Interruption of transmission and elimination of leprosy disease

Technical guidance

World Health Organization

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Abbreviations and acronyms

5-QSI-AP	5-question stigma indicator for affected persons
5-QSI-CS	5-question stigma indicator for community stigma
CBR	community-based rehabilitation
CHW	community health worker
GIS	geographical information system
GPS	global positioning system
IEC	information, education, communication
G1D	grade- 1 disability
G2D	grade- 2 disability
GLP	Global Leprosy Programme
HMIS	health management information system
LEMT	Leprosy Elimination Monitoring Tool
LPTA	Leprosy Programme and Transmission Assessment
MB	multibacillary
MDT	multidrug therapy

M. leprae	*Mycobacterium leprae*
M. lepromatosis	*Mycobacterium lepromatosis*
MoU	Memorandum of Understanding
M. tuberculosis	*Mycobacterium tuberculosis*
NCDR	new case detection rate
NGO	nongovernmental organization
NLP	national leprosy programme
NTD	neglected tropical disease
OPD	outpatient department
PB	paucibacillary
PEP	post-exposure prophylaxis
PHC	primary health care
PoD	prevention of disabilities
SDR	single-dose rifampicin
SOP	standard operating procedure
TB	tuberculosis
TFCEL	Task Force on definitions, criteria and indicators for interruption of transmission and elimination of leprosy
WHA	World Health Assembly
WHO	World Health Organization

Glossary

This glossary defines technical terms which appear in this document. It excludes the concepts that are defined in Chapter 4.

Chemoprophylaxis	Prevention of an infectious disease by the use of chemical agents/drugs.
Contact	A person having close proximity to a leprosy patient for a prolonged duration (see below). Such persons are considered "exposed" to leprosy and may or may not have been infected.
Disability	A broad term covering any impairment, activity limitation or participation restriction affecting a person.
Disability grade	A system of grading leprosy-related impairments for each eye, hand and foot on a 0–2 scale. The maximum grade at any of the six sites is used to determine the disability grade of the person.
EHF score	The sum of the individual disability grades for each eye (E), hand (H) and foot (F) (range 0–12)
Exposure	When a healthy person comes in contact with a leprosy-infected person able to infect others (i.e. before treatment or even before symptoms occur), the healthy person is considered to be exposed.
Impairment	A problem in body function or structure, such as a significant deviation or loss.
Index case	The first leprosy case identified in a group of related cases.
Infection	When the leprosy bacillus enters the human body and multiplies, the person is said to be infected. The organism may or may not cause disease, depending on the immunity (the resistance in the body) of the host.

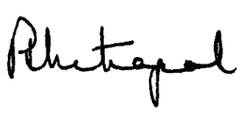
Leprosy case	A patient having one or more of the following: (i) hypo-pigmented skin lesion with definite loss of sensation; (ii) thickening or enlargement of peripheral nerve (impairment) or involvement of the peripheral nerve, as demonstrated by (a) definite loss of sensation or (b) weakness of muscles in hands/feet or face or (c) autonomic function disorders such as anhidrosis (dry skin); or (d) presence of visible impairments; (iii) signs of the disease with demonstrated presence of acid-fast bacilli in slit-skin smear or histopathological confirmation; AND in need of leprosy treatment as decided by a clinician.
Prophylaxis	Administration of a drug or vaccine to prevent disease.
Post-exposure prophylaxis (PEP)	Administration of drugs (e.g. rifampicin) to prevent disease in a person who is or has been exposed to *M. leprae* infection through close contact with a leprosy patient.
Prolonged duration of contact	Contact with an (untreated) patient for 20 hours per week for at least three months in a year, e.g. family members, neighbours, friends, school children in same class; co-workers in same office, etc.
Re-emergence of leprosy	The possibility of re-emergence of leprosy should be investigated if three or more child cases on average occur in 3 consecutive years in one area during Phase 2 (after interruption of transmission), or three or more cases (any age) on average occur in 3 consecutive years in one area during Phase 3 (Post-elimination surveillance phase).
Secondary case	A subsequent case, likely infected from a known source case (index case). Due to the variable and often long incubation period, the above-mentioned definitions of index/source case and secondary case are only conventionally used while it may never be possible to determine which patient is the true source or secondary case.
Source case:	An untreated patient who may have infected or may still infect other persons. Index case and source case are often used interchangeably, though it is not always sure that the index case is indeed the actual source of infection.
Sporadic case	Occasional new cases of leprosy occurring during elimination Phase 2 (child cases only) or Phase 3 in a given area in a particular year.

