Note: Charts below are illustrative placeholders and should be replaced with official series before publication.

CHAPTER 15

Non-vectored Infectious Diseases: Tuberculosis and Parasitic Infections (Ethiopia + global lens)

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15.1) Concepts, Burden & Rationale

We frame non-vectored infectious diseases with an Ethiopia focus and a global lens. Tuberculosis (airborne) and non-vectored parasitic diseases (soil-transmitted helminths, schistosomiasis, taeniasis/cysticercosis, echinococcosis, and protozoa such as giardiasis) share poverty-linked determinants and delivery platforms. This section defines core metrics, sketches a pathway from exposure to outcomes, summarizes why this agenda is central to human capital and equity, and previews subsequent TB and parasitic disease sections.

Figure 15.1-3. Indicative trends — TB incidence and schistosomiasis morbidity (biennial)

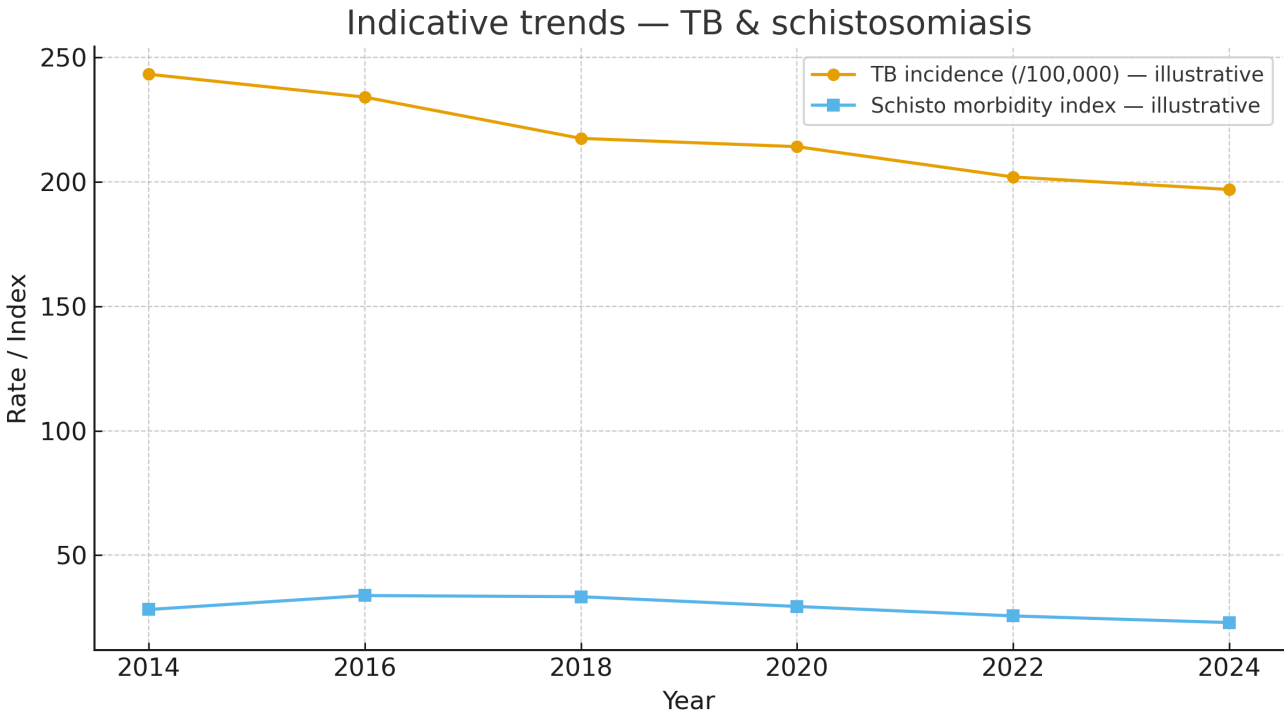

Table 15.1-A. Core concepts and definitions

Term	Definition / explanation
Non-vectored infectious diseases	Infections transmitted without arthropod vectors; e.g., TB (airborne), soil/water-mediated helminths, food-borne parasites.
Tuberculosis (TB)	Airborne disease caused by Mycobacterium tuberculosis; includes latent infection and active disease.
Parasitic diseases (non-vectored)	STH, schistosomiasis (snail intermediate host), taeniasis/cysticercosis, echinococcosis, giardiasis.
Determinants	Poverty, malnutrition, HIV/diabetes (TB), WASH deficits, housing crowding, occupational exposures.
Primary prevention	BCG, TB preventive therapy (TPT), WASH, food/meat safety, health education.
Secondary prevention	Screening/case finding (TB symptoms/CXR/Xpert; stool/urine tests for parasites).
Tertiary prevention	Effective treatment and management to avert complications and mortality.

Table 15.1-B. Key epidemiological metrics and formulas (plain text)

Metric	Formula / definition
Incidence (I)	I = new_cases / population × 10^n
Prevalence (P)	P = existing_cases / population × 10^n

Case fatality ratio (CFR)	CFR = deaths_among_cases / cases × 100
R0	Average secondary cases from one case in a susceptible population
TB treatment success	% of drug-susceptible TB cohort cured or completed
MDA coverage	Treated / eligible population × 100

Table 15.1-C. Why TB & non-vectored parasitic diseases matter in Ethiopia

Why this chapter	Policy/program rationale
Economic & human capital	Diseases reduce productivity, school attendance, and lifetime earnings.
Equity	Burden concentrates among the poor, displaced, and remote rural communities.
Health systems	Sentinel conditions for PHC strength, diagnostics, and supply chains.
Synergies	WASH + deworming; TB/HIV integration; One-Health for zoonoses.

Ethiopia-focused considerations

• TB remains a leading infectious killer; undernutrition, HIV, and diabetes are key drivers of progression and poor outcomes.
• Non-vectored parasitic diseases reduce school performance and productivity; reinfection is common without WASH improvements.
• Delivery platforms overlap: PHC for TB screening/treatment; schools and community campaigns for deworming and schisto MDA.
• Surveillance should integrate HMIS, lab networks (GeneXpert), and geospatial mapping for targeting.

Plain-language summary

TB spreads through the air, and many parasites come from soil, water, or food. These diseases hurt learning and earning, especially for poorer families. Ethiopia can make big gains by finding TB early, giving preventive medicines, improving water and sanitation, and running regular school deworming. Because the same places face both problems, combining services and tracking results can save more lives and resources.

References — Section 15.1 (URLs)

• **WHO — Global Tuberculosis Programme —** https://www.who.int/teams/global-tuberculosis-programme

• **WHO — Neglected Tropical Diseases (NTD) —** https://www.who.int/teams/control-of-neglected-tropical-diseases

• **Ethiopia EPHI / FMoH reports —** https://www.ephi.gov.et/

• **The DHS Program — Ethiopia —** https://dhsprogram.com/

• **UNICEF — WASH resources —** https://www.unicef.org/wash

15.2) TB Epidemiology: Levels, Trends & Spatial Patterns

This section profiles Ethiopia's TB burden with a global comparison and a focus on sub-national heterogeneity. We show long-run incidence trends (biennial years to keep labels legible), age-sex notification patterns, a schematic regional profile, the TB cascade from infections to treatment success, and a simple trend in drug-resistant TB notifications. Replace the illustrative values with official WHO Global TB Report and national HMIS/DHIS2 data where available.

Figure 15.2-2. TB notification rates by age & sex (schematic)

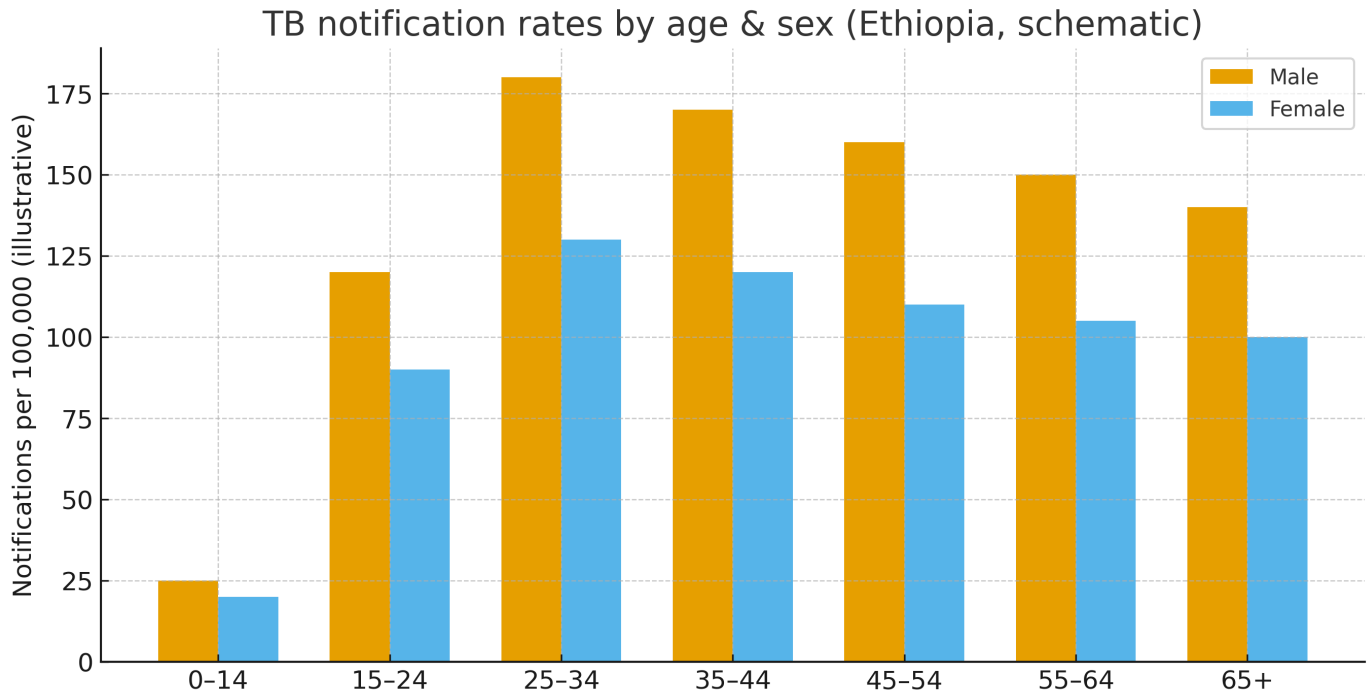

Figure . Drug-resistant TB notifications trend (biennial; illustrative)

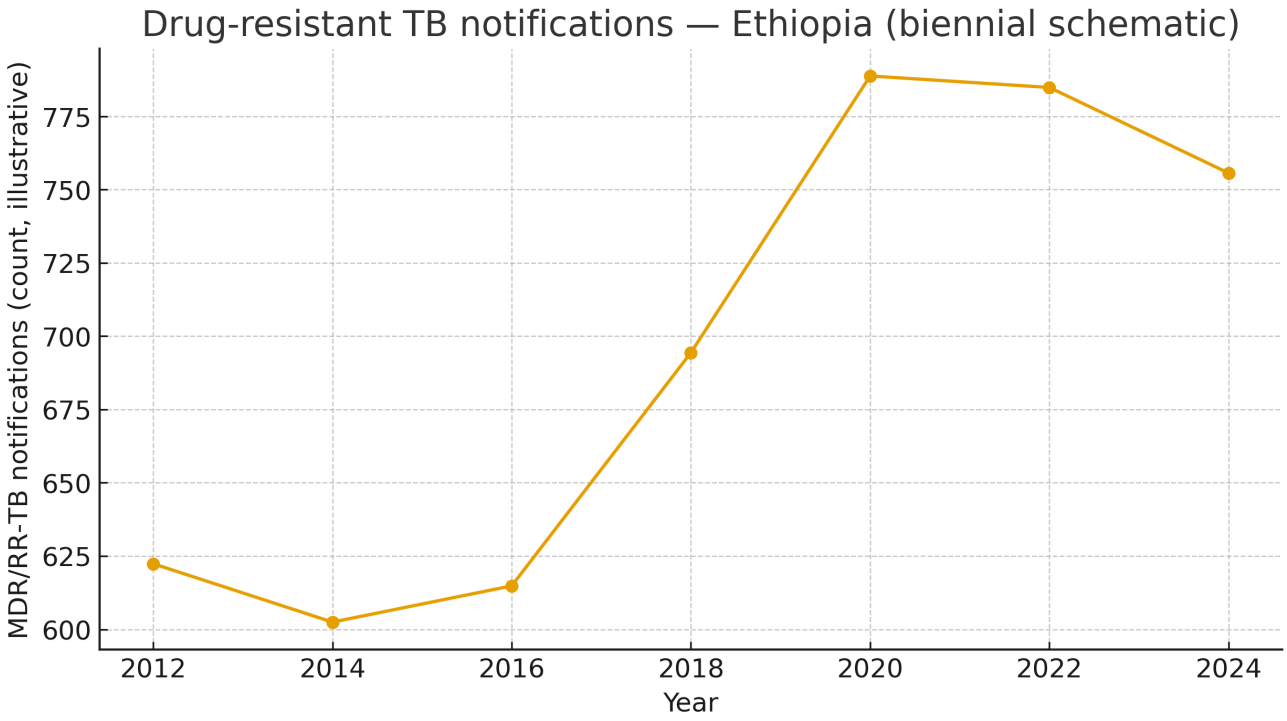

Table 15.2-A. Indicators and definitions

Indicator	Definition / notes
Incidence (TB)	Estimated new/relapse TB cases per 100,000 per year (model-based using prevalence surveys, notifications, and mortality).
Notification rate	Notified TB cases per 100,000; proxy for case detection with caveats.
Case detection ratio (CDR)	Notifications / Estimated incidence × 100.
Treatment success rate (TSR)	% of drug-susceptible TB cohort cured or completed.
MDR/RR-TB rate	% of tested TB cases with rifampicin resistance; or notifications per 100,000.
Mortality (TB)	TB deaths per 100,000 (HIV-positive and HIV-negative).

Table 15.2-B. Data sources and their roles

Source	What it contributes
WHO Global TB Report	Incidence/mortality estimates, DR-TB, treatment outcomes.
HMIS / DHIS2 notifications	Facility-reported TB cases; completeness/timeliness important.
Lab networks (Xpert, culture, DST)	Bacteriological confirmation & DR-TB surveillance.
Population surveys (DHS, PHIA)	Risk factors; sometimes TB symptom/CXR modules.
Special studies (prevalence surveys)	Anchor incidence models; rare but high value.

Table 15.2-C. Key formulas (plain text)

Metric	Formula
Notification rate	NR = (TB_notified / Population) × 100,000
CDR (%)	CDR = (Notifications / Estimated_incidence) × 100
TSR (%)	TSR = ((Cured + Completed) / Cohort_total) × 100
MDR proportion	MDR% = (RR/MDR detected / Total tested) × 100

Table 15.2-D. Interpretation caveats and biases

Issue	Implication for interpretation
Under-notification & under-diagnosis	Private sector, remote areas, stockouts, and stigma bias notifications downward.
Backlogs & shocks	Conflict/displacement and pandemics can depress detection temporarily.
Denominator issues	Population estimates and migration affect rates and CDR.

Spatial heterogeneity	Hotspots (urban cores, border areas, camps) can be masked in national averages.

Ethiopia-focused considerations

• Urban cores and border/corridor districts often show higher TB notification rates; integrate TB screening with HIV and primary care.
• Strengthen laboratory networks (Xpert/Ultra, culture, DST) and sample transport to improve bacteriological confirmation and DR-TB detection.
• Use small-area estimation and cohort analytics to identify persistent detection gaps and treatment outcome disparities.
• Coordinate with nutrition and social protection programs in hotspots where undernutrition and poverty drive TB risk.

Narrative summary

Ethiopia's TB burden is declining over the long term but remains heterogeneous across age, sex, and geography. Young and middle-aged men often have the highest notification rates, and urban cores and corridor districts emerge as recurrent hotspots. The TB cascade underscores the critical transition losses from infection to successful treatment—each step is an opportunity for impact through better screening, faster diagnosis, and patient-centered care. Routine triangulation of HMIS, lab, and WHO estimates is essential to track progress and focus resources where incidence and transmission persist.

References — Section 15.2 (URLs)

• **WHO Global Tuberculosis Report —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **Ethiopia FMoH / EPHI — HMIS/DHIS2 data and TB guidelines —** https://www.ephi.gov.et/

• **The DHS Program — Ethiopia risk factors & background indicators —** https://dhsprogram.com/

• **Stop TB Partnership — Data & dashboards —** https://www.stoptb.org/

15.3) Determinants & Risk Factors (TB)

This subsection synthesizes biological, behavioral, environmental, and social determinants that shape tuberculosis risk in Ethiopia. We emphasize factors that increase progression from infection to active disease (e.g., HIV, undernutrition, diabetes) and those that amplify exposure (e.g., household crowding, poor ventilation, occupational silica). We provide program-oriented metrics (PAF, screening yield, NNS), contextual prevalence patterns, and targeting heuristics to prioritize interventions.

Figure . Risk factor prevalence by context (schematic)

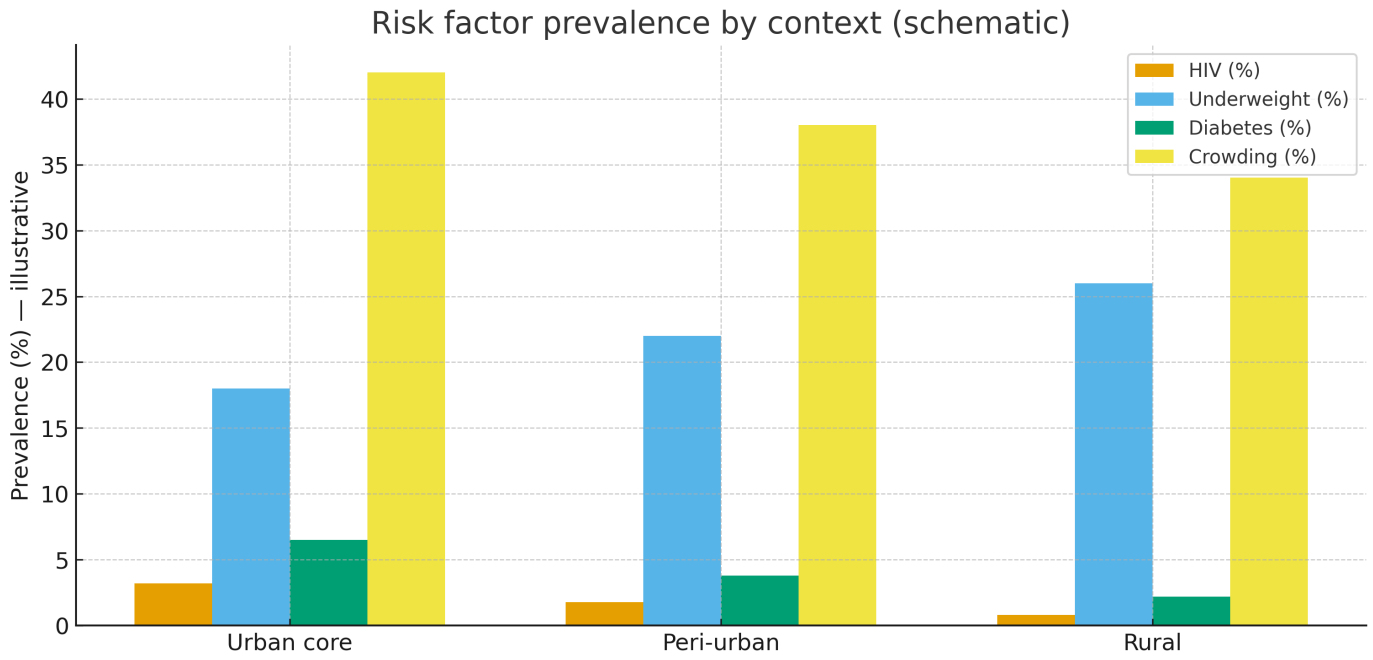

Figure . Dose–response: BMI bands vs relative risk (schematic)

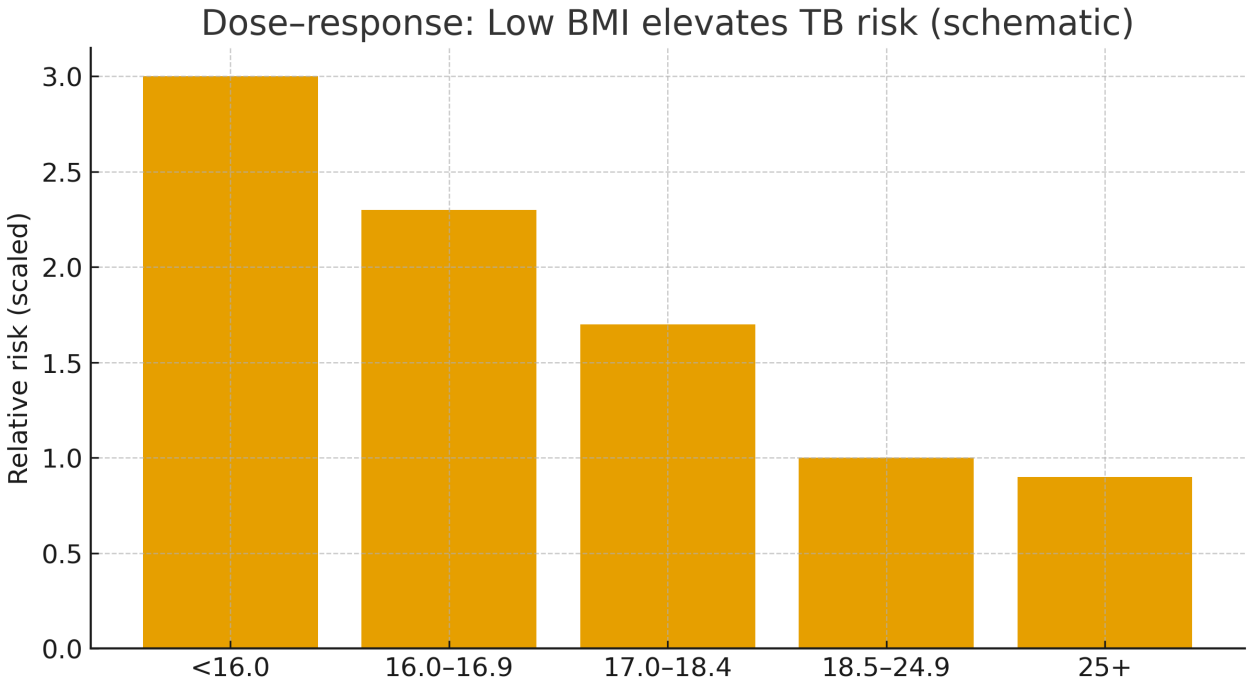

Table 15.3-A. Determinants and mechanisms — implications for programs

Determinant	Mechanism / program implication
HIV coinfection	Impaired cellular immunity increases progression from infection to disease; higher mortality without ART.
Undernutrition (low BMI)	Reduces immune competence; strong dose–response with TB incidence and mortality.
Diabetes mellitus	Hyperglycemia impairs innate and adaptive immunity; higher risk of active TB and poor outcomes.
Smoking & alcohol use	Damages mucosa/immunity; linked to poor adherence and outcomes.
Household crowding & ventilation	Higher contact intensity; increased household transmission.
Silica/occupational exposure	Silicosis dramatically raises TB risk; mining/construction at risk.

