

### III. MONITORING AND EVALUATION INDICATORS OF NATIONAL TUBERCULOSIS CONTROL PROGRAMS

One of the principal objectives of the compendium is to emphasize the importance of choosing standard indicators and measuring them repeatedly over time. The indicators suggested in this compendium are based on a review of country and program experiences in M&E. The strengths and weaknesses of existing measures have been identified, and new indicators have been introduced where they were considered necessary. Protocols for the measurement of all indicators are provided, and most have been field-tested.

#### **How to Use the Indicators**

This compendium offers a wide selection of indicators. Indicators contained here can be used as they are; every effort has been made during their development to ensure that they are relevant to most situations and countries and that they provide a comprehensive view of an NTP.

Programs are not limited to the indicators listed here nor should programs attempt to use all of the indicators outlined in this compendium. Rather, it provides a menu of indicators to be used selectively as part of the M&E of NTPs, regional programs, or projects. The choice of appropriate indicators will vary according to the goals and objectives of the TB program; the costs and feasibility associated with data collection; and the usefulness of the indicators for creating and supporting TB policies, improving program implementation, and reporting on program results.

This section of the compendium is organized into 10 sections:

1. Indicators for global reporting
2. Indicators for program outcomes
3. Political commitment
4. Diagnosis and laboratories
5. Case management and treatment
6. Drug management
7. Recording and reporting
8. Supervision
9. Human resources development
10. Health systems.

The first two sections focus on the most common and well-established indicators that are globally and routinely monitored. The remaining eight sections are organized according to the major DOTS program intervention areas.

Each section includes an introduction to the topic and a set of relevant indicators. The introduction provides an overview of the importance of M&E of that particular element of the DOTS strategy, identifies key indicators, describes measurement challenges, and lists resources that may be useful for further reading on the topic.

A description of each indicator is given to provide fundamental information that will help the reader to select, calculate, collect, and interpret the indicator. Each indicator is described with a brief statement that includes the following:

- *Definition:* What is the content of the indicator and the exact calculation (i.e., numerator and denominator, if applicable)?
- *What it measures:* What will this indicator measure? Why is this indicator important? How can the results be interpreted?
- *How to measure it:* What is the method of data collection? How should this indicator be calculated?
- *Data sources:* What are the main sources of data collection?
- *Frequency & function:* How often should the data be collected? At what level should the data be collected (e.g., district)? What is the function of the indicator (e.g., routine monitoring, evaluation)?
- *Strengths & limitations:* What are the main strengths and/or limitations of the indicator?

Table 3 provides a summary of all indicators described in this section, including their calculation, data source, level of measurement (e.g., national, regional, district, facility, community), frequency (e.g., quarterly, annually, 2 to 5 years), and function (e.g., whether the indicator is used for routine reporting, process evaluation/monitoring, program review/impact evaluation, or special survey). Appendix C also provides a summary list of indicators by these functions to facilitate the selection of indicators and planning of data collection, analysis, and use. Appendix D presents a list of key indicators that make up a minimum set of indicators for assessing the performance of an NTP.

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**Table 3. Summary Table of Indicators**

Compendium of Indicators for Monitoring and Evaluation of Tuberculosis Control Programs

Indicator	Calculation	Data Source	Level	Frequency	Function*
<b>1. Indicators for global reporting</b>					
1.1 TB case detection rate†	1) <i>Numerator:</i> Number of new TB cases detected <i>Denominator:</i> Estimated number of new TB cases countrywide 2) <i>Numerator:</i> Number of new smear-positive TB cases detected <i>Denominator:</i> Estimated number of new smear-positive TB cases countrywide 3) <i>Numerator:</i> Number of new smear-positive TB cases detected under DOTS <i>Denominator:</i> Estimated number of new smear-positive TB cases countrywide	Quarterly reports on TB case registration, TB register, WHO estimates of incidence for each country	National	Annually	1, 2, 3, 4
1.2 Treatment success rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that were cured plus the number that completed treatment <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports on treatment outcomes, TB register, TB treatment card	National, regional, district, facility	Quarterly, annually	1, 2, 3, 4
1.3 DOTS coverage	<i>Numerator:</i> Population living in the area of basic management units implementing the DOTS strategy <i>Denominator:</i> Total population	NTP reports, census statistics	National	Annually	1, 2, 3
1.4 Surveillance of multidrug-resistant TB	Yes/no	NTP data and reports	National	If no, annually; if yes, every 2 to 5 years	3, 4