Foreword

Leprosy is a chronic infectious disease that predominantly affects the skin and peripheral nerves. If left untreated, leprosy can have long-term consequences, including deformities and disabilities, which are associated with stigma. Leprosy-affected countries have in recent decades significantly reduced the leprosy burden, with the number of new leprosy cases reported globally decreasing from around 600 000 annually in the early 1980s to a little over 200 000 in 2019. Today, leprosy-affected countries aim to interrupt leprosy transmission, as well as transmission of Human African Trypanosomiasis and onchocerciasis, as a core target of the WHO Neglected Tropical Diseases (NTD) Road Map 2021–2030. The Global Leprosy Strategy 2021–2030, an integral part of the NTD Road Map, provides the necessary guidance for countries to achieve this goal.

In 2020, countries where leprosy cases are no longer reported – and countries close to achieving this milestone – requested the World Health Organization (WHO) to develop a mechanism to define criteria, definitions and cut-offs for interruption of transmission and the elimination of leprosy. The resulting taskforce, commissioned by WHO, deliberated on available evidence, consulted with national programmes, and recommended key criteria and cut-offs for verification of transmission interruption and the elimination of leprosy. Based on these recommendations, as well as further consultations, WHO developed this Leprosy Elimination Framework, which clearly defines how a country or sub-national area can move towards interruption of transmission and elimination of leprosy, followed by a phase of post-elimination surveillance and the achievement of non-endemic status. The framework is accompanied by several tools that will help leprosy programmes to monitor progress and carry out detailed epidemiological and programme assessments.

I thank and acknowledge all leprosy programme staff and other health workers for their decades-long efforts to address the leprosy burden, leaving no one behind. Together, let us leverage this framework to interrupt transmission and eliminate leprosy once and for all.



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1. Executive summary

This document provides technical guidance on concepts, definitions, indicators, criteria, milestones and tools to assist leprosy programmes in their journey towards the goals of interruption of transmission and elimination of leprosy disease and through the post-elimination period. Importantly, it provides criteria with benchmarks, where possible, for all key aspects of leprosy programmes and services. Not only those related to elimination efforts, but also those related to diagnosis and management of leprosy, leprosy-related disabilities, mental wellbeing, stigma and discrimination and inclusion and participation of persons affected by leprosy. The document emphasises that the elimination of leprosy is a long-term, continuous journey on the one hand, while, on the other, clear milestones can be recognised on the way and programme implementation can be assessed against benchmarks, guiding appropriate action to keep the programme on track.

The content of this technical guidance is based on the work of the WHO Task Force on definitions, criteria and indicators for interruption of transmission and elimination of leprosy (TFCEL). It has also used input from existing WHO guidance on elimination of other neglected tropical diseases (NTDs), such as lymphatic filariasis and trachoma, WHO documents related to control of infectious diseases, such as the WHO Global Leprosy Strategy 2021–2030, the WHO NTD Road map 2021–2030 and other authoritative sources.

The concept of 'elimination' is defined and used carefully and is discussed in relation to other relevant concepts. This is done to prevent confusion regarding this term as happened around the time when 'elimination of leprosy as a public health problem' was declared. At the time, this was misunderstood to mean that there would no longer be significant numbers of leprosy cases in countries that had achieved this target and thus had a negative impact on funding, perception of priority in public health agendas, etc. This document seeks to avoid this through carefully defining the concepts used, trying to align the terminology with that used in WHO guidance for other infectious disease programmes, notably that for infectious NTDs.

Four new tools that are introduced in this document are summarized below:

1. The Leprosy Elimination Framework that outlines the phases of elimination with indicators and milestones showing when an area or country moves from one phase to the next. Subnational areas can be easily classified based on existing data and mapped to visualise how the country progresses towards the goals of interruption of transmission and elimination of leprosy.

2. The second tool is the Leprosy Elimination Monitoring Tool (LEMT; see section 8.2). This Excel-based tool allows areas and countries to monitor their progress across the phases of elimination and determine when they (are ready to) move from one phase to the next.

3. The Leprosy Programme and Transmission Assessment (LPTA) is the third tool. The LPTA can be used by ministries of health and leprosy programme managers to assess the status of the programme and related leprosy services with regard to a set of programme criteria that comprehensively cover all key aspects of a leprosy control programme. This may be done before a subnational level area is to be acknowledged by the health ministry for having achieved interruption of transmission and/or elimination of leprosy but could be used at other times also. Importantly, this tool would be used at the national level by WHO to verify that a country has indeed reached the milestone of elimination of leprosy disease.