Air pollution (indoor/outdoor)	Inflammation and impaired host defense; proxy for low ventilation and biomass use.
Poverty & access barriers	Delayed care, under-diagnosis, and treatment interruption.

Table 15.3-B. Program metrics and formulas (plain text)

Metric / concept	Definition / formula
Population attributable fraction (PAF)	PAF = p(RR−1)/[1+p(RR−1)] where p is exposure prevalence and RR relative risk.
Screening yield	Yield = positives / screened × 100; compare by risk group and algorithm.
Number needed to screen (NNS)	NNS = screened / cases detected; lower is better for targeted screening.
TB risk score (program)	Composite of HIV, BMI, diabetes, symptoms, and contact history to prioritize diagnostics.

Table 15.3-C. Ethiopia-specific operational priorities by context

Context	Operational priorities for Ethiopia
Urban cores/corridors	Higher HIV, smoking, and crowding; integrate TB-HIV services; workplace screening pilots.
Pastoral/peripheral	Lower HIV but higher access barriers; mobile clinics; community sputum collection.
Conflict/displacement settings	Crowding, undernutrition; active case finding; isoniazid/rifapentine prophylaxis for contacts/PLHIV when feasible.
Diabetes programs	Bidirectional TB–DM screening; integrate with NCD clinics and pharmacies.
Nutrition platforms	Targeted food support for TB patients with low BMI; link to safety nets.

Table 15.3-D. Targeted screening algorithms (programmatic)

Population	Targeted screening algorithm (programmatic)
General adult	Symptom screen → CXR (if available) → Xpert/Ultra; prioritize high-pretest probability.
PLHIV	Routine periodic screening; LF-LAM for inpatients/severely ill; Xpert as first test.
Contacts of TB cases	Household contact investigation; test & treat for infection; fast-track symptomatic contacts.
Occupational (silica)	Periodic screening with CXR/Xpert; workplace TB control plans.
Diabetes clinics	Bidirectional screening; fast-track TB diagnostics for symptomatic patients.

Ethiopia-focused considerations

• Scale bidirectional TB screening in HIV and diabetes clinics; deploy LF-LAM for eligible PLHIV and Xpert/Ultra as first test.
• Integrate nutrition assessment and support into TB care (BMI, MUAC), with linkages to social protection in food-insecure districts.
• Prioritize household contact investigation and preventive therapy with rifapentine-based regimens where feasible.
• Improve ventilation and decongestion in clinics and waiting areas; promote workplace TB control in mining/construction.
• Use context-specific risk profiles (urban cores, corridors, pastoral areas) to target outreach and mobile services.

Narrative summary

TB risk in Ethiopia is driven by a mix of factors: HIV coinfection accelerates progression; undernutrition and diabetes weaken host defenses; crowded housing and poorly ventilated spaces intensify exposure; and occupational silica and tobacco use add risk for specific groups. Programmatically, the highest yields come from focused screening in high-risk clinics and households, coupled with nutrition support and rapid linkage to quality diagnostics. Estimating PAFs, tracking screening yield and NNS, and mapping context-specific profiles help managers direct effort toward the determinants that matter most in each district.

References — Section 15.3 (URLs)

• **WHO Global TB Report — risk factors —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **TB & diabetes (WHO/Union) collaborative framework —** https://www.who.int/publications/i/item/9789241502252

• **TB & nutrition guidance —** https://www.who.int/publications

• **LF-LAM guidance for PLHIV (WHO) —** https://www.who.int/

• **Stop TB Partnership — resources —** https://www.stoptb.org/

15.4) Diagnostics & Case Finding (TB)

This subsection translates Ethiopia's TB diagnostic landscape into program choices for high-yield case finding. We emphasize rapid molecular testing (Xpert/Ultra) as first-line where available, smart use of CXR (with or without CAD-AI) for triage, and targeted active case finding (ACF) in high-risk populations. All figures are illustrative placeholders to be replaced by HMIS/DHIS2, lab, and WHO sources.

Figure . Coverage of rapid molecular testing (Xpert/Ultra) — biennial (illustrative)

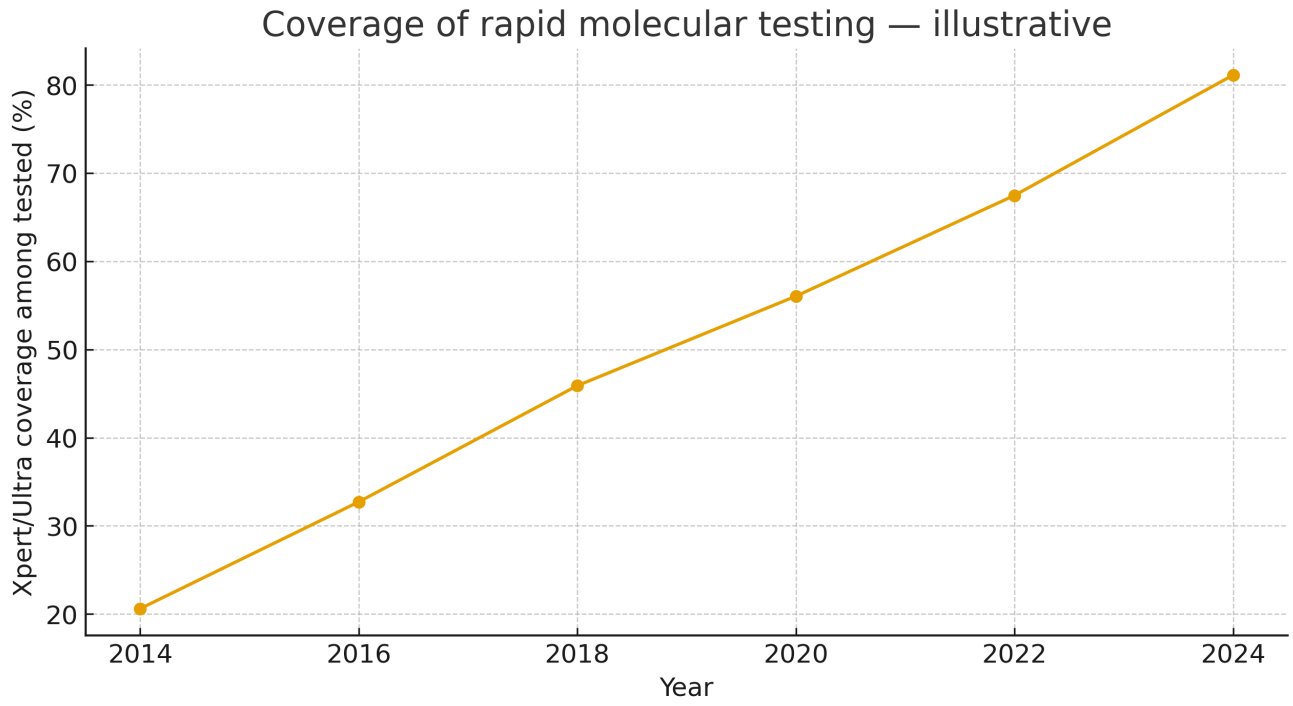

Table 15.4-A. Diagnostic tools — roles and notes

Tool	Notes & program role
Symptom screening	High sensitivity for prolonged cough when combined with risk profiling; low specificity alone.
Chest X-ray (CXR)	Sensitive triage; CAD-AI can assist; needs QA and radiation safety.

Smear microscopy	Low sensitivity esp. in PLHIV/children; still used where molecular access limited.
Xpert MTB/RIF / Ultra	Rapid molecular; detects rifampicin resistance; first test of choice.
Culture & DST	Gold standard and for full DST; slower and resource-intensive.
LF-LAM (PLHIV inpatients)	Useful for seriously ill PLHIV; complements Xpert.

Table 15.4-B. Targeted diagnostic algorithms by population

Population	Targeted diagnostic algorithm (programmatic)
General adult (facility)	Symptom screen → CXR (if available) → Xpert/Ultra; same-day sputum collection when possible.
PLHIV	Routine screening; LF-LAM for eligible; Xpert as first test; immediate linkage to ART.
Childhood TB	Symptom/history → CXR → molecular on specimen (gastric aspirate/induced sputum) or stool Xpert; clinical scoring.
Contacts of TB cases	Household contact investigation; fast-track symptomatic contacts; TB infection testing and TPT for eligible.
Occupational/high-risk groups	Periodic screening with CXR/Xpert; workplace TB plans.

Table 15.4-C. Core indicators for diagnostics & case finding

Indicator	Definition / computation
Xpert coverage	% of presumptive TB tested with Xpert/Ultra.
Positivity rate	% of Xpert/Ultra tests that are TB positive.
NNS (by channel)	Number needed to screen = screened / cases detected.

Time to diagnosis	Median days from first symptom to bacteriological diagnosis.
Bacteriological confirmation	% of notified pulmonary TB that are bacteriologically confirmed.
RR detection among positives	% of TB positives tested for RIF resistance with valid result.

Table 15.4-D. Key formulas (plain text)

Metric	Formula (plain text)
Positivity (%)	100 × (TB_positive / Tests_done)
NNS	Screened / Cases_detected
Xpert coverage (%)	100 × (Xpert_tests / Tests_total_for_TB)
Bac. confirmation (%)	100 × (Bac_confirmed / Notified_PTB)

Table 15.4-E. Ethiopia-specific operational priorities

Context	Operational priorities for Ethiopia
Urban cores & corridors	Extend evening/weekend sputum collection; link with HIV services; maintain cartridge supply and calibration.
Peri-urban growth areas	Mobile CXR triage days + onsite Xpert; community health worker referral loops.
Remote rural	Specimen transport networks; hub-and-spoke Xpert; SMS result return; fallback to smear where necessary.
Children & adolescents	Pediatric sampling capacity; stool Xpert pilots; strengthen clinical scoring & referral.
Private sector	Engage private labs/clinics; notification agreements; QA and commodity support.

Ethiopia-focused considerations

• Standardize CXR triage + Xpert algorithms in urban cores and corridors; ensure cartridge supply and maintenance.
• Institutionalize contact investigation with fast-track testing for symptomatic contacts and TB infection testing for others.
• Build specimen transport networks and SMS result delivery for remote districts; align with community health platforms.
• Expand pediatric sampling capacity and consider stool Xpert pilots; strengthen referral from schools and pediatric wards.
• Formalize private sector engagement with notification, QA, and commodity support.

Narrative summary

Finding people with TB earlier saves lives and reduces transmission. Ethiopia can boost detection by using Xpert/Ultra widely, adding chest X-ray as an efficient triage tool, and taking services to where risk and symptoms are—households of TB patients, HIV and diabetes clinics, urban workplaces, and remote communities. Measuring positivity, NNS, and time to diagnosis across channels will reveal where to intensify efforts and where to simplify.

References — Section 15.4 (URLs)

• **WHO — TB screening & diagnostics guidelines —** https://www.who.int/teams/global-tuberculosis-programme

• **Stop TB Partnership — ACF and diagnostics resources —** https://www.stoptb.org/

• **Ethiopia FMoH / EPHI — TB guidelines and HMIS/DHIS2 —** https://www.ephi.gov.et/

• **CAD/AI for CXR — WHO guidance —** https://www.who.int/

15.5) Treatment Regimens & Outcomes (TB)

This subsection distills current treatment approaches for drug-susceptible and drug-resistant TB and links them to operational outcomes and patient experience. We emphasize same-day initiation when clinically appropriate, differentiated delivery with multi-month dispensing (MMD), and robust active drug safety monitoring (aDSM) for DR-TB. All figures are illustrative placeholders; replace with Ethiopia's national cohort reports and WHO Global TB Report data.

Figure . Drug-susceptible TB treatment success trend — Ethiopia (biennial; illustrative)

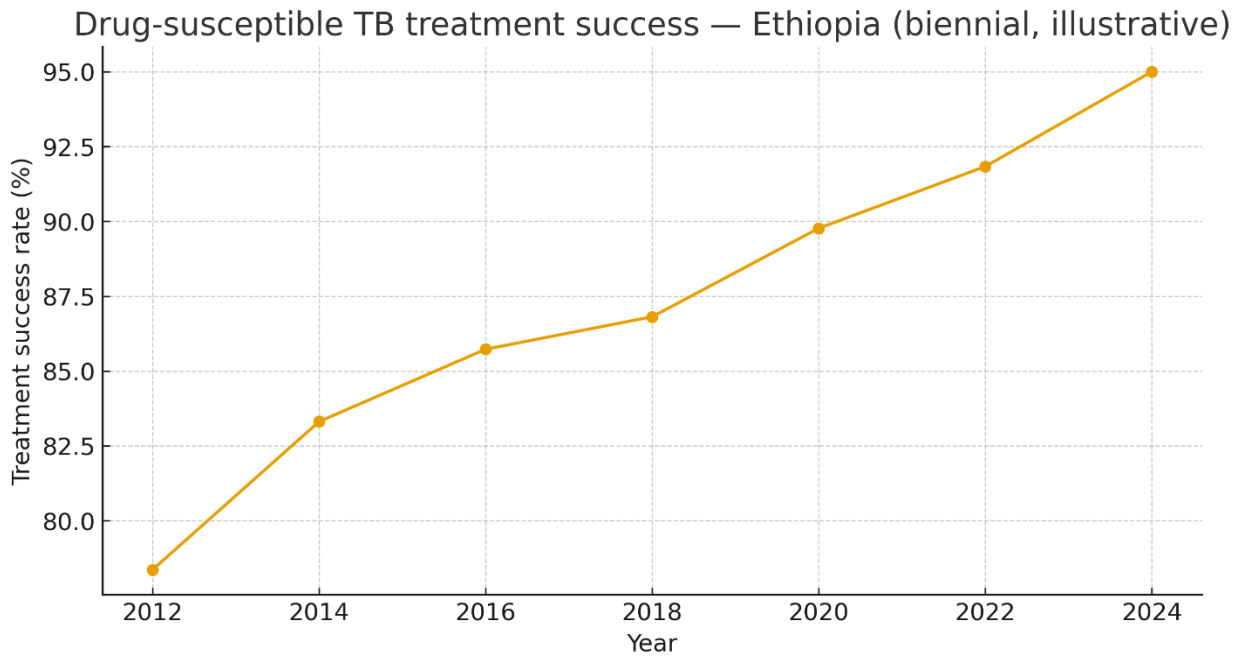

Figure 1. aDSM coverage over time (biennial; illustrative)

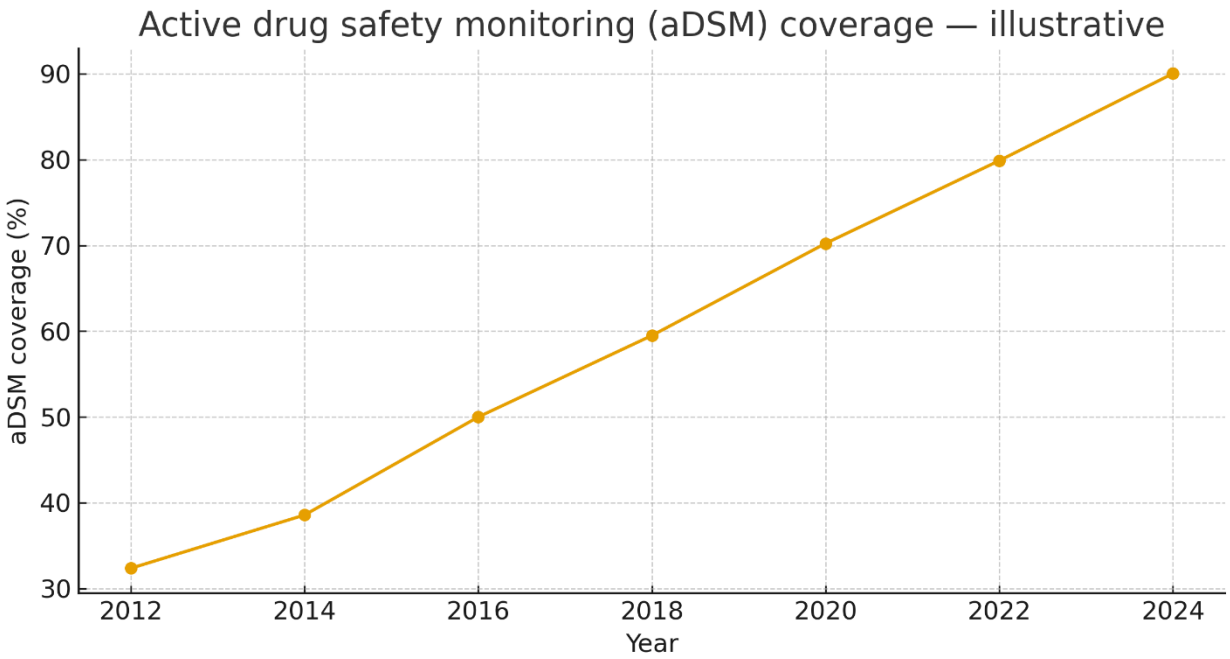

Table 15.5-A. Drug-susceptible TB regimens — program notes

Drug-susceptible TB regimens	Key notes (programmatic)
Standard 6-month regimen	2 months HRZE + 4 months HR (daily); patient-centered delivery and MMD where feasible.
4-month regimen (selected patients)	Daily regimen including rifapentine- and moxifloxacin-containing options per guidance; eligibility criteria apply.
Special populations	Pregnancy, children, hepatic/renal disease — adjust per national guideline; ensure pharmacovigilance.

Table 15.5-B. Drug-resistant TB regimens — program notes

Drug-resistant TB regimens	Key notes (programmatic)
Short all-oral (e.g., BPaLM/BPaL)	6–9 months all-oral; higher completion and faster time to culture conversion; aDSM required.
Long all-oral	18–20 months for specific resistance patterns or treatment history.
Add-ons/substitutions	Per DST and intolerance; consult national DR-TB committee.

Table 15.5-C. Operational elements for high-quality TB care

Operational element	Programmatic considerations
Same-day initiation	Reduce pre-treatment loss; readiness checks; starter packs available.
Differentiated service delivery	Facility or community refills; MMD for stable patients.
Adherence support	Digital reminders, peer support, treatment supporters as chosen by patient.
Safety monitoring	aDSM for DR-TB; routine AE screening for all regimens; rapid management pathways.
Social support	Transport vouchers, nutrition packages for underweight patients, linkage to safety nets.
Drug supply & QA	Forecasting, buffer stocks, quality assurance, and pharmacovigilance reporting.

Table 15.5-D. Core indicators for treatment outcomes

Indicator	Definition / computation
Treatment success (DS-TB)	% of cohort cured/completed.
Treatment success (DR-TB)	% of DR-TB cohort with favorable outcome per regimen.

Pre-treatment loss to follow-up	% diagnosed who do not start treatment within 14 days.
Time to treatment start	Median days from diagnosis to initiation.
Adverse event reporting	% of patients with aDSM record / AE assessed per visit.
MMD coverage	% of stable patients with ≥2-month refills (or program standard).