\* **Functions:** 1 = Routine Reporting, 2 = Process Evaluation/Monitoring, 3 = Program Review/Impact Evaluation, 4 = Special Survey

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Indicator	Calculation	Data Source	Level	Frequency	Function*
1.5 HIV seroprevalence among TB patients	<p>1) <i>Numerator</i>: Total number of newly registered TB patients (registered over a given period of time) who are HIV positive</p> <p><i>Denominator</i>: Total number of newly registered TB patients (registered over the same given time period) who were tested for HIV and included in the surveillance system</p> <p>2) <i>Numerator</i>: Total number of newly registered smear-positive TB patients (registered over a given period of time) who are HIV positive</p> <p><i>Denominator</i>: Total number of newly registered smear-positive TB patients (registered over the same given time period) who were tested for HIV and included in the surveillance system</p>	Modified TB register or separate TB/HIV register, sentinel surveillance, special surveys	National, regional, district	Quarterly, annually if routinely collected otherwise 2 to 3 years	1, 2, 3
<p>† All of the indicators commonly known as “rates” in this compendium are, technically, percentages.</p> <p>‡ This same definition is used to calculate outcome among other cohorts (or case types), e.g., new smear-negative cases, relapse cases, treatment-after-failure cases, and treatment-after-default cases.</p>					
<b>2. Indicators for program outcomes</b>					
2.1 Case notification rate	<p>1) <i>Numerator</i>: Number of new TB cases reported in the past year (<math>\times 100,000</math>)</p> <p><i>Denominator</i>: Total population in the specified area</p> <p>2) <i>Numerator</i>: Number of new and relapse TB cases reported in the past year (<math>\times 100,000</math>)</p> <p><i>Denominator</i>: Total population in the specified area</p> <p>3) <i>Numerator</i>: Number of all TB cases reported in the past year (<math>\times 100,000</math>)</p> <p><i>Denominator</i>: Total population in the specified areas</p>	Quarterly reports on TB case registration, census statistics	National, regional, district	Annually	1, 2, 3
2.2 Case notification rate—new smear-positive pulmonary TB cases	<p><i>Numerator</i>: Number of new smear-positive pulmonary TB cases reported (<math>\times 100,000</math>)</p> <p><i>Denominator</i>: Total population in the specified area</p>	Quarterly reports on TB case registration, census statistics	National, regional, district	Annually	1, 2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
2.3 New pulmonary TB cases with no smear result	<i>Numerator:</i> Number of new pulmonary TB cases registered during a specified time period that do not have results of sputum smear examinations on diagnosis <i>Denominator:</i> Total number of new pulmonary TB cases registered during the same period	Quarterly reports on TB case registration, TB register, TB laboratory register	National, regional, district	Quarterly, annually	1, 2, 3
2.4 New adult smear-positive cases	<i>Numerator:</i> Number of new smear-positive adult (age 15 and older) TB cases registered during a specified time period <i>Denominator:</i> Total number of new adult pulmonary TB cases registered during the same period	Quarterly reports on TB case registration, TB register	National, regional, district	Annually	1, 2, 3
2.5 Retreatment TB cases	<i>Numerator:</i> Number of retreatment TB cases registered during a specified time period <i>Denominator:</i> Total number of TB cases registered in the same period	Quarterly reports on TB case registration, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.6 New extrapulmonary TB cases	<i>Numerator:</i> Number of new extrapulmonary TB cases registered during a specified time period <i>Denominator:</i> Total number of new TB cases registered in the same period	Quarterly reports on new cases and relapses of tuberculosis, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.7 New TB cases with no smear conversion result	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specific period that were not examined at the end of the initial phase of treatment <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered during the same period	Quarterly reports on smear conversion or program management, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.8 Sputum conversion rate at the end of the initial phase of treatment	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that were smear negative at the end of the initial phase of treatment <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered for treatment in the same period	Quarterly reports on smear conversion, TB register	National, regional, district	Quarterly, annually	1, 2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