4. The Leprosy Elimination Dossier. Data and information gathered through the national-level LPTA would be added to any subnational LPTA results and collected in this dossier. A country would submit a Leprosy Elimination Dossier to WHO at the point when they request verification of achieving the milestones of interruption of transmission and elimination of leprosy. The dossier will contain background information on the health system and development context in the country, details of leprosy programme and its activities and evidence of achieving the milestones. It also documents that the leprosy programme has the capacity to provide required services in place to manage the ongoing needs of any sporadic new cases that might still occur and of people living with the long-term consequences of leprosy. The dossier will be examined by WHO to ensure that all criteria have been met before declaring that the country has achieved elimination of leprosy disease.

It is hoped that this set of definitions, indicators, programme criteria and tools will bring greater clarity of the task ahead and it is also hoped that it will boost both political commitment and motivation of leprosy programme staff to do everything possible to achieve the milestones provided and to offer required services to all persons affected by leprosy in the years to come.

2. Introduction

Every health ministry in leprosy-endemic countries seeks to interrupt the transmission of *Mycobacterium leprae* and to reach and celebrate the day when there will be no more new autochthonous cases of leprosy. While these goals have been pursued for many years by leprosy programme around the world, there was no road map to elimination of leprosy clearly distinguishing phases with indicators and milestones, and specific tools to assess the status of (formerly) endemic areas with regard to transmission and to collect evidence for a process that would result in verification of elimination of leprosy at the country level.

To address these gaps, WHO organised an informal consultation on defining criteria to declare elimination of leprosy in Mexico City in February 2020. Based on the recommendations of this consultation, a Task Force on Criteria for Elimination of Leprosy (TFCEL) was formed. The TFCEL conducted monthly virtual meetings to identify key concepts, definitions, indicators and milestones to be used by countries on the road to interruption of transmission and elimination of leprosy disease. The TFCEL also worked on programme criteria for leprosy services and surveillance and response systems to accelerate progress towards elimination and for use in the post-elimination phase. The work of the TFCEL concluded with a workshop in Chennai, India, in March 2021.

This Technical guidance document is built on the work done by the TFCEL to provide guidance on the monitoring of the elimination process and the confirmation of interruption of transmission and elimination of leprosy as a disease. It discusses the key concepts involved and provides definitions for these. It describes the 'phases of elimination' from an epidemiological perspective and provides indicators and milestones for monitoring progress and for determining the transition from one phase to the next. This is illustrated with a few case studies of countries that are in different stages of achieving the goals of interruption of transmission and elimination of leprosy disease.

To help leprosy programmes accelerate progress towards the elimination targets, to ensure early diagnosis and prompt treatment for new leprosy patients and to provide quality care to persons with leprosy-related complications and long-term consequences, a set of 'criteria for ensuring availability of leprosy services' have been defined. These are outlined in this document.

This Technical guidance document introduces the concept of the **Leprosy Programme and Transmission Assessment (LPTA)** and provides guidance on what data should be collected and how these may be interpreted. Another new tool is the **Leprosy Elimination Dossier**, a portfolio to be compiled at the country level to provide evidence of a country's achievement of the elimination targets. The dossier also documents how the requirements of a robust post-elimination surveillance and response system are being met.

Altogether it is hoped that these criteria, indicators, milestones and tools will provide sufficient guidance to leprosy control programmes to reinvigorate efforts to achieve the long-desired goals of interruption of transmission and elimination of leprosy and to document their progress to allow monitoring and verification in a globally standardised way.

3. Background

Leprosy is one of the 20 neglected tropical diseases (NTDs) captured in the 'WHO road map for neglected tropical diseases 2021–2030'.[1] The causative agent is *Mycobacterium leprae (M. leprae)* and, in some areas, *Mycobacterium lepromatosis (M. lepromatosis)*. From here onwards, reference is made only to *M. leprae* since most of time the diagnosis is made without a detailed bacteriological examination and treatment is the same for both infections. Leprosy is one among three NTDs targeted for interruption of transmission by 2030, along with Human African Trypanosomiasis (HAT) and onchocerciasis. The leprosy-specific 2030 targets in the Road map include '120 countries with zero new autochthonous leprosy cases'(World Health Organization, 2020, p. 126). This implies that processes should be in place to enable verification of such achievements at the country level. The broad target for each NTD is shown in Table 1.

[1] World Health Organization (2020). Ending the neglect to attain the sustainable development goals – a road map for neglected tropical diseases 2021–2030. Geneva: WHO, accessed 16 June 2023).