Table 15.5-E. Key formulas (plain text)

Metric	Formula (plain text)
Treatment success (%)	((Cured + Completed) / Cohort_total) × 100
Pre-treatment LTFU (%)	100 × (Diagnosed_no_start_≤14d / Diagnosed_total)
Median time to start	Median(Date_start − Date_diagnosis) in days
aDSM coverage (%)	100 × (Patients_with_aDSM / DR-TB_patients)

Ethiopia-focused considerations

• Institutionalize same-day initiation; track median time to start and pre-treatment LTFU.
• Scale MMD for stable DS-TB patients to reduce congestion and missed visits.
• Adopt/expand short all-oral DR-TB regimens where indicated; ensure aDSM and rapid AE management.
• Provide social/nutrition support for underweight patients to improve outcomes.
• Use cohort analytics by district, age, and sex to reveal gaps and tailor quality improvement.

Narrative summary

Treatment is the hinge between diagnosis and cure. When therapy starts quickly, is easy to stay on, and is monitored for safety, outcomes improve and transmission falls. For drug-susceptible TB, high treatment success hinges on same-day starts and patient-centered delivery. For drug-resistant TB, all-oral shorter regimens raise completion rates but require strong safety systems. Tracking success, losses to follow-up, and time to start—along with aDSM coverage—gives managers the dials to continually upgrade Ethiopia's TB care.

References — Section 15.5 (URLs)

• **WHO — TB treatment guidelines (DS-TB & DR-TB) —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **WHO — aDSM & pharmacovigilance resources —** https://www.who.int/

• **Stop TB Partnership — DR-TB regimen resources —** https://www.stoptb.org/

• **Ethiopia FMoH / EPHI — National TB guidelines & cohort reports —** https://www.ephi.gov.et/

15.6) Drug-Resistant Tuberculosis (DR-TB)

This subsection synthesizes Ethiopia’s DR-TB picture and the program design choices it implies. We profile incidence proxies, rifampicin resistance among those tested, diagnostic and enrollment cascades, culture conversion timing, outcomes by regimen, and safety monitoring. Replace the illustrative values with WHO Global TB Report estimates, national HMIS/DHIS2, and lab LIMS datasets.

Figure . DR-TB incidence proxy — Ethiopia (biennial; illustrative)

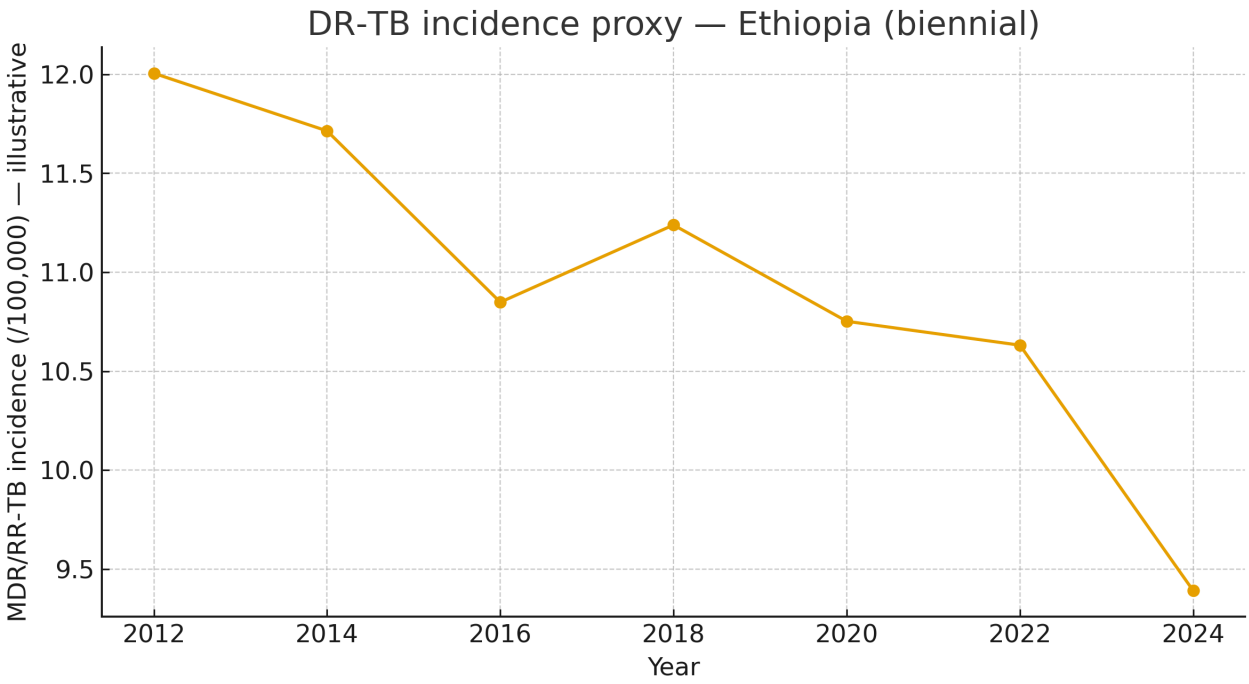

Figure . Rifampicin resistance among tested TB cases (biennial; illustrative)

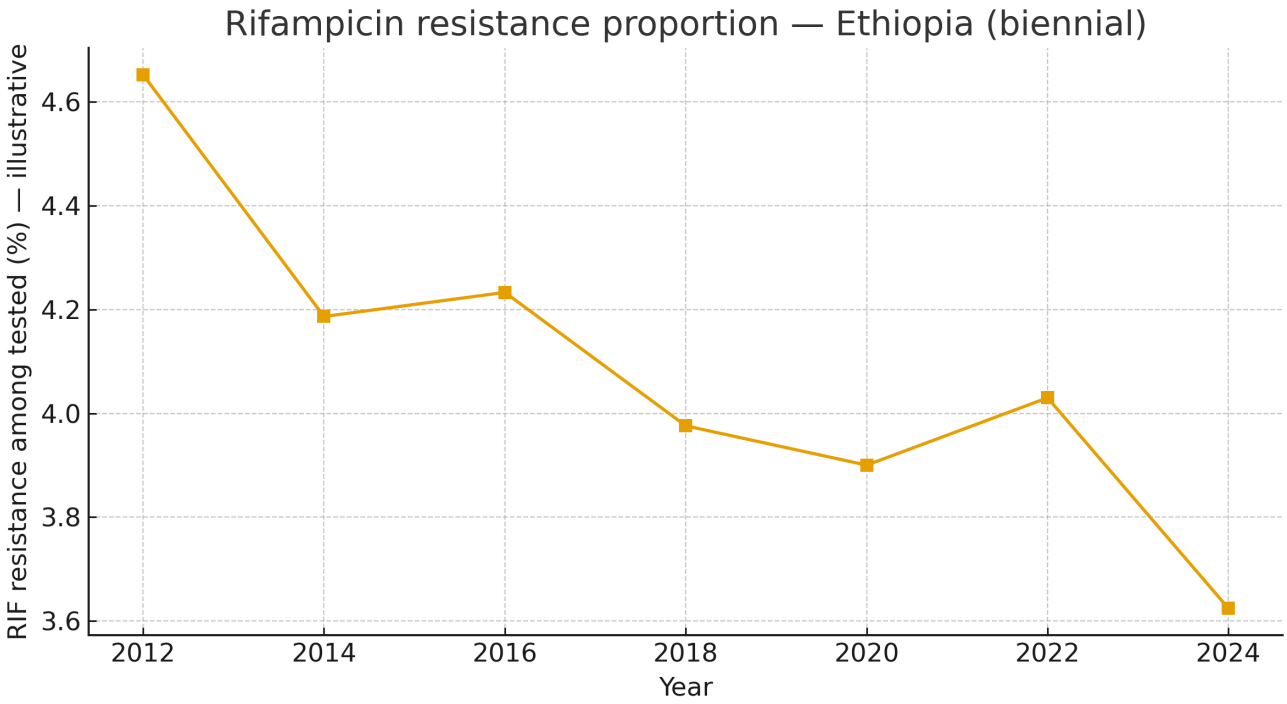

Figure . Treatment outcomes by regimen (BPaLM/BPaL vs comparators; illustrative)

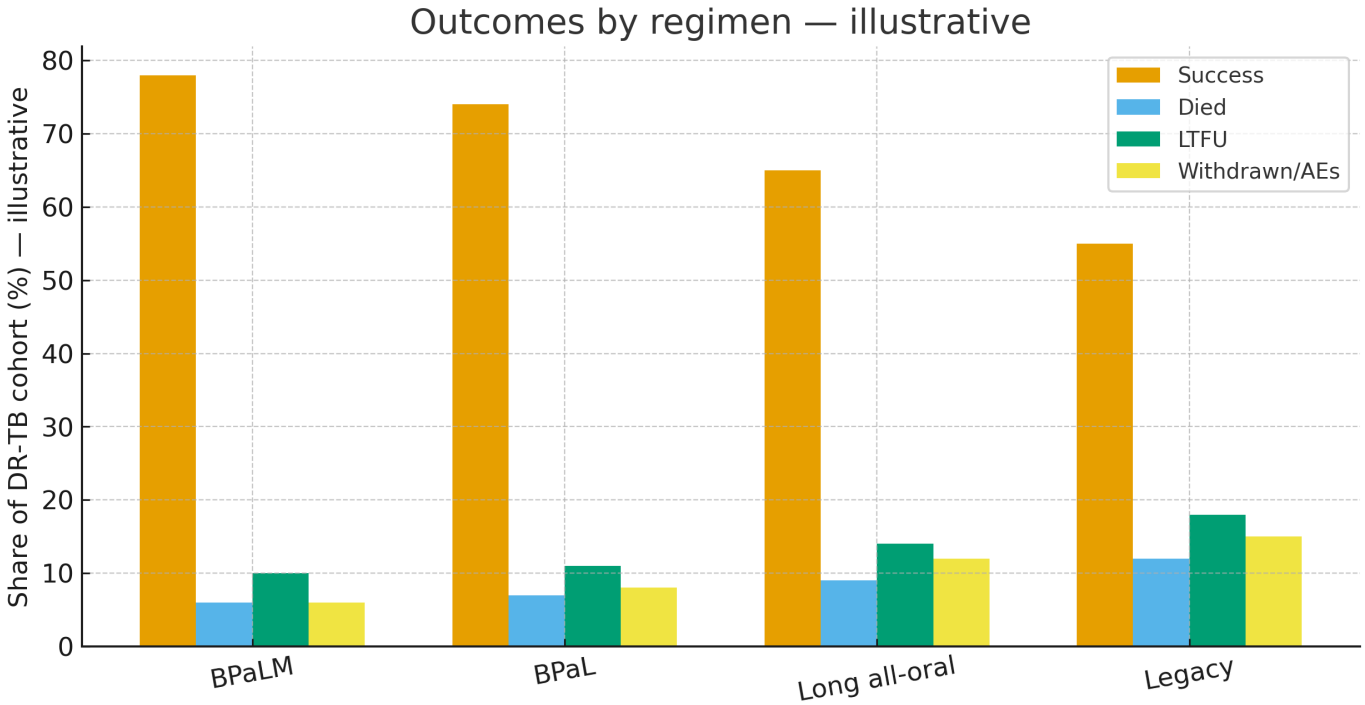

Figure . Safety monitoring: aDSM coverage & SAE reporting (biennial; illustrative)

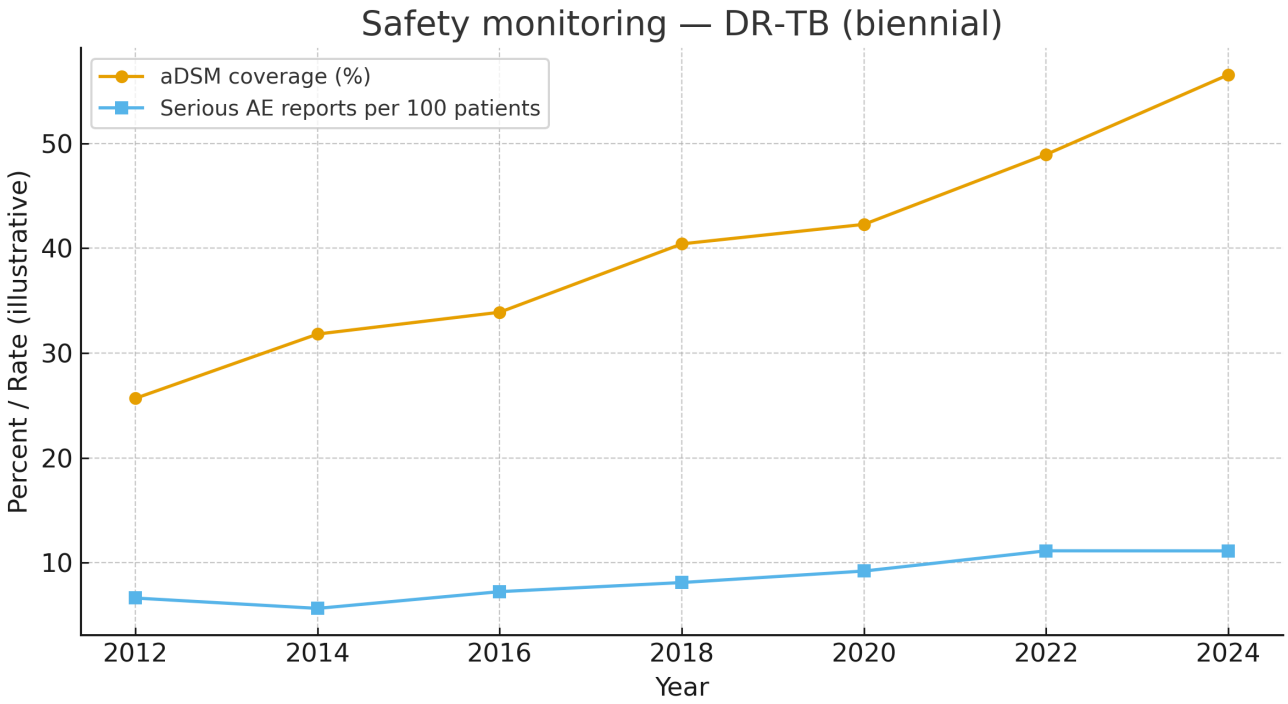

Table . Key definitions

Term	Definition / notes
RR-TB / MDR-TB	Rifampicin-resistant TB (RR-TB) includes MDR-TB (resistant to at least isoniazid and rifampicin).
XDR-TB (current WHO)	TB resistant to rifampicin plus any fluoroquinolone and ≥1 additional Group A drug.
aDSM	Active Drug Safety Monitoring and management for DR-TB regimens.
Culture conversion	Two consecutive negative cultures ≥30 days apart after initial positive.

Table . Diagnostics and data systems

Component	Operational elements in Ethiopia
Initial DST algorithm	Xpert/Ultra for RIF; reflex second-line DST where RR detected.

Second-line DST	Fluoroquinolones and Group A agents; LPA or sequencing where available.
Sample transport	Hub-and-spoke with tracking; cold chain where needed.
Data systems	LIMS→HMIS/DHIS2; unique IDs for deduplication.

Table 15.6-C. Regimens and program notes

Regimen	Notes (programmatic)
BPaLM	Bedaquiline + Pretomanid + Linezolid + Moxifloxacin; short, all-oral; aDSM mandatory.
BPaL	Bedaquiline + Pretomanid + Linezolid where Mfx not indicated; monitor linezolid toxicity.
Long all-oral	18–20 months tailored to DST; close adherence & AE management.
Adjuncts	Corticosteroids when indicated; pyridoxine with linezolid.

Table 15.6-D. Indicators for DR-TB program performance

Indicator	Definition / computation
RR testing coverage	% of TB positives with valid RIF result.
Enrollment gap	(RR detected − DR-TB starts) / RR detected × 100.
Conversion ≤3m	% of DR-TB cohort with culture conversion by 3 months.
Treatment success (DR-TB)	% with favorable outcome by regimen.
aDSM coverage	% of DR-TB patients with aDSM records; SAE rate.
Stockout days	Days of Group A/B drug stockout per quarter.

Table 15.6-E. Formulas (plain text)

Metric	Formula (plain text)
Enrollment gap (%)	100 × (RR_detected − DR_Tx_started) / RR_detected
Conversion by 3m (%)	100 × (Converted_≤90d / DR_TB_cohort)
Treatment success (%)	100 × (Favorable / Cohort_total)
RR testing coverage (%)	100 × (RR_tested_valid / TB_positive)

Table 15.6-F. Ethiopia-focused priorities and actions

Priority	Operational actions for Ethiopia
Scale short all-oral regimens	Prioritize BPaLM/BPaL where indicated; maintain aDSM.
Strengthen second-line DST	Expand LPA/sequencing; rapid reporting.
Close enrollment gaps	Enroll within 7 days of RR detection; patient navigation.
Supply chain resilience	Buffer stocks and synchronized forecasting for Group A/B drugs.
Data integration	Automate LIMS→DHIS2; unique IDs; dashboards by regimen/region/age/sex.

Ethiopia-focused considerations

• Ensure every TB positive has a valid RIF result; reflex second-line DST when RR is detected.
• Enroll patients on short all-oral regimens within a week of RR detection where indicated; embed patient navigation.
• Monitor culture conversion by 3 months and act on slow converters (adherence checks, AE management, regimen review).
• Maintain robust aDSM and commodity security for Group A/B drugs; publish quarterly DR-TB scorecards.
• Strengthen LIMS↔DHIS2 integrations and unique IDs for deduplication and longitudinal outcomes.

Narrative summary

Drug-resistant TB is a smaller share of Ethiopia's TB epidemic but demands exceptional program discipline. Universal rifampicin testing, rapid second-line DST, fast enrollment onto short all-oral regimens, and rigorous safety monitoring can deliver markedly better outcomes. Dashboards that track enrollment gaps, culture conversion, and aDSM coverage help clinical and supply chain teams coordinate in real time.

References — Section 15.6 (URLs)

• **WHO Global TB Report — DR-TB and treatment guidelines —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **Stop TB Partnership — DR-TB resources and regimens —** https://www.stoptb.org/

• **aDSM — WHO pharmacovigilance resources —** https://www.who.int/

• **Ethiopia FMoH / EPHI — National TB guidelines & LIMS/HMIS —** https://www.ephi.gov.et/

15.7) TB/HIV Integration

This subsection operationalizes the interface between TB and HIV programs in Ethiopia. It focuses on four pillars: (1) routine HIV testing for TB patients and rapid ART initiation for those coinfected; (2) systematic TB screening in HIV care; (3) scale-up of TB preventive therapy (TPT) with rifapentine-based regimens; and (4) integrated data, supply chains, and service models. Figures are illustrative placeholders.