2.9 Cure rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that were cured <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports on treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.10 Treatment completion rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that completed treatment and did not meet the criteria for cure or failure <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports on treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.11 Death rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that died during treatment, irrespective of cause <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports of treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.12 Treatment failure rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that are smear positive 5 months or later after initiating treatment <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports of treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.13 Default rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that interrupted treatment for more than 2 consecutive months <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered in the same period	Quarterly reports of treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3
2.14 Transfer-out rate‡	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases registered in a specified period that were transferred to another basic management unit and for which there is no treatment outcome information <i>Denominator:</i> Total number of new smear-positive pulmonary TB cases registered during the same period	Quarterly reports of treatment outcomes, TB register	National, regional, district	Quarterly, annually	1, 2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
2.15 Retreatment failure rate (chronic TB rate)	Numerator: <i>Number of retreatment smear-positive pulmonary TB cases registered in a specified period that are smear positive at the end of the retreatment regimen</i> Denominator: Total number of retreatment smear-positive pulmonary TB cases registered in the same period	TB register	National, regional, district	Quarterly, annually	1, 2, 3
‡ This same definition is used to calculate outcome among other cohorts (or case types), e.g., new smear-negative cases, relapse cases, treatment-after-failure cases, and treatment-after-default cases.					
<b>3. Political commitment</b>					
3.1 TB control is among stated priorities	Yes/no	Government planning and strategy documents	National	Annually	If no = 2 If yes = 3
3.2 National TB policy	Yes/no	Ministry of Health (MOH) policies and/or directives regarding TB control at the national level, checklist of key policy components	National	Annually	If no = 2 If yes = 3
3.3 National TB program manual	Yes/no	Manual of norms and procedures for NTPs, checklist of key manual components	National	Annually	If no = 2 If yes = 3
3.4 NTP medium-term development plan and budget	Yes/no	NTP MDP and budget	National	Annually	If no = 2 If yes = 3
3.5 NTP annual work plan and budget	Yes/no	NTP annual plan and budget, MDP	National	Annually	2, 3
3.6 Peripheral units with work plan and budget	Numerator: Number of peripheral management units for which a work plan and budget are available Denominator: Total number of peripheral management units with budget and planning responsibility	Work plans and budgets, checklist of key components for annual work plans	Regional, district	Annually	2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
3.7 Financial resources committed to NTP from the national government	<i>Numerator:</i> Total funding from the national government for the annual plan of activities <i>Denominator:</i> Total budget required for full implementation of the annual plan of activities (consistent with MDP)	Annual TB work plan and budget, MDP budget	National	Annually	2
3.8 Annual NTP budget allocated to implement DOTS as required by medium-term development plan	<i>Numerator:</i> Total amount of funds allocated for DOTS-based TB control in the previous year's NTP budget <i>Denominator:</i> Total amount of funds budgeted for DOTS-based TB control in the previous year's NTP budget as described in the annual plan	Annual NTP work plan and budget, MDP budget	National, regional	Annually	2, 3
3.9 Key NTP staff positions filled	<i>Numerator:</i> Number of key NTP positions filled by local staff <i>Denominator:</i> Total number of key NTP positions, as described in the NTP human resources development plan	NTP organizational diagram, human resource development plan	National	Annually	2, 3
3.10 Interinstitutional coordination of TB control	Yes/no	Reports from coordination meetings, joint planning documents, recording and reporting forms	National	Annually	2, 3
3.11 Existence and dissemination of NTP annual report	Yes/no	NTP annual reports, dissemination records	National	Annually	2, 3
3.12 National TB control policy addresses links between TB and HIV	Yes/no	Policy audit of MOH and NTP records and policies, checklist of key components for policy	National	Annually	2

