including webinars, project publications and treatment guidelines (website). Boston: The Sentinel Project (<http://sentinel-project.org/resources/>, accessed 10 September 2018).

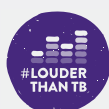
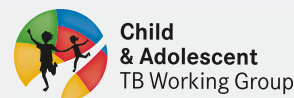
Advocacy

- Change the Game. An agenda for action on childhood tuberculosis. New York: United Nations Children's Fund; 2018 (https://data.unicef.org/wp-content/uploads/2018/03/TB-Advocacy-Brochure-Final-3_21-high-Res.pdf, accessed 10 September 2018).
- The ascent begins: tuberculosis research funding trends, 2005–2016. New York: Treatment Action Group; 2017 (http://www.treatmentactiongroup.org/sites/default/files/TB_FUNDING_2017_final.pdf, accessed 10 September 2018).
- The Tuberculosis Diagnosis Pipeline for Children. New York: Treatment Action Group; 2018 (<http://www.pipelinerreport.org/2018/tb-peds-diagnosis-pipeline>, accessed 10 September 2018).
- The Tuberculosis Prevention Pipeline for Children. New York: Treatment Action Group; 2018 (<http://www.pipelinerreport.org/2018/tb-peds-prevention-pipeline>, accessed 10 September 2018).
- The Tuberculosis Treatment Pipeline for Children. New York: Treatment Action Group; 2018 (<http://www.pipelinerreport.org/2018/tb-peds-treatment-pipeline>, accessed 10 September 2018).

Websites

- Stop TB Partnership Child and Adolescent Working Group (http://www.stoptb.org/wg/dots_expansion/childhoodtb/, accessed 10 September 2018).
- WHO Childhood and Adolescent TB (<http://www.who.int/tb/areas-of-work/children/en/>, accessed 10 September 2018).

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