Figure . HIV testing among TB patients — Ethiopia (biennial; illustrative)

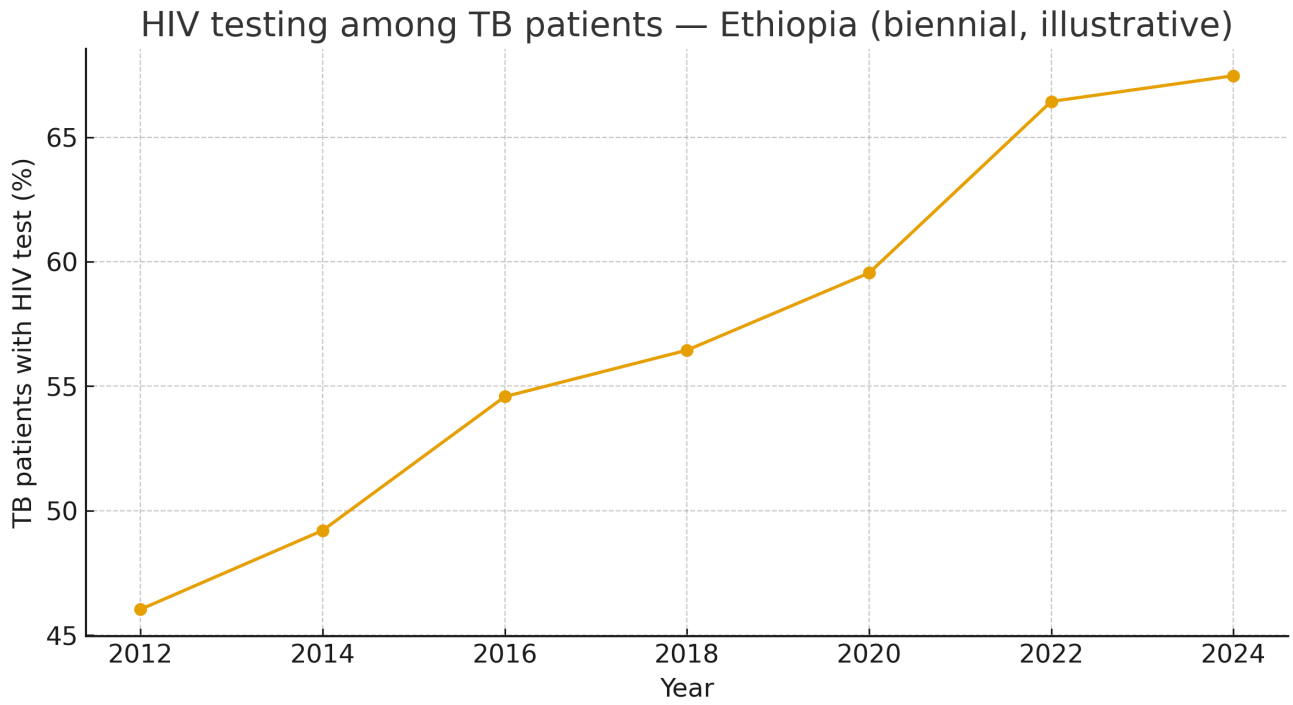

Figure . TB screening coverage among PLHIV — Ethiopia (biennial; illustrative)

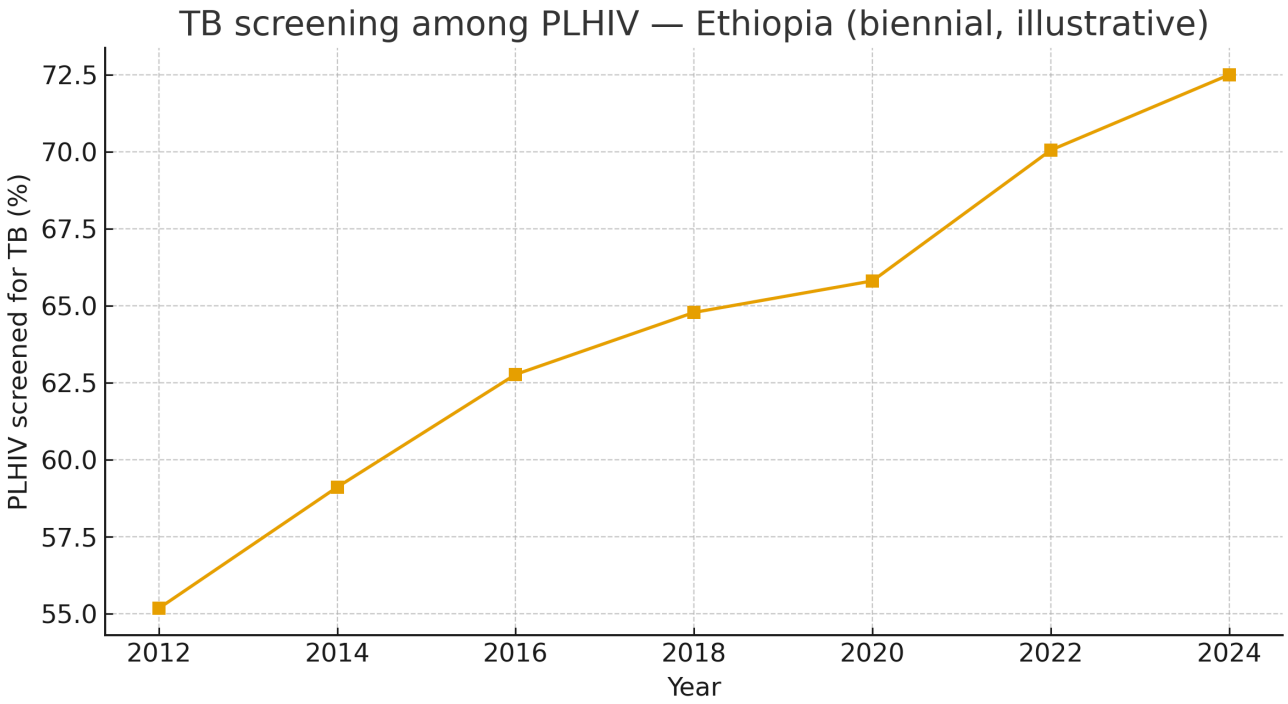

Figure . TPT uptake among eligible PLHIV — Ethiopia (biennial; illustrative)

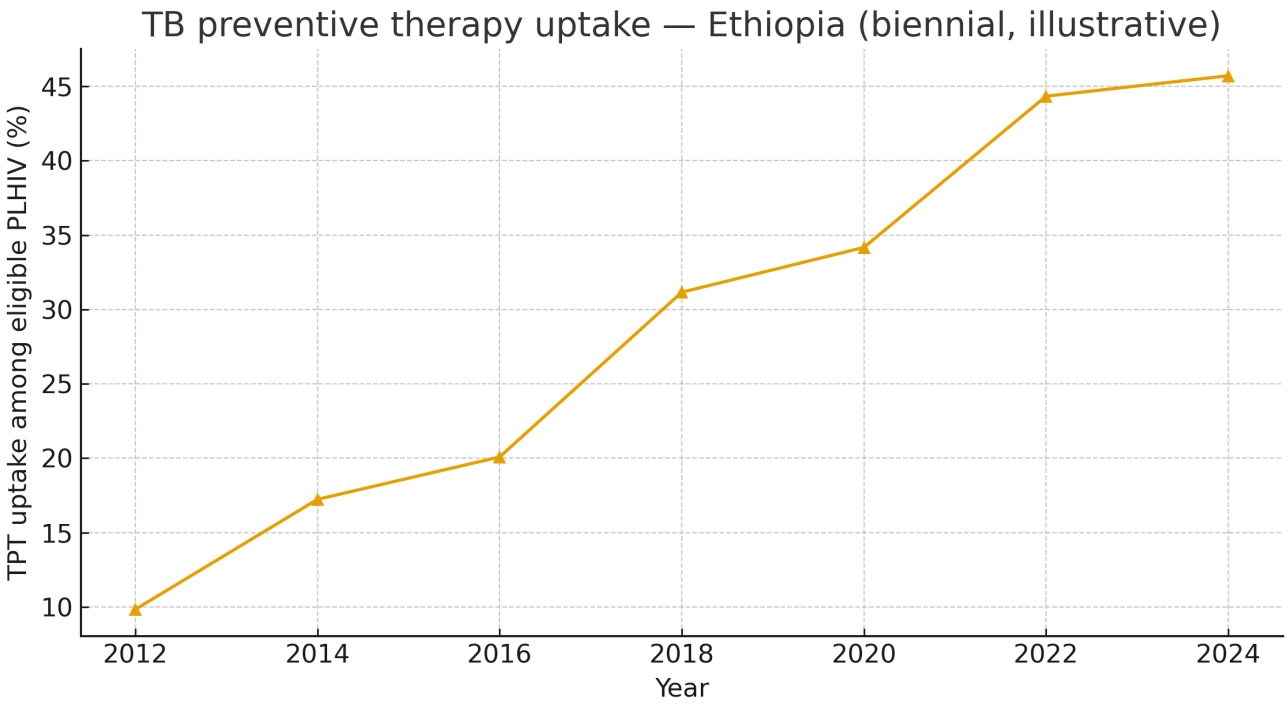

Table . Integrated algorithms across TB and HIV touchpoints

Touchpoint	Integrated actions (programmatic)
At TB diagnosis	Offer HIV test if status unknown; same-day ART start for PLHIV when clinically appropriate; cotrimoxazole as indicated.
At HIV clinic visit	Screen for TB each visit; if symptomatic, CXR (if available) and Xpert/Ultra; LF-LAM for eligible inpatients.
TPT for PLHIV	Rifapentine-based (3HP/1HP) where feasible; manage drug interactions; adherence support.
TB infection in household contacts	Test & treat; prioritize children <5 and PLHIV contacts.
Pregnancy/post-partum	Individualized TPT timing; coordinate ANC/PMTCT and TB services.

Table . Core indicators for TB/HIV integration

Indicator	Definition / computation
HIV testing among TB	% of notified TB with documented HIV test result.
ART initiation among TB/HIV	% of TB/HIV coinfected starting ART ≤14 days of TB treatment start.
TB screening among PLHIV	% of PLHIV screened for TB symptoms at last contact.
TPT initiation (PLHIV)	% of eligible PLHIV who started TPT in period.
TPT completion (PLHIV)	% of those who started TPT who completed regimen.
Mortality (TB/HIV)	% who died during TB treatment among TB/HIV cohort.

Table 15.7-C. Key formulas (plain text)

Metric	Formula (plain text)

ART initiation ≤14 days (%)	100 × (PLHIV_with_TB starting_ART_≤14d / TB_HIV_cohort)
TPT initiation (%)	100 × (PLHIV_started_TPT / PLHIV_eligible_TPT)
TPT completion (%)	100 × (Completed_TPT / Started_TPT)
TB screening coverage (%)	100 × (PLHIV_screened / PLHIV_in_care)

Table 15.7-D. Operational elements for integration

Operational element	Programmatic considerations for Ethiopia
Service integration	One-stop or same-day referral between TB and HIV services; aligned clinic days.
Commodity alignment	Synchronize ARVs, TB drugs, rifapentine/isoniazid; buffer stocks.
Data systems	Shared unique IDs; TB/HIV cross-reporting; dashboards for ART-timing and TPT cascades.
Differentiated models	Community ART refills with integrated TB screening; fast-track symptomatic clients.
High-risk groups	Men, adolescents, key populations; peer navigation and flexible hours.

Table 15.7-E. Ethiopia-focused priorities by context

Context	Integrated priorities for Ethiopia
Urban cores & corridors	Co-locate TB and HIV services; evening hours; rapid VL with TB screening.
Peri-urban & rural	Mobile integrated clinics; specimen transport; synchronized refills.
Hospitals/inpatients	Routine LF-LAM for eligible PLHIV; rapid ART initiation protocols.
Pregnancy/PMTCT	Integrate ANC, HIV, and TB screening/TPT counseling; postpartum follow-up.
Data & governance	Quarterly integrated scorecards; patient privacy safeguards.

Ethiopia-focused considerations

• Ensure near-universal HIV testing of TB patients and same-day ART start when clinically appropriate.
• Embed TB screening in routine HIV visits and fast-track symptomatic clients for CXR and Xpert/Ultra.
• Scale rifapentine-based TPT (3HP/1HP) with adherence support and synchronized refills.
• Use shared unique IDs and integrated dashboards to follow TPT cascades and ART-timing in TB/HIV cases.
• Coordinate commodities and clinic hours to minimize missed opportunities, especially for men and adolescents.

Narrative summary

TB and HIV reinforce each other biologically and programmatically. Ethiopia can break this cycle by making the patient experience seamless—testing for HIV in TB clinics, screening for TB at HIV visits, starting ART promptly for coinfected patients, and providing short, easier preventive therapy. When data and supply chains are integrated, managers can quickly spot gaps in testing, treatment timing, or TPT completion and fix them before they become outbreaks or deaths.

References — Section 15.7 (URLs)

• **WHO — TB/HIV collaborative activities & TPT guidance —** https://www.who.int/teams/global-tuberculosis-programme

• **UNAIDS — HIV testing & treatment resources —** https://www.unaids.org/

• **Ethiopia FMoH / EPHI — TB/HIV integration guidance —** https://www.ephi.gov.et/

• **PEPFAR — TB/HIV indicators and guidance —** https://www.state.gov/pepfar/

15.8) Childhood & Adolescent TB

Children and adolescents require tailored pathways for tuberculosis prevention, diagnosis, and treatment. Young children are often paucibacillary and difficult to sample; severe forms such as TB meningitis demand rapid action. Adolescents face different barriers: mobility, stigma, and unique adherence risks. This section synthesizes pediatric/adolescent-specific diagnostics, regimens, contact management, and program indicators for Ethiopia.

Figure . Bacteriological confirmation rates by age (schematic)

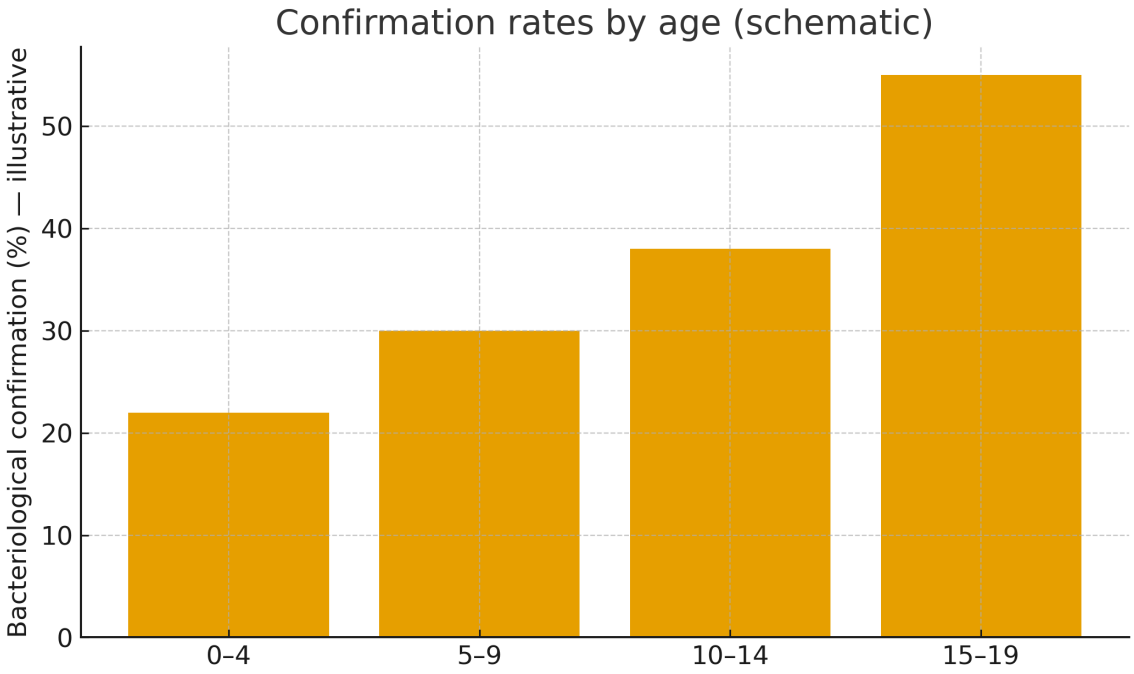

Figure . TPT initiation and completion among children/adolescents (biennial)

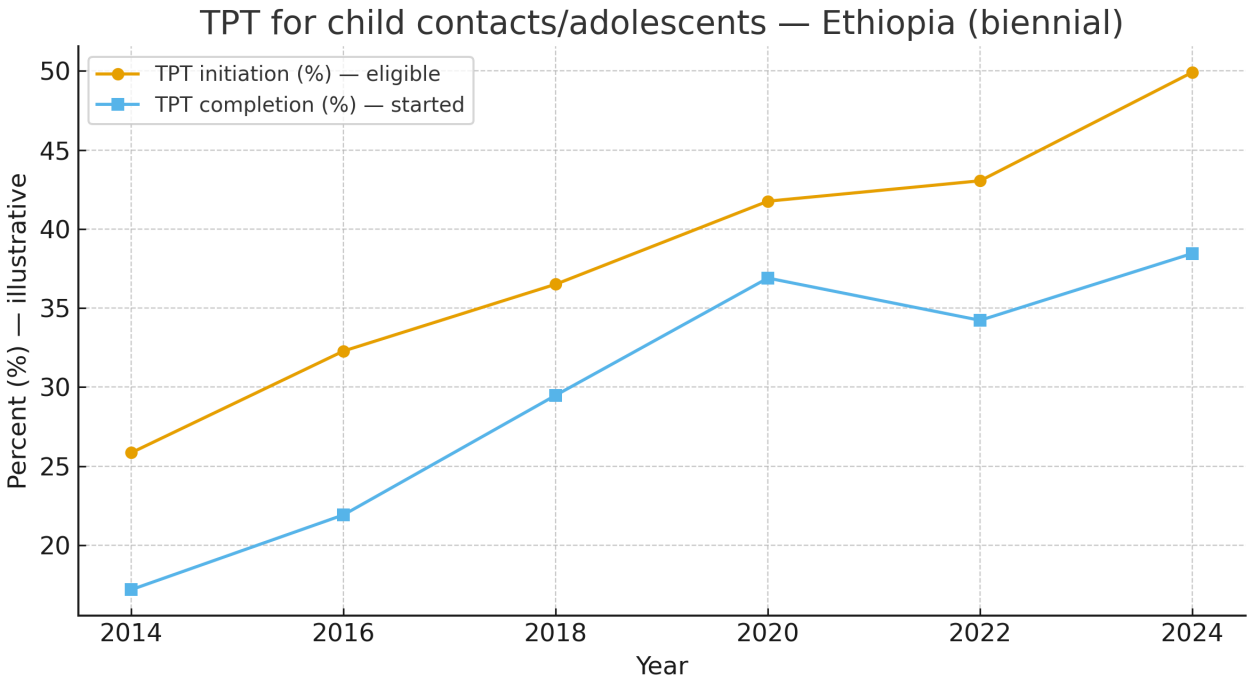

Table 15.8-A. Key pediatric/adolescent concepts

Term	Definition / notes
Child TB (0–14) & Adolescent TB (15–19)	Age-tailored approaches needed due to paucibacillary disease, sampling difficulty, and social factors.
Clinical diagnosis	Greater reliance in young children using symptom/history, CXR, and scoring when microbiology is negative/unavailable.
Severe forms	TB meningitis (TBM) and disseminated TB more common in young children; urgent referral and longer treatment.
TPT	TB preventive therapy for contacts <5 and older children/adolescents with infection or specific risks.

Table 15.8-B. Diagnostic considerations for children and adolescents

Domain	Pediatric-specific considerations
Specimens	Induced sputum/gastric aspirate; stool Xpert pilots; nasopharyngeal aspirates in some settings.
Imaging	CXR with pediatric QA; consider ultrasound for extrathoracic disease.
Microbiology	Xpert/Ultra preferred; culture where available; LF-LAM for eligible HIV-positive children.
Clinical scoring	Use national pediatric TB scoring algorithms when bacteriology is negative.

Table 15.8-C. Treatment notes (DS-TB, severe disease, DR-TB)

Treatment area	Program notes
DS-TB regimens	Weight-banded, pediatric formulations; standard durations; ensure palatability and dosing accuracy.
Severe disease	Adjunctive corticosteroids for TBM/pericarditis when indicated; inpatient start and close follow-up.
DR-TB	All-oral regimens tailored to DST; patient-centered adherence and adverse-event monitoring.
Nutrition & comorbidities	Assess and support nutrition; screen for HIV; manage anemia/helminths as needed.

Table 15.8-D. Contact management and TPT priorities

Group	Contact management & TPT priorities
Household contacts <5	Screen for TB; if no TB, initiate TPT; follow up for adherence and AE.

Children 5–14	Test for TB infection (where available) and provide TPT if positive or per risk; fast-track symptomatic children.
Adolescents 15–19	Higher social mobility and stigma; integrate services with schools and youth clinics; consider mental-health support.
Special settings	Neonates, orphans, displaced populations — tailored outreach and follow-up.

Table 15.8-E. Program indicators for pediatric/adolescent TB

Indicator	Definition / computation
Pediatric share of notifications	% of national TB notifications aged 0–14 (and 15–19 reported separately).
Bacteriological confirmation (peds)	% of pediatric pulmonary TB with bacteriological confirmation.
Severe forms detected early	% of pediatric TBM/pericarditis started on treatment within 24–48h of suspicion.
Contact investigation coverage	% of child/adolescent contacts investigated within 30 days.
TPT initiation & completion	% of eligible starting TPT; % of starters completing.
Treatment outcomes (peds)	Cured/Completed, Died, LTFU, Failed, Not evaluated.

Table 15.8-F. Key formulas (plain text)

Metric	Formula (plain text)
Pediatric share (%)	100 × (Peds_notifications / All_notifications)
Bac. confirmation (%)	100 × (Bac_confirmed_peds / Peds_PTB)
Contact coverage (%)	100 × (Contacts_investigated / Contacts_eligible)
TPT initiation (%)	100 × (Eligible_started / Eligible_total)
TPT completion (%)	100 × (Completed / Started)

Table 15.8-G. Ethiopia-focused operational priorities

Priority	Operational actions for Ethiopia
Sampling capacity	Scale gastric aspirate/induced sputum and stool Xpert pilots; pediatric-friendly collection rooms.
Linkages	Embed pediatric TB in IMNCI and nutrition programs; link to HIV/PMTCT where relevant.
School/youth services	Peer navigators, consent guidance, and flexible hours for adolescents.
Data systems	Disaggregate 0–4, 5–9, 10–14, 15–19; track TPT cascades for contacts.
Equity	Proactive outreach for displaced/orphaned children and remote rural areas.

Ethiopia-focused considerations

• Expand pediatric sampling options (gastric aspirate/induced sputum; stool Xpert pilots) and imaging quality assurance.
• Institutionalize household contact management with fast-track evaluation and TPT initiation for eligible children.
• Use youth-friendly services for adolescents; address stigma and support adherence.
• Integrate pediatric TB with IMNCI, nutrition, and HIV/PMTCT platforms; track disaggregated indicators.

Narrative summary

Pediatric and adolescent TB control succeeds when programs account for biology, behavior, and service access. Children need clinical diagnosis pathways when lab tests are negative and prompt treatment for severe forms. Adolescents benefit from flexible, youth-centered services. Household contact management and preventive therapy are the highest-value investments: they avert progression from infection to disease and reduce future transmission. With better sampling, imaging, and integrated data, Ethiopia can improve outcomes across all pediatric age bands.