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Indicator	Calculation	Data Source	Level	Frequency	Function*
<b>4. Diagnosis and laboratories</b>					
4.1 Existence of comprehensive laboratory network	Yes/no	TB laboratory register and forms	National	If no, measure annually; if yes, measure every 5 years	If no = 2 If yes = 3
4.2 TB microscopy coverage	1) <i>Numerator</i> : Number of TB microscopy units that cover a population of a size within a recommended range <i>Denominator</i> : Total number of TB microscopy units 2) <i>Numerator</i> : Total population <i>Denominator</i> : Total number of TB microscopy units	Census statistics, NTP records, MOH records	National, regional, district	Annually	3, 4
4.3 TB microscopy units with adequate workloads	<i>Numerator</i> : Number of TMUs with an average daily staff workload within a recommended range <i>Denominator</i> : Total number of TMUs for which data are available	TB laboratory register	National, regional, district, facility	Annually	1, 2, 3
4.4 TB microscopy units submitting slides for rechecking	<i>Numerator</i> : Number of TB microscopy units for which slide rechecking results are available during a specified period <i>Denominator</i> : Total number of units performing TB smear microscopy during the same period	Laboratory records containing quality assurance results	National	Quarterly, annually	2, 3
4.5 TB suspects who are smear positive	<i>Numerator</i> : Number of TB suspects found to be smear positive during a specified period <i>Denominator</i> : Number of TB suspects identified clinically during the same period	TB laboratory register or cough register	National, regional, district	Quarterly, annually	1, 2, 3
4.6 Smear-negative cases properly diagnosed	<i>Numerator</i> : Number of adult smear-negative pulmonary TB cases diagnosed with at least three negative smears and chest radiograph according to NTP-recommended algorithm during a specified time period <i>Denominator</i> : Total number of adult smear-negative cases diagnosed during the same period	NTP diagnostic algorithm for smear-negative TB, TB laboratory register, TB treatment cards	District, facility	Annually	1, 2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
4.7 Detected smear-positive cases registered for treatment (inverse of primary default rate)	<i>Numerator:</i> Number of new smear-positive pulmonary TB cases that have initiated treatment during a specified time period <i>Denominator:</i> Total number of new smear-positive cases detected during the same period	TB laboratory register, TB register	National, regional, district, facility	Quarterly, annually	2, 3
<b>5. Case management and treatment</b>					
5.1 Patients under direct observation of therapy	<i>Numerator:</i> Number of new smear-positive pulmonary TB patients who report observation of every dose of medication per NTP guidelines <i>Denominator:</i> Total number of new smear-positive pulmonary TB patients interviewed regarding direct observation of therapy	Survey of TB patients and staff	National, regional, district	Annually	2, 3, 4
5.2 New TB patients who were prescribed the correct regimen	<i>Numerator:</i> Number of new TB patients who were prescribed the correct regimen of medications during a specified period <i>Denominator:</i> Total number of new TB patients who completed treatment during the same period	NTP treatment guidelines, TB register, individual medical records, facility survey	District, facility	2 to 3 years	2, 3, 4
<b>6. Drug management</b>					
6.1 Existence of a quality assurance system for drug management	Yes/no	MOH documents, National Pharmaceutical Committee documents	National	Annually	If no = 2 If yes = 3
6.2 Anti-TB drugs meeting international minimum quality standards	<i>Numerator:</i> Number of batches of anti-TB drugs procured locally and internationally where a batch certificate was received and showed acceptable results during a specified time period <i>Denominator:</i> Total number of batches of anti-TB drugs procured during the same time period	Procurement agency records, drug registration authority records	National	Annually	2, 3
6.3 Existence of buffer stock at central, regional, or district-level facility	Yes/no	TB drug quantification records, procurement records	National, regional, district	Annually, biannually	2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
6.4 Accuracy of stock records for anti-TB drugs	<i>Numerator:</i> Number of stock records that correspond with physical counts × 100 <i>Denominator:</i> Total number of stock records examined	Storage facility stock cards for individual drugs, physical observations at the facility	National, regional, facility	Biannually	2, 3
6.5 Time anti-TB drugs are out of stock—storage facilities	<i>Numerator:</i> Total number of stockout days for all first-line drugs stocked × 100 <i>Denominator:</i> 365 × number of anti-TB drugs	Storage facility stock cards of individual drugs	National, regional, district	Quarterly	2, 3
6.6 Time anti-TB drugs are out of stock—treatment facilities	<i>Numerator:</i> Total number of stockout days for all first-line drugs stocked × 100 <i>Denominator:</i> 365 × number of anti-TB drugs in treatment facilities	Facility stock cards of individual drugs	National, regional, district	Quarterly	2, 3
6.7 Basic management units where anti-TB drugs are available	<i>Numerator:</i> Number of basic management units visited where anti-TB drugs are present <i>Denominator:</i> Total number of basic management units visited	Drugs stocked in TB BMUs	National, regional, district	Quarterly	2, 3
6.8 Anti-TB drug samples that fail quality control tests	<i>Numerator:</i> Number of anti-TB drug samples that failed quality control testing × 100 <i>Denominator:</i> Total number of anti-TB drug samples tested in the country's quality control analysis laboratory	Quality control laboratory register, MOH reports	National	Annually	2, 3
<b>7. Recording and reporting</b>					
7.1 Completeness of reporting to NTP	<i>Numerator:</i> Number of basic management units that submitted case-finding and treatment outcome reports to the NTP in the previous quarter <i>Denominator:</i> Total number of basic management units required to submit case-finding and treatment outcome reports to the NTP each quarter	NTP statistics and reports	National, regional, district	Quarterly, annually	1, 2, 3
7.2 Accuracy of reporting to NTP	<i>Numerator:</i> Number of TB case-finding and treatment outcome reports that were recorded completely and accurately <i>Denominator:</i> Total number of TB case-finding and treatment outcome reports examined	NTP statistics and reports, TB register	National, regional, district	Quarterly	2, 3