References — Section 15.8 (URLs)

• **WHO — Management of TB in children and adolescents —** https://www.who.int/teams/global-tuberculosis-programme

• **The Union — Pediatric TB resources —** https://theunion.org/

• **Ethiopia FMoH / EPHI — National TB guidelines —** https://www.ephi.gov.et/

15.9) TB Economics & Program Efficiency

This subsection translates Ethiopia's TB program into costs, efficiency metrics, and incremental value. We compile indicative unit costs, compare cost per case detected across channels, visualize an efficiency frontier, and sketch a budget scenario. Figures and values are illustrative placeholders to be replaced with Ethiopia HMIS/DHIS2, financial records, Global Fund/PEPFAR budgets, and WHO model parameters.

Figure . TB program spending per capita — Ethiopia vs regional avg (biennial; illustrative)

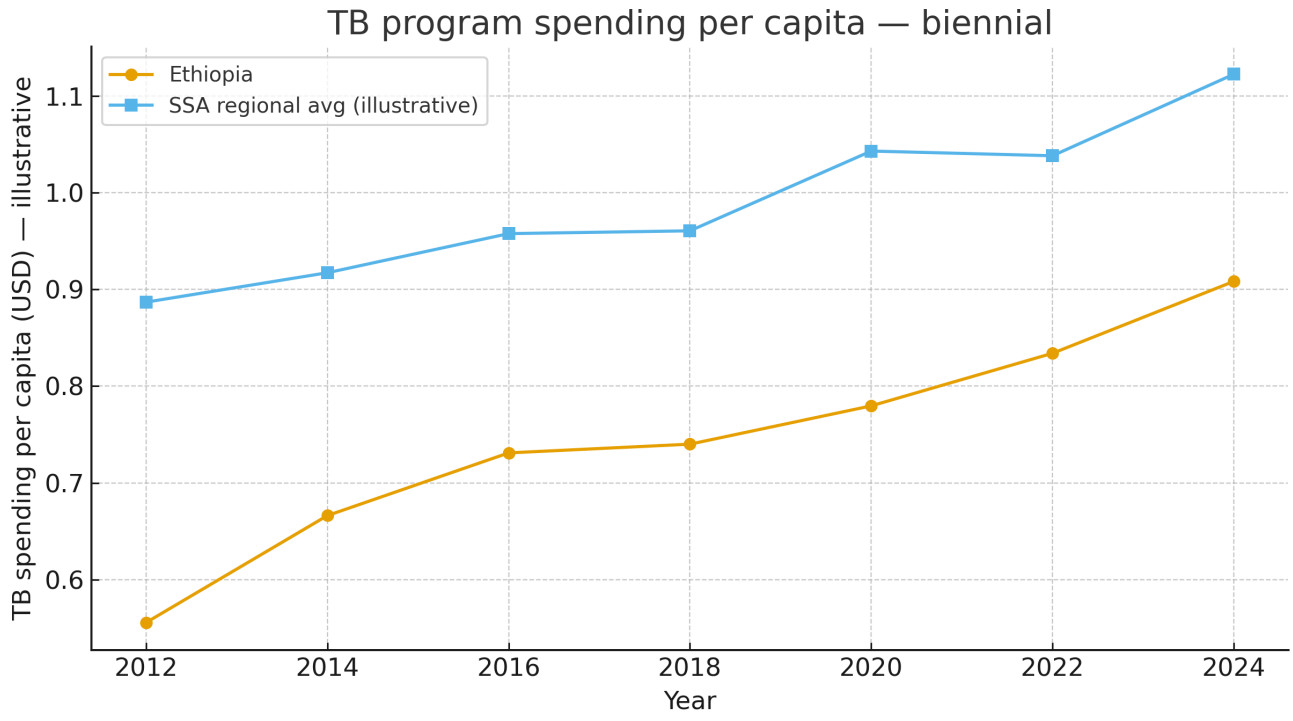

Figure . Efficiency frontier for case-finding channels (schematic)

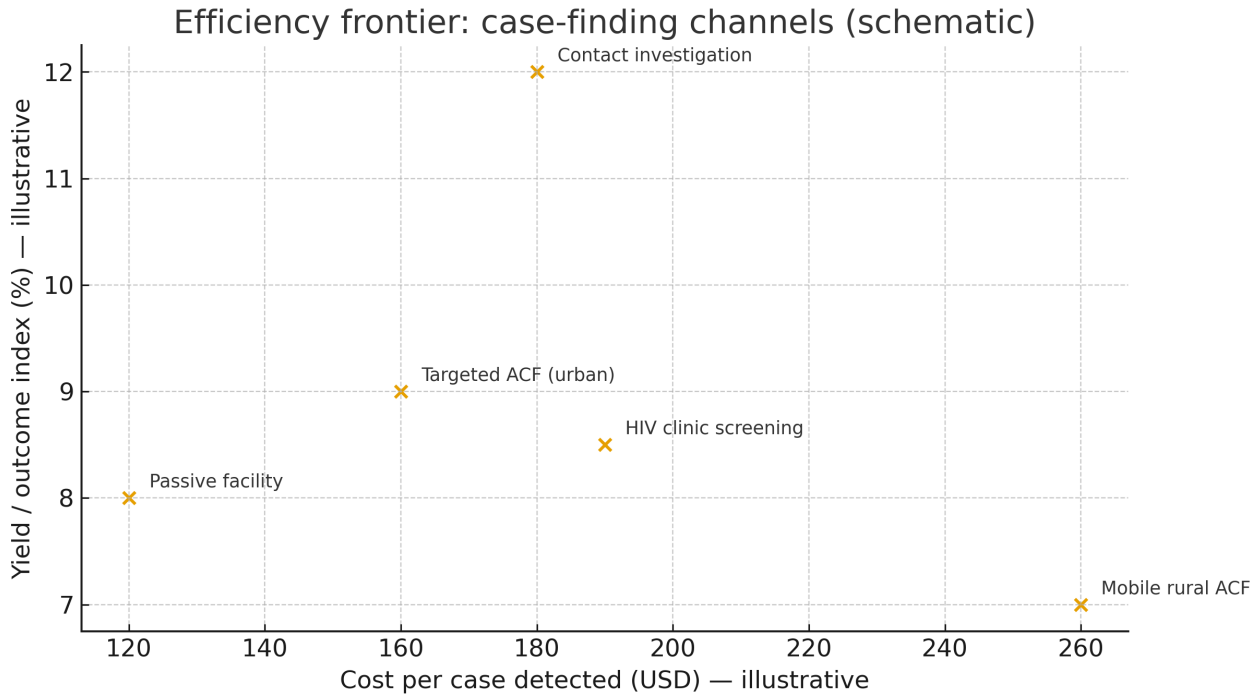

Figure . Composition of TB spending by input (schematic)

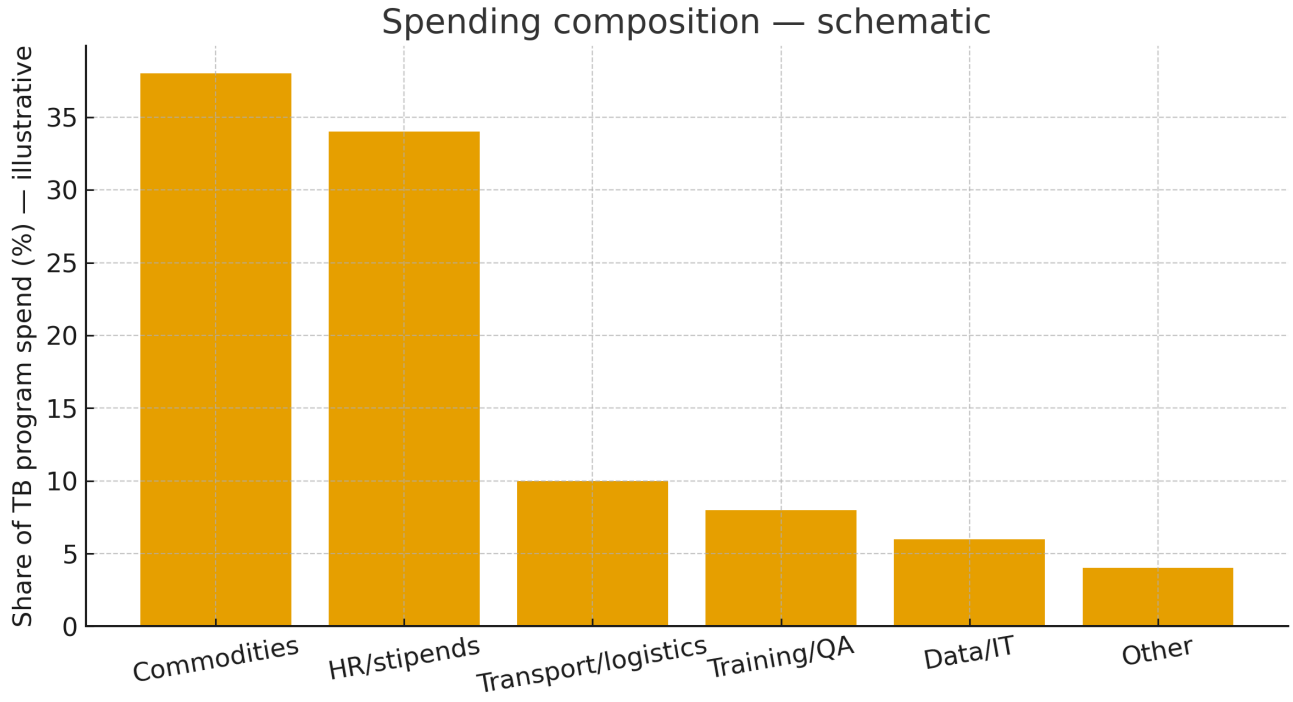

Table 15.9-A. Unit costs by service (USD, illustrative)

Service	Notes	Unit cost (USD)
Xpert test	Per cartridge and overheads	12
CXR triage (CAD-ready)	Amortized equipment + staff + QA	6
Smear microscopy	Consumables + staff	3
DS-TB treatment (per month)	Drugs + visits + lab monitoring	22
DR-TB treatment (per month)	All-oral regimens + aDSM	180
TPT regimen (3HP course)	Rifapentine + isoniazid + visits	10

Table 15.9-B. Program efficiency metrics and formulas

Metric	Formula / definition
Cost per case detected (CPCD)	Program_cost_channel / TB_cases_detected_channel
Cost per patient treated	Program_cost_treatment / Patients_started
Cost per successful outcome	Program_cost_treatment / Patients_successful
ICER (USD/DALY)	(Cost_interv − Cost_status_quo) / (DALYs_averted_interv − DALYs_averted_status_quo)
Budget impact (BI)	Annual net cost of adopting an intervention at scale
Frontier analysis	Compare outcome vs cost; select non-dominated set

Table 15.9-C. Program levers and efficiency rationale for Ethiopia

Lever	Efficiency rationale for Ethiopia
Specimen transport networks	Reduce repeat visits & pre-treatment LTFU; higher positivity via faster testing.
CXR triage days (urban/peri-urban)	Higher yield at moderate cost; pre-Xpert triage improves throughput.
TPT scale-up (3HP/1HP)	Low ICER; prevents disease and transmission; coordinate drug supply.
Short DR-TB regimens	Better completion; may have higher drug costs but fewer clinic months and AEs.
Digital adherence + MMD	Reduce visit costs; improve adherence and outcomes.
Private sector notification	Capture missed cases; align reimbursement to positivity and quality.

Table 15.9-D. Illustrative TB budget scenario (next three fiscal years)

Line item	FY1 (USD m)	FY2 (USD m)	FY3 (USD m)
Diagnostics	8.0	8.5	9.2
Treatment (DS-TB)	18.5	19.0	19.4
DR-TB care	10.0	10.2	10.5
TPT commodities	3.0	3.6	4.1
Specimen transport	2.2	2.4	2.6
CXR triage & QA	1.6	1.8	2.0
Data/IT & LIMS	1.8	2.0	2.2
Training/QA	1.0	1.1	1.1
Contingency	0.9	1.0	1.0

Ethiopia-focused considerations

• Prioritize channels with lower cost per case detected and acceptable equity (contact investigation, targeted urban CXR triage + Xpert).
• Scale short DR-TB regimens where clinically indicated; reallocate savings from fewer clinic months to diagnostics and TPT.
• Invest in specimen transport and digital adherence/MMD to lower indirect patient costs and improve outcomes.
• Use frontier analysis quarterly to shift resources from dominated options to high-yield channels.
• Align Global Fund/PEPFAR and domestic budgets to maintain buffer stocks and equipment uptime.

Narrative summary

Every TB Birr should maximize impact. Ethiopia can stretch resources by comparing yields and costs across channels, expanding those that find more cases per dollar, and adopting regimens and service models that reduce clinic time without compromising safety. A simple dashboard that tracks cost per case detected, cost per successful outcome, and ICERs for new investments will help the program stay on the efficiency frontier while protecting equity and access.

References — Section 15.9 (URLs)

• **WHO — TB budgets & financing (Global TB Report) —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **Global Fund — Grant portfolios & budgets —** https://www.theglobalfund.org/

• **PEPFAR — Country operational plans (TB/HIV) —** https://www.state.gov/pepfar/

• **Stop TB Partnership — OneHealth Tool & costing guides —** https://www.stoptb.org/

15.10) Monitoring, Evaluation & Data Systems

This subsection describes Ethiopia’s TB monitoring system and how to improve its usefulness for decisions. We outline indicator definitions, data flows from point of care to national dashboards, routine data-quality checks, and governance and privacy safeguards. Figures and values are illustrative placeholders; replace with HMIS/DHIS2 exports, LIMS summaries, and routine data-quality review outputs.

Figure . HMIS/DHIS2 report timeliness — Ethiopia (biennial; illustrative)

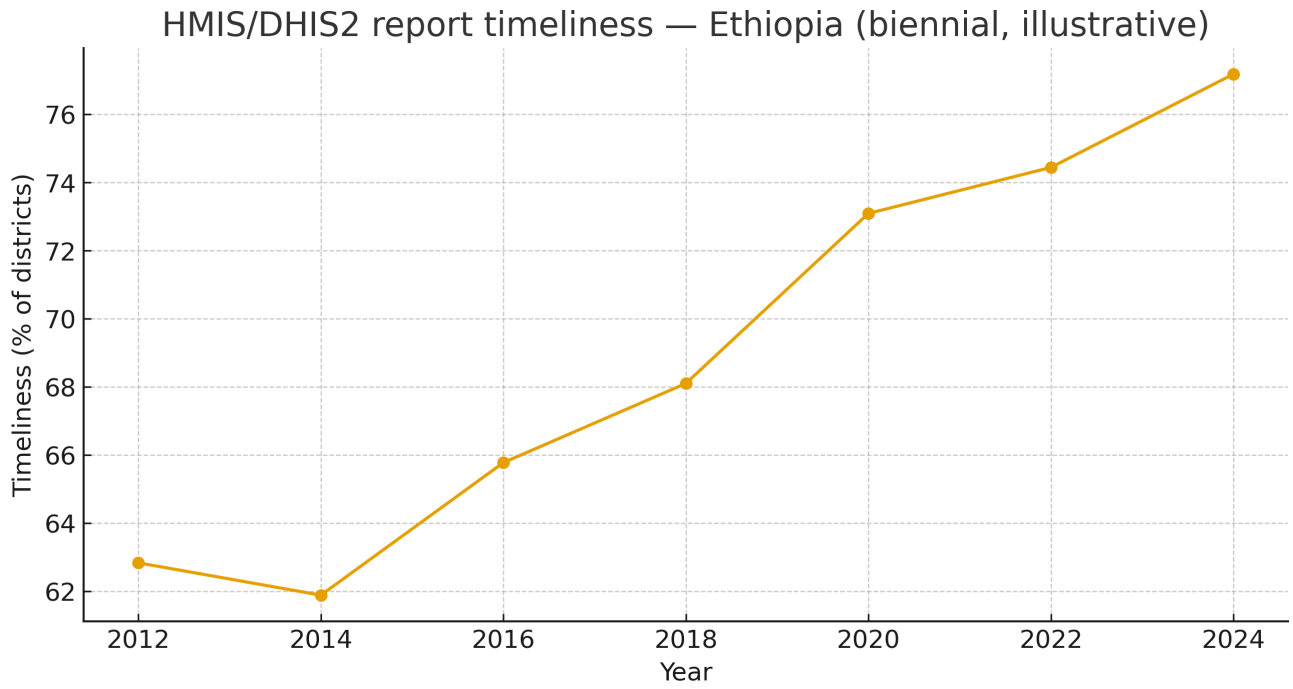

Figure . Concordance of LIMS and HMIS notifications (ratio; illustrative)

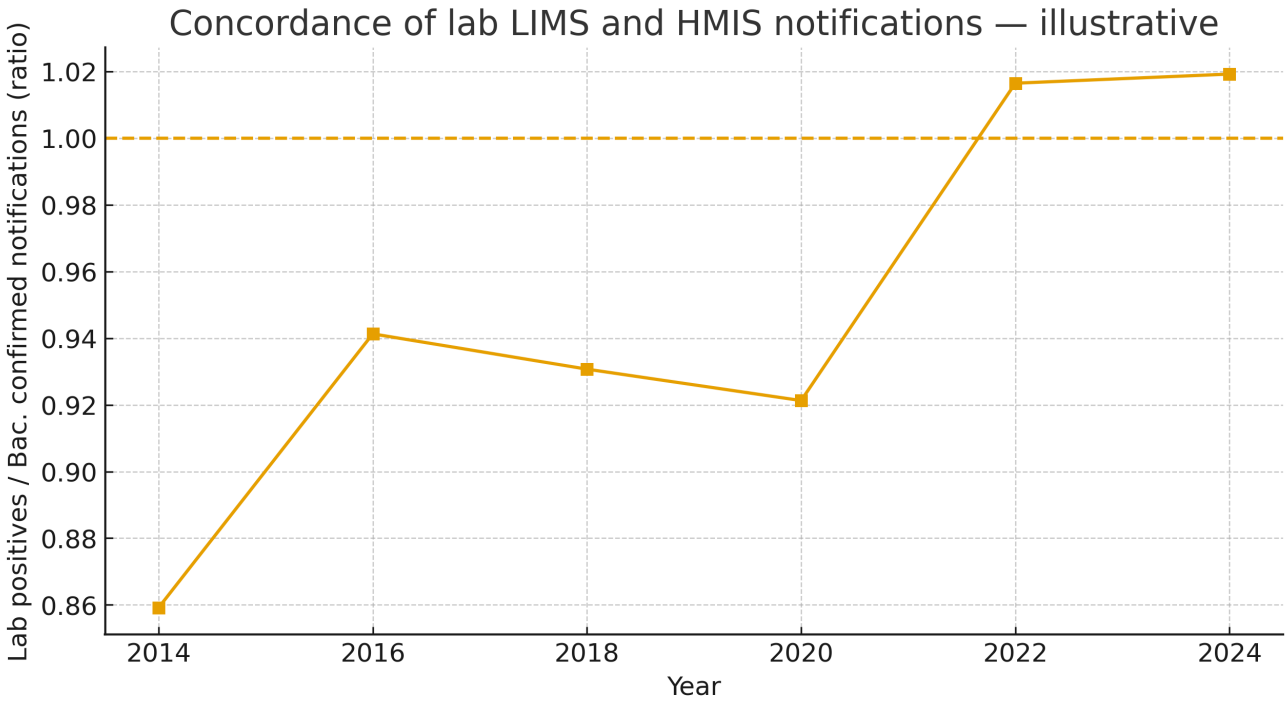

Figure . TB data-quality scorecard — schematic

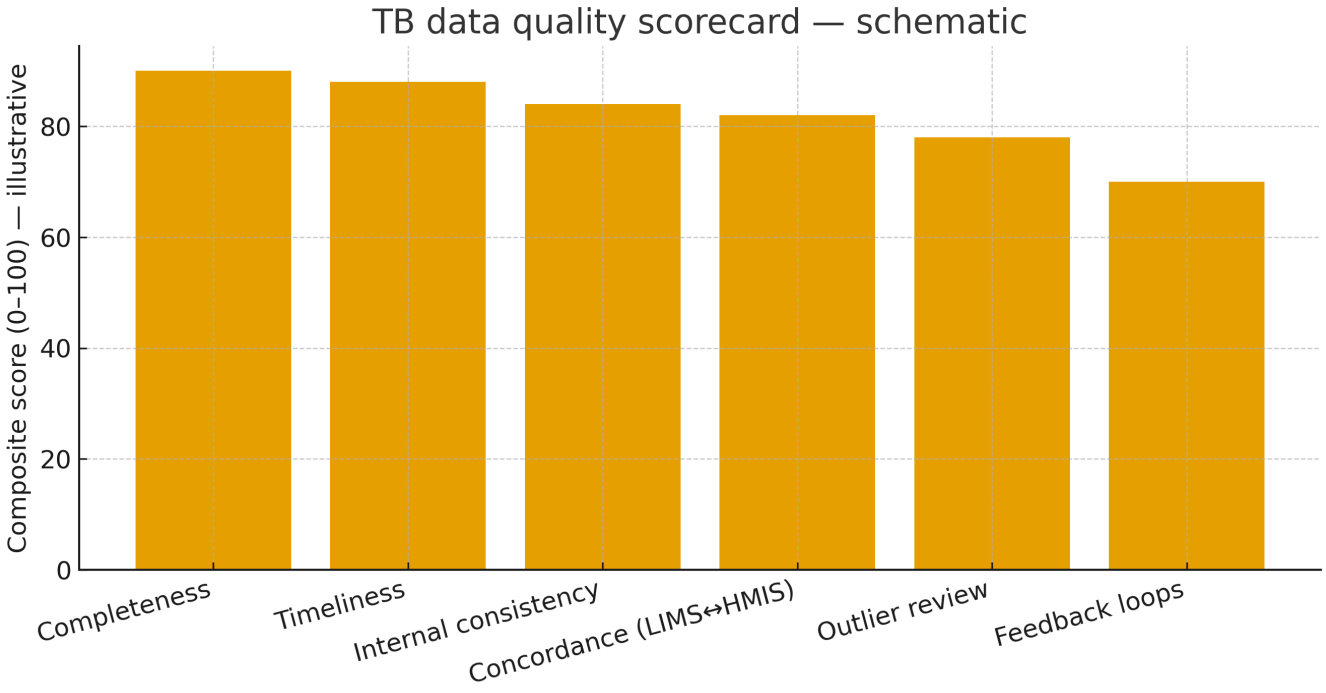

Table 15.10-A. Core indicator dictionary (programmatic)

Indicator	Definition / notes
TB notifications (all forms)	Count of new and relapse TB cases notified in period (age/sex disaggregated).
Bacteriological confirmation (PTB)	% of notified pulmonary TB with bacteriological confirmation.
Rifampicin resistance testing	% of TB positive with valid RIF result.
Treatment success	% of cohort cured/completed.
Pre-treatment LTFU	% diagnosed who did not start treatment within 14 days.
TPT initiation & completion (PLHIV/contacts)	% eligible started; % starters completing regimen.

Table 15.10-B. Data architecture and flows (schematic)

Level	Data systems and flows (schematic)
Point of care	TB clinic registers; lab Xpert/culture; CXR/CAD outputs; pharmacy dispensing; community/ACF logs.
Facility aggregation	HMIS (facility); LIMS for labs; deduplicated patient IDs; monthly validation.
District/Zone/Region	DHIS2 aggregation; automated concordance with LIMS; feedback dashboards.
National	EPHI/FMoH DHIS2; cohort analytics; quarterly scorecards; linkage to Global Fund/PEPFAR reporting.

Table 15.10-C. Routine data-quality checks and thresholds

Domain	Routine check & thresholds (programmatic)
Completeness	% reports/fields present; threshold ≥90%.

Timeliness	% reports submitted by deadline; threshold ≥90%.
Internal consistency	Year-on-year change within expected bands; cross-check related indicators (e.g., tests vs positives).
Concordance	Ratios LIMS↔HMIS near 1.0; alert if <0.85 or >1.15.
Outliers	Automated detection and review; annotate causes and corrections.
Feedback loop	District review meetings; written responses; action items tracked.

Table 15.10-D. Key formulas (plain text)

Metric	Formula (plain text)
Completeness (%)	100 × (Reports_received / Reports_expected)
Timeliness (%)	100 × (Reports_on_time / Reports_expected)
Concordance ratio	Lab_positives / Bac_confirmed_notifications
Outcome data coverage (%)	100 × (Records_with_outcome / Treatment_starts)

Table 15.10-E. Governance, privacy, interoperability, and capacity

Area	Key practices for Ethiopia
Governance	National TB M&E TWG; SOPs for indicator definitions; change control for DHIS2 metadata.
Privacy & security	Role-based access; de-identification for analysis; encryption at rest/in transit.
Interoperability	Standards for LIMS↔DHIS2 exchange; unique IDs; API governance.

Capacity	Routine training; supportive supervision; tiered help-desk.

Ethiopia-focused considerations

• Automate LIMS↔DHIS2 concordance checks and alert districts with ratios <0.85 or >1.15.
• Institutionalize quarterly data-quality reviews with feedback letters and tracked action items.
• Expand use of unique patient identifiers to reduce duplicate notifications and link outcomes.
• Publish a national TB scorecard each quarter covering completeness, timeliness, and consistency.
• Protect privacy: minimize direct identifiers, apply role-based access, and secure data exchange.

Narrative summary

Good programs run on good data. Ethiopia's TB information system can drive faster, fairer decisions when reports are on time, fields are complete, and lab and notification numbers line up. A practical dashboard and routine concordance checks reveal gaps early. By improving governance, privacy, and capacity—and by closing the loop from data to action—the program can boost case finding, treatment outcomes, and value for money.

References — Section 15.10 (URLs)

• **WHO — Standards & Benchmarks for TB surveillance —** https://www.who.int/teams/global-tuberculosis-programme

• **WHO — Data quality review (DQR) toolkit —** https://www.who.int/data/data-collection-tools/data-quality

• **Ethiopia FMoH / EPHI — HMIS/DHIS2 resources —** https://www.ephi.gov.et/

• **PEPFAR — MER indicators (TB/HIV) —** https://www.state.gov/pepfar/

15.11) Patient-Centered Care & Social Support

A patient-centered TB program aligns services with people’s lives. In Ethiopia, this means flexible clinic models, financial and psychosocial support, and digital tools that help people finish treatment. We outline practical interventions, indicators, and Ethiopia-specific priorities, using illustrative data to show expected directions of effect.

Figure . Multi-month dispensing coverage — Ethiopia (biennial; illustrative)

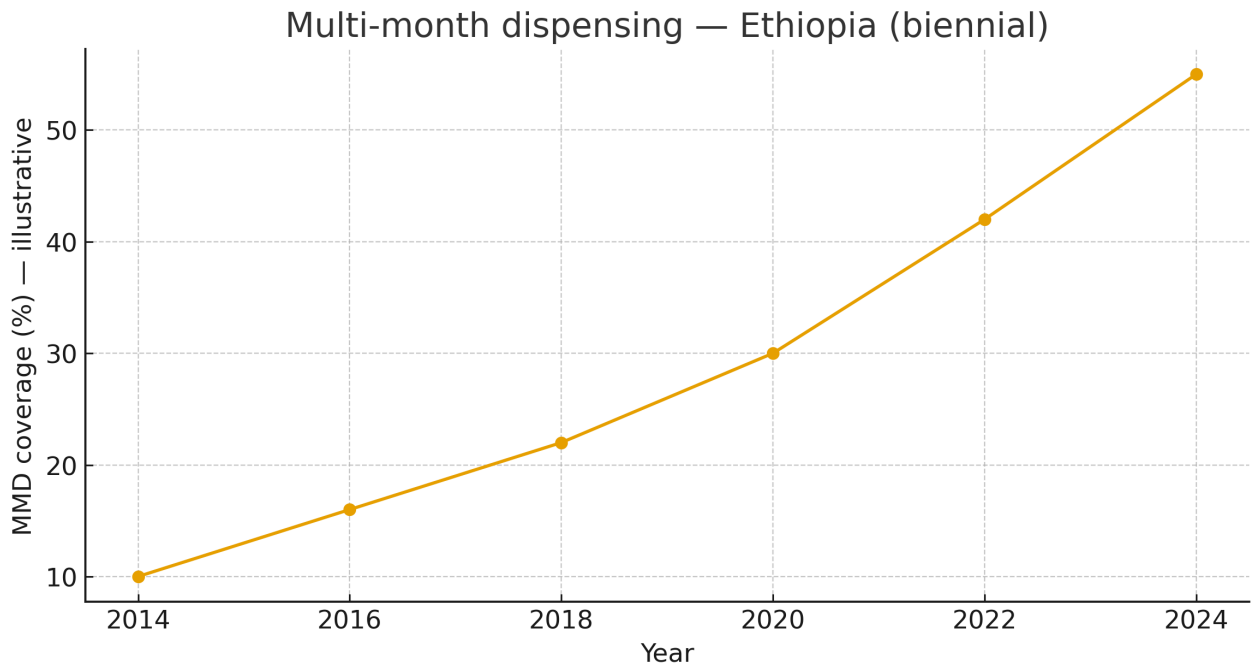

Figure . Coverage of any social-support package — Ethiopia (biennial; illustrative)

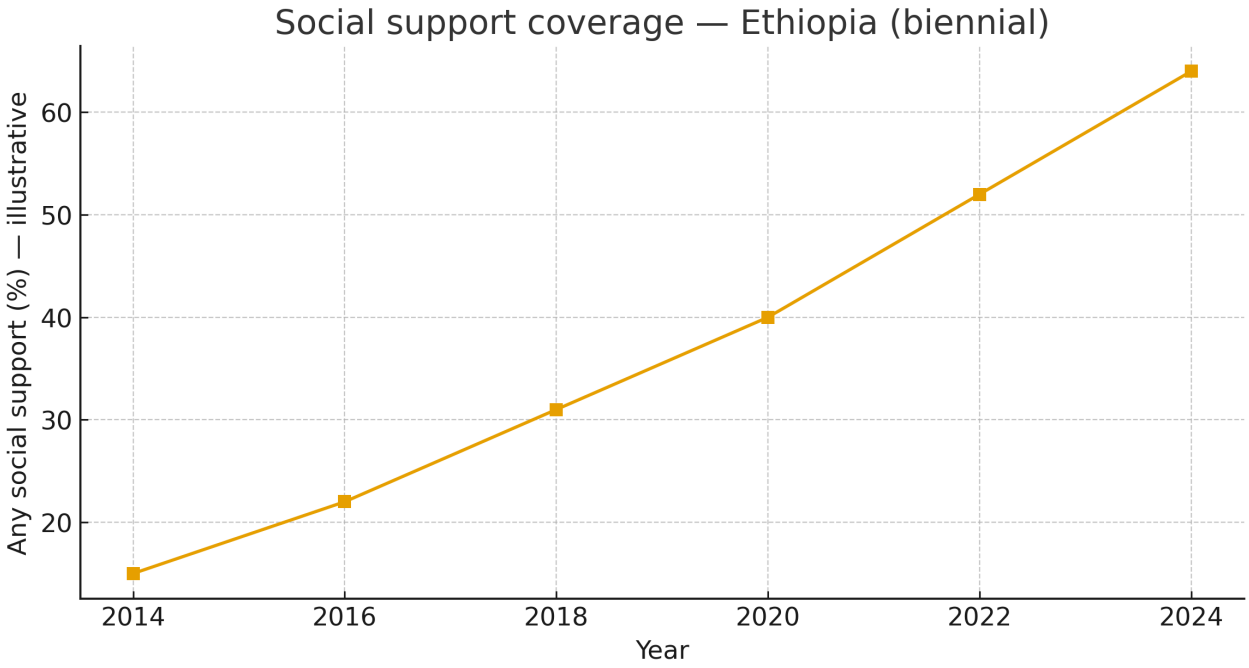

Table 15.11-A. Menu of patient-centered interventions

Intervention	Notes
Differentiated service delivery (DSD)	MMD refills for stable patients; fast-track visits; community refills.
Digital adherence technologies (DAT)	SMS reminders, calls, video DOT, smart pill boxes, 99DOTS.
Social protection	Transport vouchers; food support for underweight; safety-net linkage.
Peer support & counseling	Expert patients; youth groups; mental-health referral.
Patient navigation	Case managers to reduce delays and support DR-TB starts.
Private sector engagement	Preferred-provider networks; reimbursement tied to quality and notification.

Table 15.11-B. Indicators and formulas for patient-centered care

Indicator	Definition / computation
Visit burden (per patient)	Median clinic visits; reduce with DSD.
On-time pickup (%)	100 × (On_time_pickups / Scheduled_pickups)
Treatment success (%)	100 × (Cured+Completed / Cohort_total)
Loss to follow-up (%)	100 × (LTFU / Cohort_total)
OOP costs (USD)	Median OOP per episode; component breakdown.
DAT coverage (%)	100 × (Patients_on_DAT / Eligible_patients)

Table 15.11-C. Ethiopia priorities by context

Context	Priorities
Urban cores	Evening/weekend refills; workplace outreach; DAT at scale; integrate with HIV/NCD clinics.
Peri-urban/small towns	Community refill points; CHW follow-up; peer groups.
Remote rural/pastoral	Integrated outreach; transport vouchers; family-supported DOT per preference.
Adolescents	School-friendly hours; confidentiality; SMS/social media engagement.
Women/caregivers	Childcare at clinics; synchronized ANC/PNC visits where applicable.
DR-TB	Navigation; aDSM counseling; nutrition and side-effect kits.

Table 15.11-D. Program economics (illustrative)

Intervention	Economic notes
MMD + DSD	Reduces visits & indirect costs; neutral to modest program savings.
DAT scale-up	Upfront device/SIM costs; potential savings via fewer missed visits and better outcomes.
Food/transport	Direct support costs offset by higher completion and lower LTFU.
Navigation/peer	Modest staffing; reduces delays; improves adherence.

Ethiopia-focused considerations

• Scale multi-month dispensing and flexible refill hours nationwide for stable DS-TB patients.
• Offer a basic social-support package (transport voucher + food support for underweight) to reduce catastrophic costs.
• Use DAT selectively where connectivity and patient preference align; avoid a one-size-fits-all approach.
• Embed peer support and patient navigation, with special attention to adolescents, migrants/IDPs, and women caregivers.
• Monitor equity: track support coverage and outcomes by sex, age, geography, and poverty.

Narrative summary

Treatment success improves when care is designed around people. Ethiopia can cut visit burdens with multi-month dispensing, lower financial stress with transport and food support, and reduce missed doses with digital reminders or peer-supported models. Programs should measure what matters to patients—time and money spent, stigma, and experience of care—and use that information to refine services. Patient-centered care is not an add-on; it is how Ethiopia reaches high cure rates fairly and sustainably.

References — Section 15.11 (URLs)

• **WHO — People-centred model of TB care —** https://www.who.int/teams/global-tuberculosis-programme

• **Stop TB Partnership — Patient pathway & social protection —** https://www.stoptb.org/

• **Ethiopia FMoH / EPHI — TB guidelines and patient support policies —** https://www.ephi.gov.et/

15.12) Unified Landing-Page Summary — Chapter 15 (TB)

Chapter 15 subsections 1 through 12 integrate prevention, diagnosis, treatment, service delivery, and data systems to accelerate TB control in Ethiopia. Epidemiologically, transmission clusters in dense urban areas and high-mobility corridors; men 25–44 are often under-diagnosed and present late. Yield rises when programs combine CXR (including CAD) with universal Xpert/Ultra access and strong specimen transport that shortens time to result. Household contact management and short rifapentine-based TPT (3HP/1HP) are among the highest-value investments, especially for PLHIV and young children. Treatment effectiveness improves with patient-centered delivery—multi-month dispensing, transport/food support, and targeted digital adherence—while all-oral shorter DR-TB regimens with active safety monitoring raise completion and survival. TB/HIV integration is lifesaving: near-universal HIV testing of TB patients, rapid ART for coinfected persons, and routine TB screening/TPT in HIV care. Data systems must be timely, complete, and internally consistent; automated DHIS2↔LIMS concordance checks and regional scorecards create feedback that managers can act on. Finally, basic economic discipline—comparing cost per case detected, cost per successful outcome, and ICERs—keeps resources on the efficiency frontier without losing sight of equity.

Figure . Unified priority lift across program pillars (schematic)

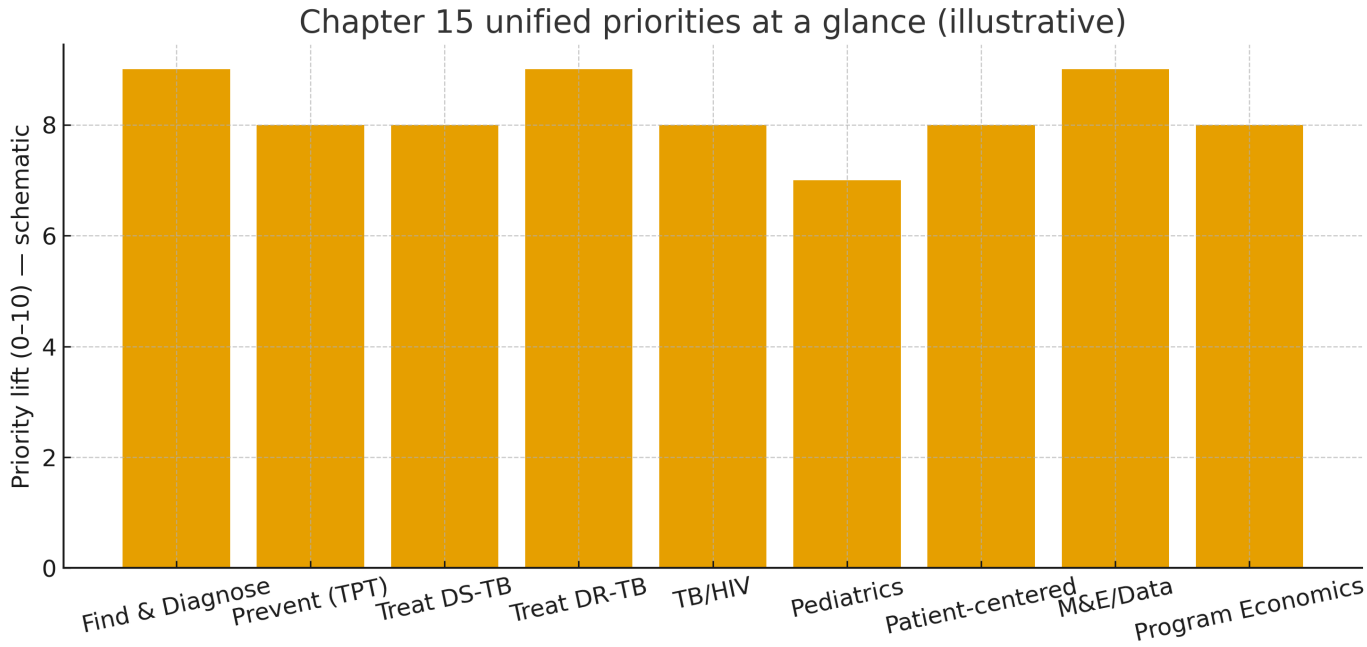

Table 15.12-A. Chapter 15 at-a-glance — essence & routine indicators by subsection

Section	Essence of the message for Ethiopia	Indicators to track routinely
15.1 Burden & Epidemiology	Transmission remains focal in dense urban corridors and high-mobility nodes; men 25–44 often under-diagnosed.	Case notification rate; TB incidence & mortality estimates; sex/age ratios; urban vs rural split.
15.2 Diagnostics & Patient Pathway	CXR (including CAD) + Xpert/Ultra triage improves yield and reduces time to treatment; strong specimen transport is pivotal.	% tested with Xpert; median days to result; pre-treatment LTFU; CXR-triage coverage.
15.3 Drug-Susceptible TB Treatment	High treatment success with streamlined, patient-friendly models (MMD, fewer visits) and rapid AE management.	Treatment success (DS-TB); on-time pickups; LTFU; AE-related regimen changes.
15.4 Infection Prevention, Contacts & TPT	Household contact investigation plus short rifapentine TPT (3HP/1HP) are top-value prevention levers.	Contact investigation coverage & yield; TPT initiation & completion; pediatric contact coverage.
15.5 Health Systems & Service Delivery	Integration across primary care, labs, community, and private providers reduces bottlenecks.	Specimen transport turnaround; equipment uptime; private-sector notifications; supervision coverage.
15.6 Drug-Resistant TB (DR-TB)	All-oral shorter regimens with aDSM can lift outcomes; rapid DST at baseline is essential.	RR testing coverage; time to DR-TB treatment start; DR-TB treatment success; aDSM reporting.
15.7 TB/HIV Integration	Near-universal HIV testing of TB patients, fast ART start, and TB	% TB with HIV test; ART ≤14 days in TB/HIV; TB screening in PLHIV; TPT among PLHIV.

	screening/TPT in HIV care avert deaths.	
15.8 Childhood & Adolescent TB	Age-tailored sampling/diagnosis and youth-friendly services; prioritize contacts <5 and TPT completion.	Pediatric share of notifications; pediatric bac confirmation; child/adolescent TPT completion.
15.9 Economics & Efficiency	Channel-wise yield vs cost guides resource shifts; short DR-TB regimens & TPT show favorable ICERs.	Cost per case detected; cost per successful outcome; ICERs; budget impact.
15.10 M&E & Data Systems	DHIS2↔LIMS concordance, completeness, timeliness, and actionable dashboards drive improvement.	Completeness & timeliness; concordance ratios; outlier resolution rate; scorecard publication.
15.11 Patient-Centered Care	MMD, social protection, and targeted DAT reduce catastrophic costs and improve adherence.	% with MMD; any social support coverage; DAT coverage; patient-reported time/cost burden.