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Indicator	Calculation	Data Source	Level	Frequency	Function*
<b>8. Supervision</b>					
8.1 Supervision of DOTS implementation	<i>Numerator:</i> Number of supervisory visits performed during a specified time period <i>Denominator:</i> Number of supervisory visits planned according to the annual work plan during the same period	Annual work plan, reports of the supervisory visits	National	Annually	2
8.2 Existence of supervision guidelines	Yes/no	NTP supervision documents	National	Annually	If no = 2 If yes = 3
<b>9. Human resources development</b>					
9.1 TB microscopy units with at least one laboratory technician trained in AFB microscopy	<i>Numerator:</i> Number of TB microscopy units with at least one laboratory technician trained in AFB in the past 3 years <i>Denominator:</i> Number of TB microscopy units	NTP training records, list of certified laboratory technicians and laboratory of employment, interviews with staff members	National, regional, district	Annually	2, 3
9.2 Health care units with at least one health care professional trained in TB case detection and treatment	<i>Numerator:</i> Number of TB treatment facilities with at least one health care professional trained in TB case detection and treatment (within the past 3 years) <i>Denominator:</i> Total number of TB treatment facilities	NTP training records, employee training certificates, facility training registers, interviews with staff members	National, regional, district	Annually	2, 3
9.3 Adequate staffing at all levels to enable implementation of DOTS	Yes/no	Staffing documents or rosters, interviews with staff members	National, regional, district, facility	Annually	2
<b>10. Health systems</b>					
10.1 Equitable distribution of DOTS	<i>Numerator:</i> Number of TB patients living in poverty notified under DOTS in specified time period <i>Denominator:</i> Total number of TB patients notified under DOTS in specified time period × the percentage of the population living in poverty	Quarterly reports on TB case registration, census statistics, special surveys	National	Annually	2, 3, 4

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