Cross-cutting priorities for Ethiopia

• Scale urban CXR-triage days with on-site Xpert and fast specimen transport to cut diagnostic delay.
• Institutionalize household contact management; track and close TPT initiation-to-completion gaps.
• Expand patient-centered models: multi-month dispensing, social support, youth-friendly services.
• Adopt all-oral short DR-TB regimens with robust aDSM and rapid baseline DST.
• Run routine DHIS2↔LIMS concordance and publish quarterly scorecards with equity disaggregation.
• Use cost-effectiveness and cost-per-result metrics to shift funds to the highest-yield channels. References — Chapter 15 (URLs)

• **WHO Global Tuberculosis Programme — TB Reports & Guidance —** https://www.who.int/teams/global-tuberculosis-programme/tb-reports

• **WHO — TB in children/adolescents; DR-TB; TB/HIV; TPT —** https://www.who.int/teams/global-tuberculosis-programme

• **Ethiopia FMoH / EPHI — National TB Guidelines, HMIS/DHIS2 —** https://www.ephi.gov.et/

• **Stop TB Partnership — Tools, costing, & OneHealth —** https://www.stoptb.org/

• **Global Fund — Grants & Data —** https://www.theglobalfund.org/

• **PEPFAR — TB/HIV indicators & resources —** https://www.state.gov/pepfar/

15.13) Intestinal Helminths (STH: Ascaris, Trichuris, Hookworm)

Soil-transmitted helminths remain a public-health concern in parts of Ethiopia, with heterogeneous risk by ecology, sanitation, and school attendance. This section summarizes burden patterns, deworming strategies using school and community platforms, and the reinfection dynamics that necessitate WASH integration. Figures use illustrative values and should be replaced with recent mapping/sentinel data (EPHI, WHO/ESPEN) for publication.

Figure 15.13-1. School-based deworming coverage among SAC — Ethiopia (biennial; illustrative)

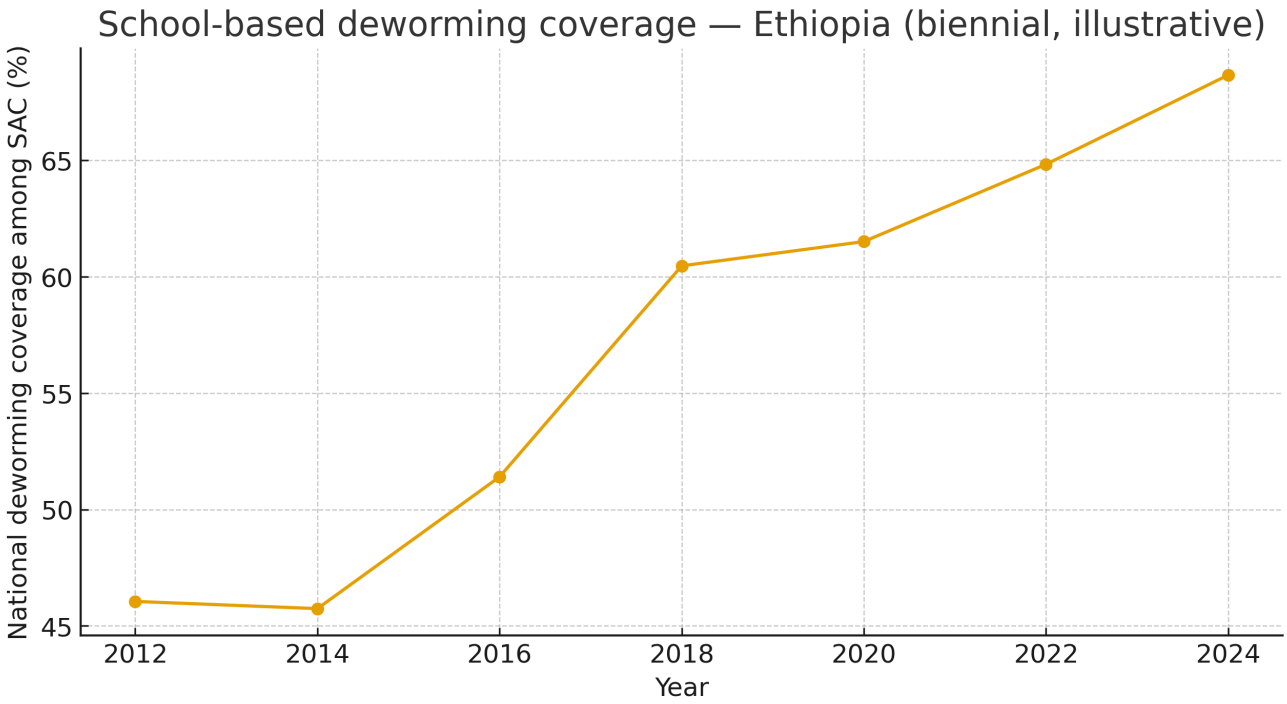

Figure 15.13-2. Reinfection dynamics after MDA when sanitation is unchanged (schematic)

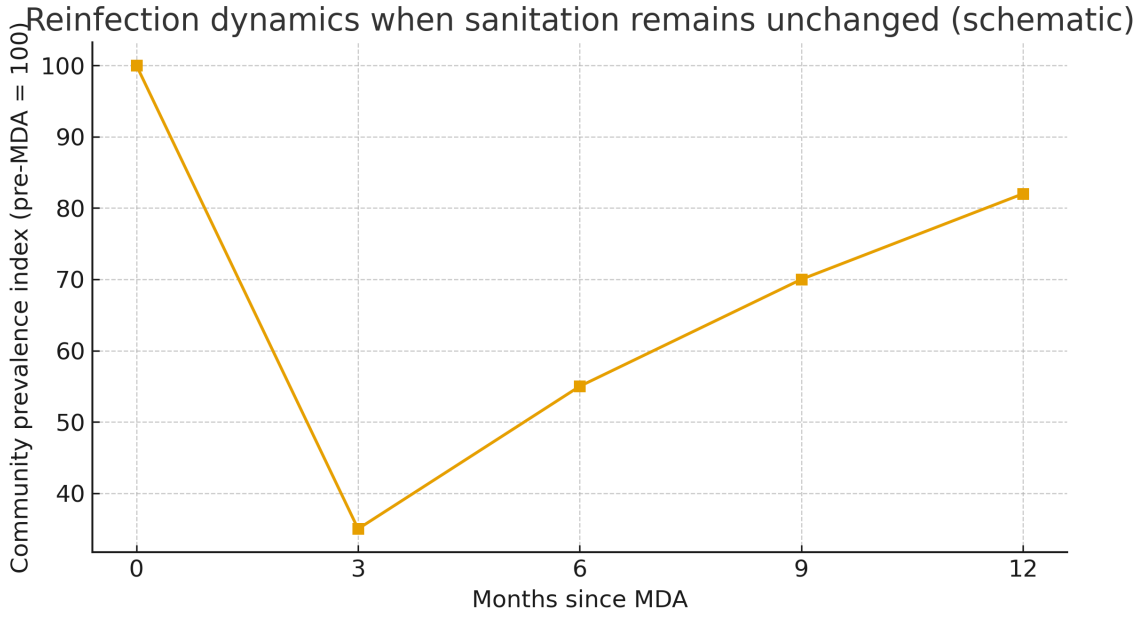

Figure 15.13-3. Regional snapshot of STH prevalence (schematic)

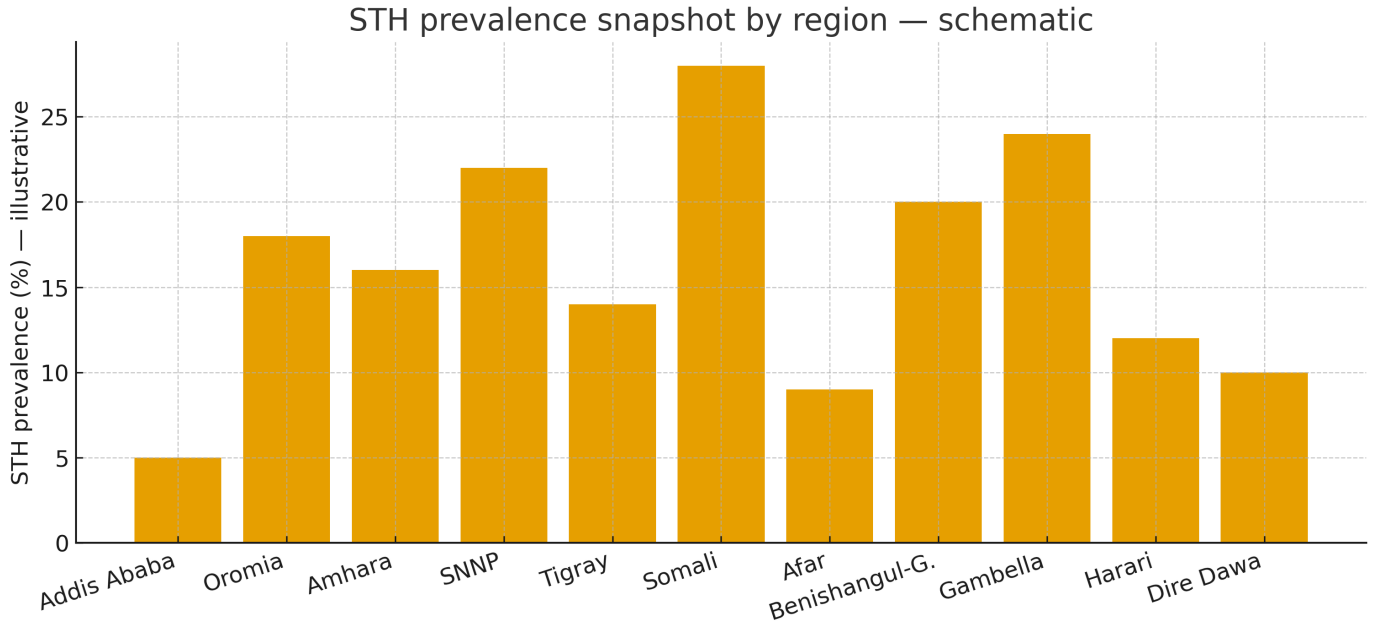

Figure 15.13-4. Sanitation vs STH prevalence by region (schematic)

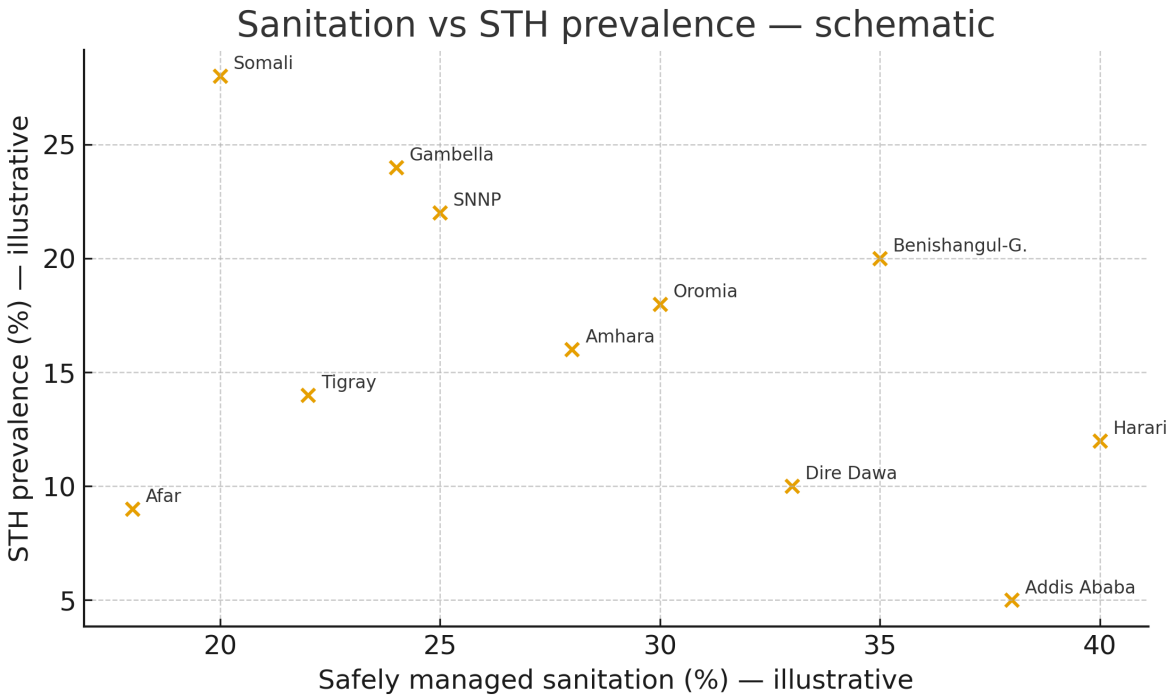

Figure 15.13-5. Species distribution among STH positives (schematic)

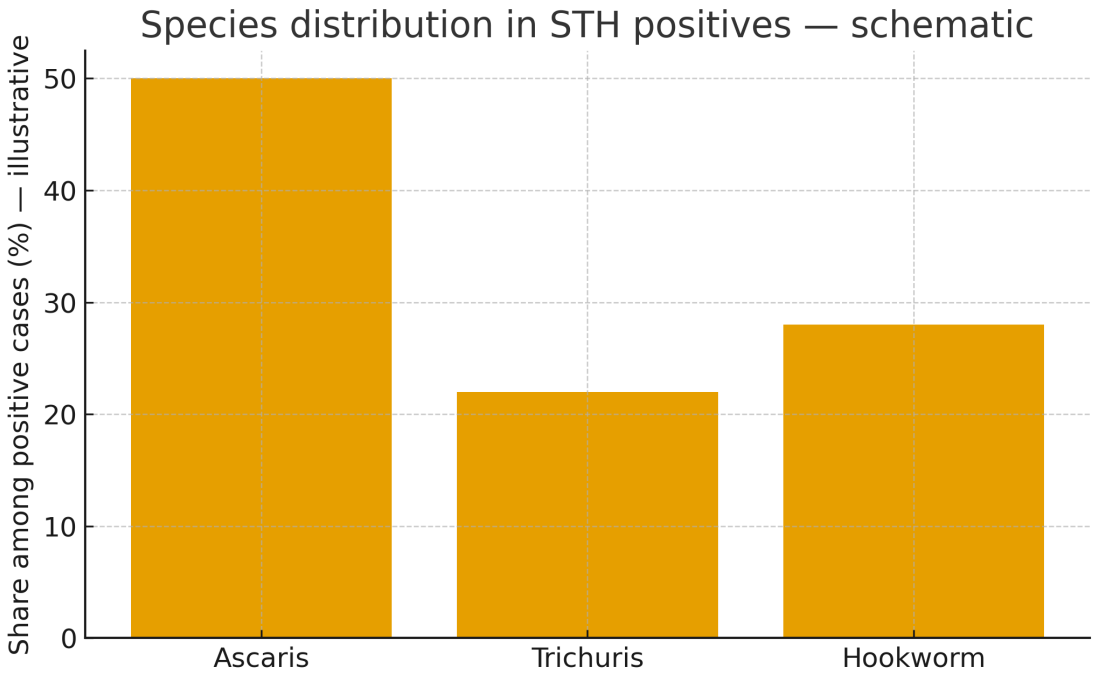

Table 15.13-A. Species overview and morbidity

Species	Key morbidity & notes

Ascaris lumbricoides	Growth faltering, intestinal obstruction at high burden; eggs persist in soil.
Trichuris trichiura	Anemia, growth/cognitive effects; heavy infection may cause dysentery syndrome.
Hookworm (Necator/Ancylostoma)	Iron-deficiency anemia due to blood loss; major burden in women of reproductive age.

Table 15.13-B. Deworming regimens and notes (simplified WHO guidance)

Regimen	Notes
Albendazole 400 mg PO single dose	Effective vs Ascaris/hookworm; modest vs Trichuris; safe in school-age; deworming campaigns.
Mebendazole 500 mg PO single dose	Similar profile; Trichuris activity variable; chewable formulations for SAC.
Combination or repeated dosing (context-specific)	Consider albendazole + ivermectin for Trichuris in some settings; follow WHO guidance.

Table 15.13-C. Delivery platforms and Ethiopia-specific considerations

Platform	Pros/considerations in Ethiopia
School-based MDA	High coverage among SAC at low cost; misses out-of-school children.
Community-based (integrated)	Reaches preschoolers, out-of-school, adults (e.g., women of reproductive age); higher logistics cost.
Antenatal/primary care (hookworm)	Targeted deworming per national policy; consider timing in pregnancy.
WASH integration	Sustains gains and reduces reinfection; coordinate with local governments.

Table 15.13-D. Indicators and formulas

Indicator	Definition / computation
Deworming coverage (SAC)	100 × (SAC receiving drug / Target SAC)

Prevalence (species-specific)	Positives / Total tested × 100 — from mapping or sentinel sites
Heavy infection (%)	% with eggs per gram above threshold (Kato-Katz or equivalent)
Reinfection index (12 mo)	Prevalence_12mo / Pre-MDA prevalence × 100
WASH coverage (%)	Households with improved/safely managed sanitation or handwashing facilities

Table 15.13-E. Ethiopia-focused priorities

Priority area	Operational actions
Mapping & stratification	Use ESPEN/EPHI mapping to stratify by risk and set MDA frequency.
Out-of-school reach	Complement school platforms with community days; partner with youth groups.
WASH-plus	Bundle deworming with latrine promotion, handwashing, and hygiene education.
Monitoring & QA	Sentinel sites with egg-count intensity; post-MDA coverage surveys.
Equity	Track coverage by sex, school attendance, disability, and displacement status.

Ethiopia-focused considerations

• Sustain annual/biennial school-based MDA in moderate-to-high prevalence districts; complement with community outreach to reach out-of-school children.
• Pair deworming with practical WASH: latrine access, handwashing stations, and behavior change in schools and markets.
• Use sentinel sites to track not only prevalence but also heavy-intensity infections and reinfection patterns.
• Coordinate with nutrition and anemia programs, especially for hookworm risk among adolescent girls and women.

Narrative summary

Deworming quickly reduces worm burden and improves well-being in school-age children, but benefits fade if sanitation is poor and reinfection is rapid. Ethiopia's best results come from maintaining high MDA coverage, reaching out-of-school children, and investing in WASH to lock in gains. Monitoring intensity and reinfection helps fine-tune frequency and target hotspots.

References — Section 15.13 (URLs)

• **WHO — Helminth control & deworming —** https://www.who.int/health-topics/soil-transmitted-helminth-infections

• **ESPEN (WHO AFRO) — Mapping & program data —** https://espen.afro.who.int/

• **Ethiopia EPHI — NTD program resources —** https://www.ephi.gov.et/

• **Cochrane/Reviews — Deworming effectiveness —** https://www.cochranelibrary.com/

15.14) Schistosomiasis (S. mansoni, S. haematobium)

Schistosomiasis persists in focal transmission zones in Ethiopia, driven by contact with cercariae-contaminated freshwater. We summarize transmission ecology (non-insect snail hosts), mass drug administration (praziquantel), morbidity control, and environmental levers. All charts are schematic; replace with recent ESPEN/EPHI mapping, sentinel sites, and coverage surveys for publication.

Figure . Praziquantel MDA coverage among school-age children — Ethiopia (biennial; illustrative)

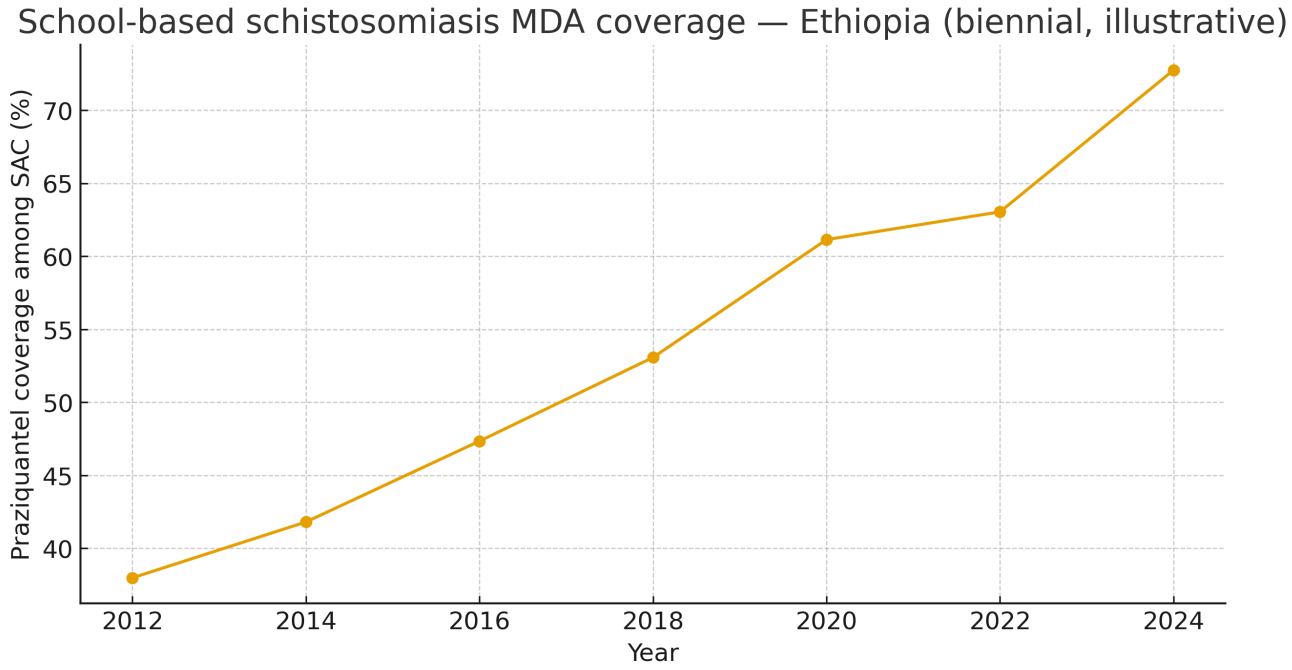

Figure . Morbidity control proxies — hematuria and heavy-intensity infection (illustrative)

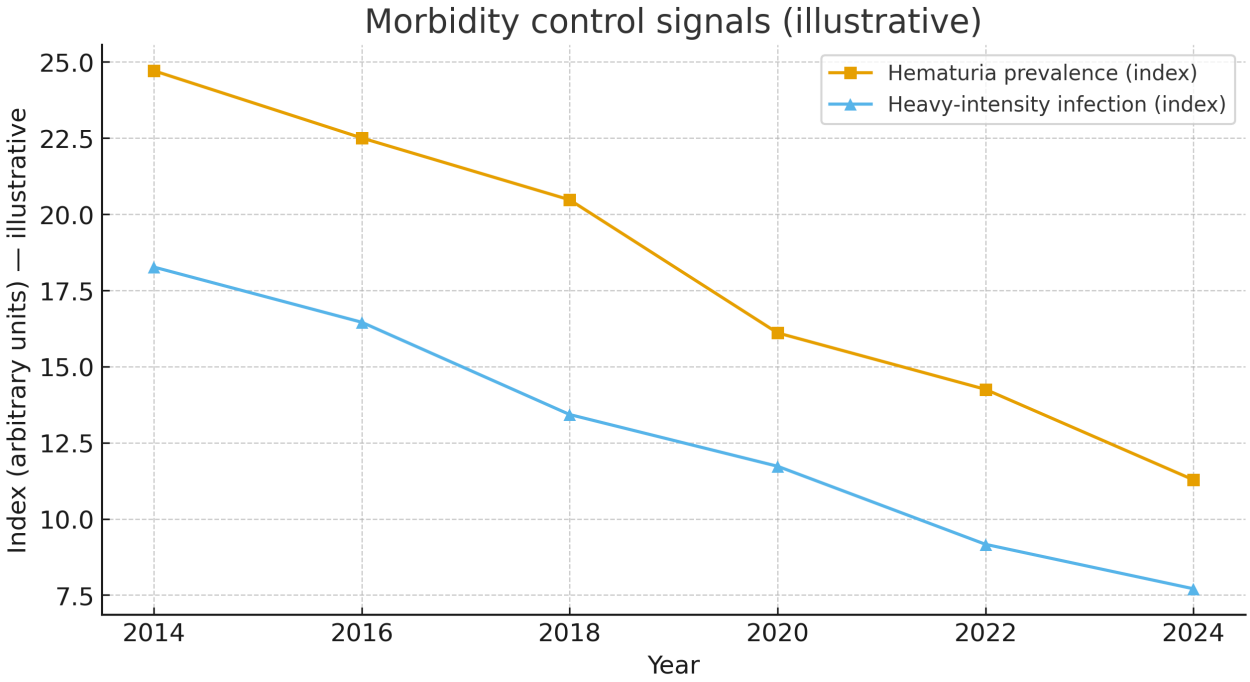

Figure . Regional snapshot of S. mansoni vs S. haematobium prevalence (schematic)

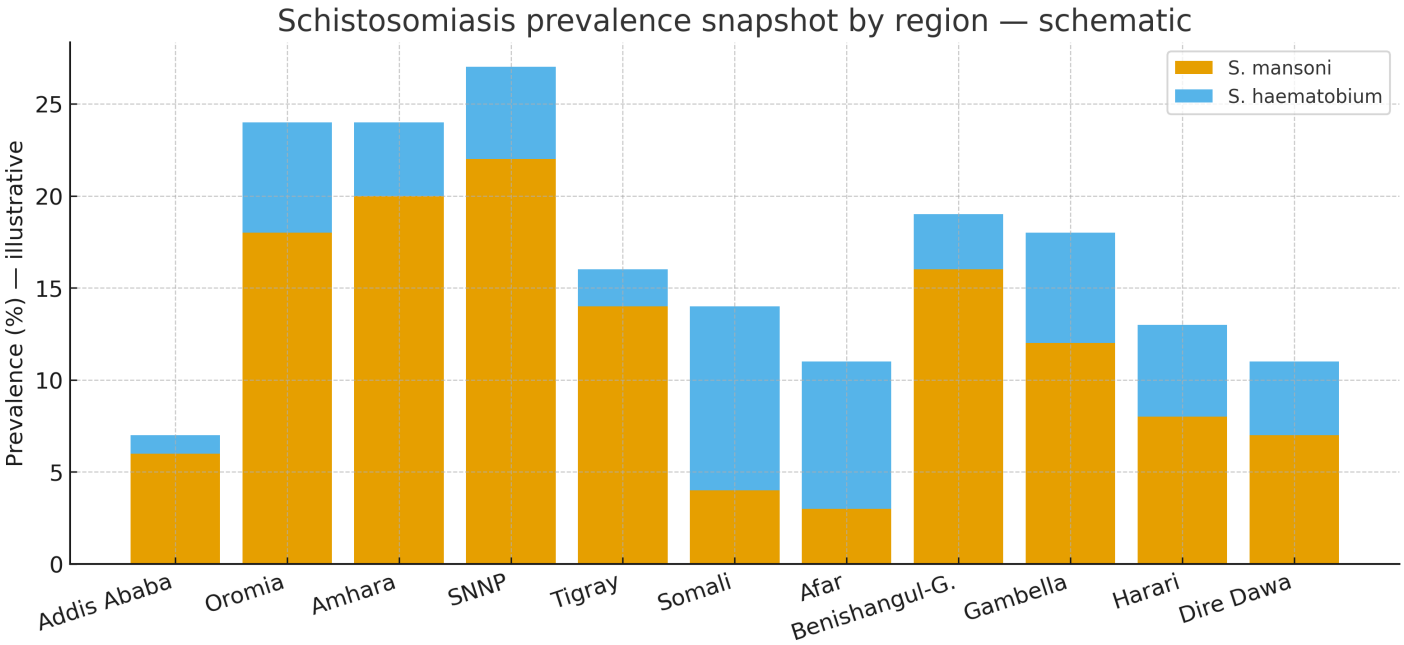

Figure . Water-contact behaviors among school-age children (schematic)

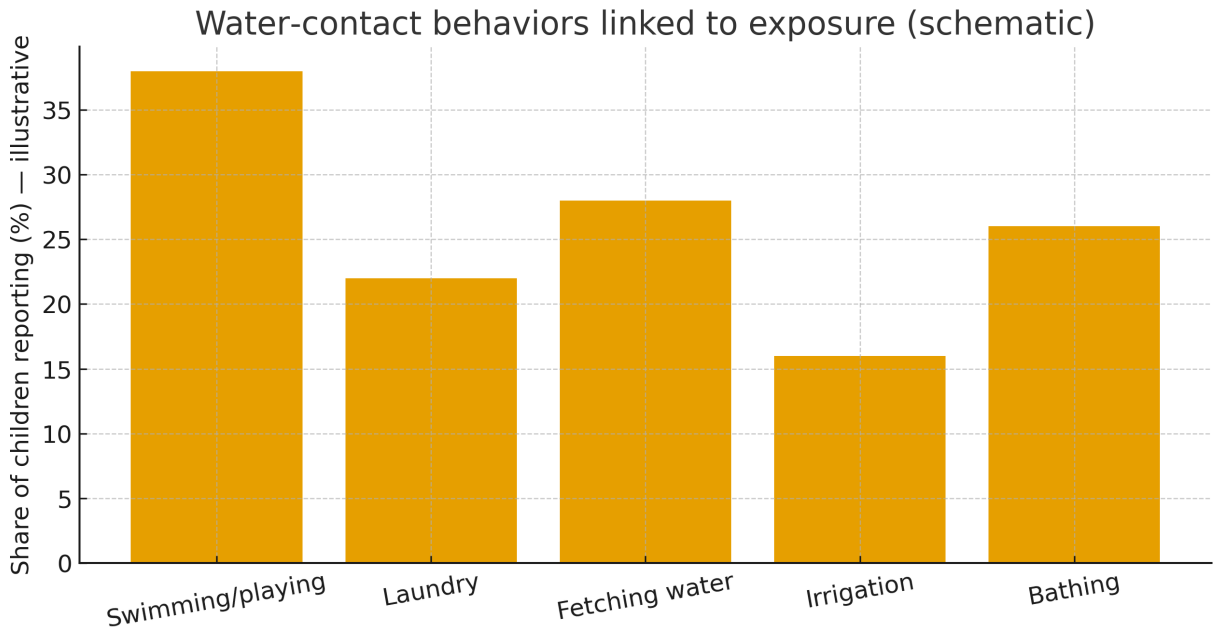

Figure . Snail habitat suitability cues (schematic)

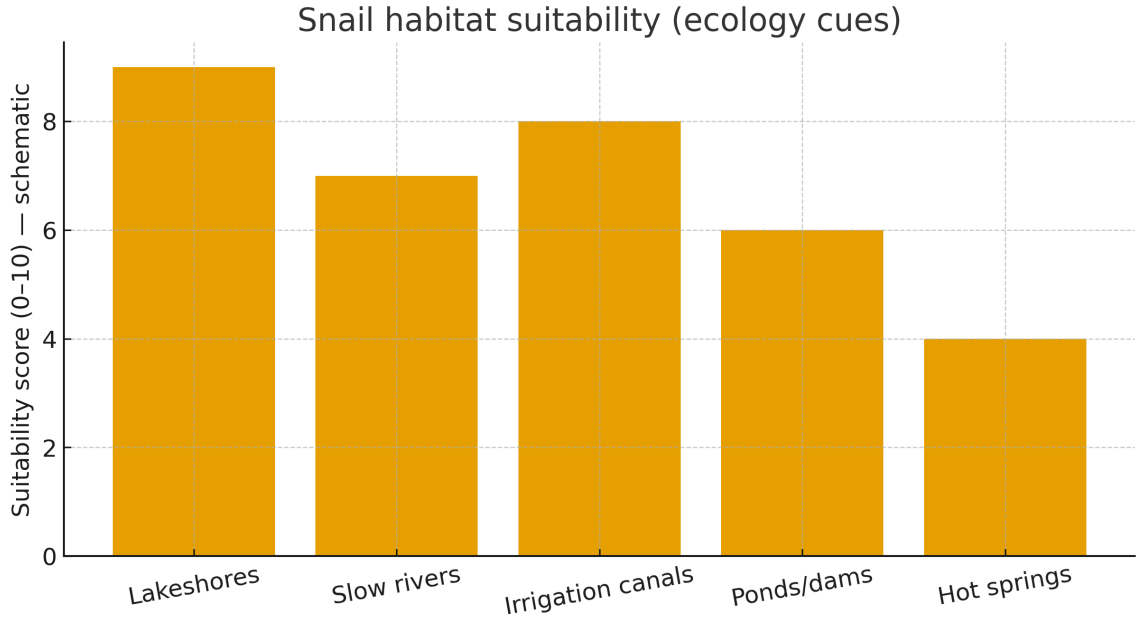

Figure 15.14-6. Reinfection trajectory after MDA without WASH change (schematic)

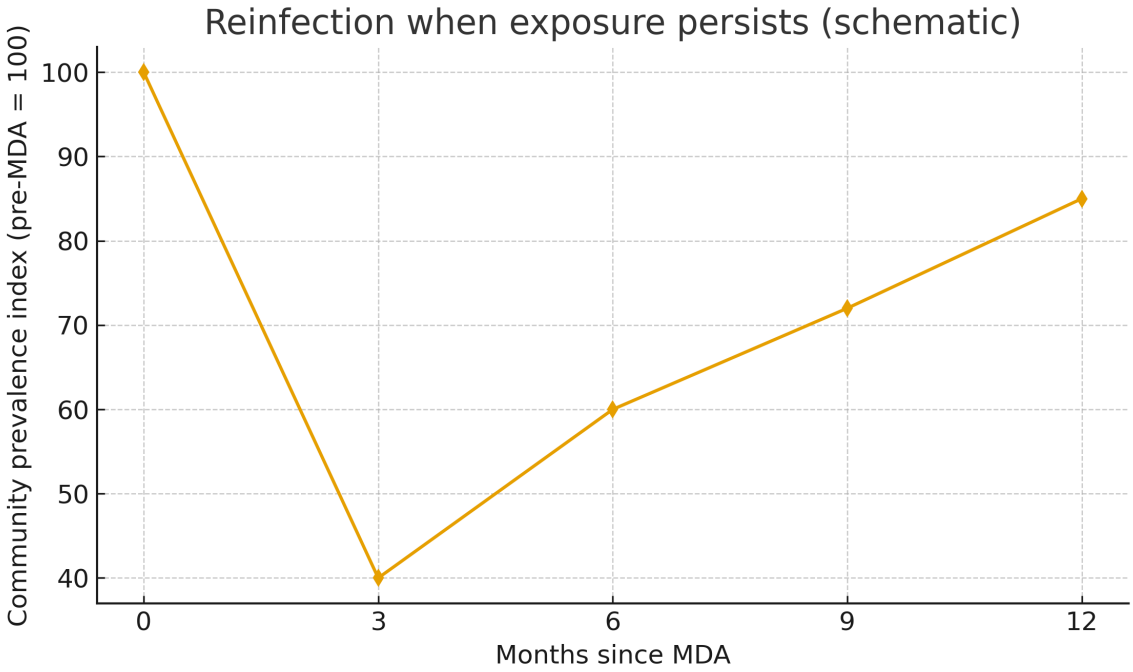

Table 15.14-A. Species and transmission overview

Species	Key transmission & morbidity notes
S. mansoni (intestinal)	Eggs in stool; Biomphalaria snails; peri-urban streams/canals; morbidity: hepatosplenic disease.
S. haematobium (urogenital)	Eggs in urine; Bulinus snails; ponds/dams; morbidity: hematuria, bladder pathology.

Table 15.14-B. Praziquantel MDA — dosing and frequency (simplified WHO guidance)

Guidance	Notes
Praziquantel ~40 mg/kg single dose	Use height-based dose pole in MDA; crushable tablets for younger children.
Frequency by risk	Annual in high-risk districts; biennial in moderate; per WHO/ESPEN stratification.
Safety & AEs	Transient AEs (nausea, abdominal pain); administer with food to reduce AEs.

Table 15.14-C. Morbidity control package

Component	Implementation notes
MDA coverage & repetition	Sustain high coverage; repeat per risk until morbidity indicators drop.
WASH & behavior	Safe water access; discourage high-risk water contact; laundry points.
Snail habitat management	Environmental modifications where feasible; maintain irrigation flow rates.
School health & screening	Hematuria screening where urogenital schisto suspected; referral pathways.

Table 15.14-D. Indicators and formulas

Indicator	Definition / computation
MDA coverage (SAC)	100 × (SAC given praziquantel / Target SAC)
Prevalence — species-specific	% positive by Kato-Katz (mansoni) or urine filtration/reagent strips (haematobium)
Heavy-intensity infection (%)	% above egg/10 mL (haem) or EPG (mansoni) thresholds
Hematuria proxy (%)	% with reagent-strip hematuria among school-age children
Reinfection index (12 mo)	Prevalence_12mo / Pre-MDA prevalence × 100

Table 15.14-E. Ethiopia-focused priorities

Priority area	Operational actions for Ethiopia
Risk mapping & stratification	Use ESPEN/EPHI maps to classify districts and set MDA frequency.
Lake/river communities	Prioritize focal MDA and WASH around exposed villages and schools.
Irrigation schemes	Add health education and engineering fixes (drainage, lining) where feasible.

Supply & logistics	Ensure praziquantel availability, dose poles, and crushable formulations.
Monitoring	Track heavy-intensity infection and hematuria; add sentinel sites near hotspots.

Ethiopia-focused considerations

• Maintain high praziquantel coverage in moderate-to-high risk districts using school platforms, with outreach to out-of-school children.
• Pair MDA with WASH and behavior change to reduce exposure in lakeshores, canals, and village ponds.
• Use risk maps to plan focal interventions for riparian and irrigation communities; strengthen supply chains for praziquantel and dose poles.
• Track heavy-intensity infections and hematuria to confirm morbidity control; add sentinel sites near hotspots.

Narrative summary

Repeated praziquantel campaigns can curb schistosomiasis morbidity quickly, but transmission rebounds if children continue frequent water contact in endemic sites. Sustained success requires both medicines and environment: high-coverage MDA alongside access to safe water, low-risk laundry/bathing alternatives, and practical habitat management. With stratified planning and reliable supplies, Ethiopia can accelerate morbidity control while working toward elimination as a public-health problem.

References — Section 15.14 (URLs)

• **WHO — Schistosomiasis fact sheets & guidelines —** https://www.who.int/health-topics/schistosomiasis

• **ESPEN (WHO AFRO) — Mapping & program data —** https://espen.afro.who.int/

• **Ethiopia EPHI — NTD programme resources —** https://www.ephi.gov.et/

• **Cochrane/Reviews — Praziquantel and control strategies —** https://www.cochranelibrary.com/

Sections 15.16–15.18 — Unified Summary, Glossary & References

Unified narrative (Ethiopia focus + global lens)

Non-vectored parasitic infections persist where water and sanitation are weak, diagnostics are limited, and delivery platforms are fragmented. In Ethiopia, giardiasis, amebiasis, and strongyloidiasis add to morbidity beyond helminths and schistosomiasis. Reducing their burden requires a two-track approach: reliable case management (with better stool antigen/PCR testing, microscopy quality assurance, and appropriate medicines such as ivermectin for Strongyloides and metronidazole/tinidazole with luminal agents for amebiasis) and durable WASH improvements that shrink reinfection. Platforms matter: school-based and community campaigns reach large populations efficiently, while facilities ensure continuous care; both depend on strong supply chains, microplanning, training, and clear data. Programs should verify progress with mapping and sentinel sites, triangulate DHIS2 tallies with independent coverage surveys, and publish data-quality scorecards. When equity is tracked (sex, age, school attendance, poverty, displacement), gaps become visible and correctable. The north star is simple: keep medicines and supplies moving, measure honestly, and invest in the water and sanitation conditions that make gains stick.

Table 15.16–18-A. At-a-glance synthesis for Sections 15.16–15.18

Section	Focus	Key transmission/delivery context	Diagnostics/Treatment/Systems	Program levers & notes
15.16 Other Non-Vectored Parasites	Giardiasis, Amebiasis, Strongyloidiasis	Water/food/soil transmission; person-to-person (Giardia)	Antigen/PCR (where available), microscopy with QA; ivermectin for Strongyloides; metronidazole/tinidazole ± luminal agents for amebiasis	Safe water, sanitation, hygiene (WASH); school/market hygiene education
15.17 Program Platforms	School/community MDA, facility	Microplanning; procurement & last-mile logistics; training &	Buffer stocks; lead-time tracking; DHIS2 tallies +	Cost-effectiveness framing

& Delivery	case management, WASH, private providers, IDP outreach	supervision; social mobilization; AEFI preparedness	coverage surveys; integrate WASH where reinfection high	(ICERs); equity gap monitoring
15.18 Monitoring, Mapping & Impact Evaluation	ESPEN/EPHI mapping; sentinel sites; routine DHIS2	Completeness/timeliness/concordance; baseline vs post-MDA prevalence & intensity	Before-after (sentinel), phased rollout/DiD when feasible; lab QA and geo-tagging	Equity disaggregation (sex, age, school status, poverty, displacement)

Table 15.16–18-B. Glossary of terms used

Term	Definition (as used in Sections 15.16–15.18)
AEFI	Adverse Event Following Immunization/treatment; monitored during MDA/campaigns.
Baermann/agar plate	Concentration techniques to detect Strongyloides larvae in stool.
Coverage survey	Independent post-event measurement validating administrative coverage.
DHIS2	District Health Information Software 2 — national platform for routine data.
Difference-in-differences (DiD)	Impact evaluation comparing changes over time between treated and comparison groups.
ESPEN	Expanded Special Project for Elimination of NTDs (WHO AFRO) — mapping/data portal.
ICER	Incremental cost-effectiveness ratio — extra cost per extra health gain (e.g., $/DALY).

JMP	WHO/UNICEF Joint Monitoring Programme for water, sanitation and hygiene indicators.
MDA	Mass Drug Administration — population-level deworming/antiparasitic campaigns.
PAIR	Puncture-Aspiration-Injection-Reaspiration procedure for hydatid cysts (context of CE).
Sentinel site	Fixed location for repeated standardized measurements (e.g., prevalence/intensity).
Strongyloidiasis	Infection by Strongyloides stercoralis; risk of hyperinfection with steroids/immunosuppression.
WASH	Water, Sanitation and Hygiene interventions that reduce enteric transmission.

References — Sections 15.16–15.18 (URLs)

• **WHO — Neglected Tropical Diseases: M&E and program guidance —** https://www.who.int/health-topics/neglected-tropical-diseases

• **WHO — Diarrhoeal diseases, protozoal infections —** https://www.who.int/health-topics/diarrhoeal-diseases

• **ESPEN (WHO AFRO) — Mapping & program data —** https://espen.afro.who.int/

• **Ethiopia EPHI — Surveys, DHIS2, Lab QA, NTD resources —** https://www.ephi.gov.et/

• **UNICEF/WHO JMP — WASH indicators and methods —** https://washdata.org/