Table 1: Control, elimination and eradication of NTDs as per the targets in NTD Road map 2021–2030

Concept	Targeted NTDs (by 2030)	Public health implication	Acknowledgement process
Control[2]	Buruli ulcer chikungunya cutaneous leishmaniasis dengue echinococcosis food-borne trematodiases mycetoma, chromoblastomycosis and other deep mycoses scabies and other ectoparasitoses snakebite envenoming taeniasis/cysticercosis	Reduction of morbidity	None
Elimination as a public health problem	Chagas disease HAT-rhodesiense lymphatic filariasis rabies schistosomiasis soil-transmitted helminthiases trachoma visceral leishmaniasis	Elimination of morbidity and/or reduction of transmission	Validation
Elimination	HAT-gambiense **leprosy** onchocerciasis	Interruption of transmission at the national level	Verification
Eradication	dracunculiasis yaws	Global transmission disruption	Certification
Extinction		Complete eradication of a pathogen in nature and in the laboratory	Possibly none

WHO has set up acknowledegment processes to validate, verify or certify the achievement of set targets by an applicant country. Global processes that have been established include those for certification of eradication of dracunculiasis and yaws, verification of elimination of onchocerciasis, and validation of elimination of lymphatic filariasis, trachoma, visceral leishmaniasis and rabies as a public health problem. Others are being developed.

[2] For precise definitions of each concept, see Chapter 4 – Concepts and definitions.

It is general practice that only endemic countries that have implemented disease control interventions and successfully achieved a set target can request WHO to acknowledge such an achievement. For diseases targeted for eradication, non-endemic countries are also subject to the certification process. The processes of certification and verification are typically coordinated at WHO headquarters level, while validation is done at the Regional level. Three key steps are required for a country to go through the acknowledgement process: (i) the development of a dossier (including all evidence supporting the country's claim); (ii) submission of the dossier to WHO requesting verification; (iii) the establishment of a reviewing authority (usually a group of experts), tasked with verifying the country's claim; and (iv) the official acknowledgment of the achievement by WHO's Director-General, based on the adivce by the reviewing authority's advice.

In 1990, the WHO Global Leprosy Programme (GLP) formulated a target for 'elimination of leprosy as a public problem' This was endorsed by the Forty-fourth World Health Assembly in May 1991 through Resolution WHA44.9.[3] The target was to reduce the registered prevalence of leprosy to less than 1 per 10,000 population at the global level by the year 2000. This target and the subsequent WHO campaign to achieve this brought about some unprecedented advances in the global efforts to end leprosy. For example, whereas the use of WHO-recommended multi-drug therapy (MDT) was still patchy in many countries in 1990 and had not even been introduced at all in others, implementation and use was universal by December 2000. Large case detection campaigns had resulted in hundreds of thousands of new patients being treated with MDT. As a result, the target of elimination as a public health problem was indeed achieved at a global level and in many endemic countries. Millions of patients had been treated and cured with MDT by 2006, the prevalence of leprosy cases on treatment had fallen by 90% compared to 1991.[4]

Unfortunately, the misunderstanding around the communication of this achievement, led to the belief that 'elimination as a public health problem' meant that leprosy was now a problem of the past. Resources for leprosy programmes and leprosy research were seriously reduced, causing major problems in continuing leprosy services and in attracting researchers to address the many remaining research challenges. This led to a widespread aversion against the term 'elimination' in connection to leprosy, especially among civil society organisations, including organisations of persons affected by leprosy.

In this document and in future endeavours to achieve 'zero leprosy', the GLP is making every effort to avoid further confusion around the term 'elimination' and yet to abide by the standard terminology used in infectious disease control as outlined above. For this reason and because it has been achieved already in the majority of countries, the target of elimination of leprosy disease as a public health problem expressed in terms of prevalence of leprosy cases on treatment is no longer used. Milestones for both interruption of transmission and elimination of leprosy are expressed in terms of incidence of, respectively, new autochthonous child cases and any new autochthonous cases.

[3] World Health Organization (1991). 44th World Health Assembly. Resolution WHA44.9, accessed 16 June 2023).
[4] World Health Organization (2006). Report of the global forum on elimination of leprosy as a public health problem. Geneva: WHO.

Furthermore, this document seeks to avoid situations where interruption of transmission is celebrated as 'elimination' while, due to the long incubation period of leprosy, new patients continue to emerge in substantial numbers in subsequent years. The document therefore distinguishes 'interruption of transmission' from 'elimination of leprosy as a disease' as two separate milestones. This is explained in more detail in section 4.2. The indicators and milestones used to mark the transition from one elimination phase to the next are explained in Chapter 5 and are illustrated with a few country examples.

To monitor the progress towards the milestones, an effective surveillance system is essential. In addition, while leprosy programmes endeavour to achieve interruption of transmission and elimination of leprosy disease, it is crucial that good quality services are maintained for patient management and for (self-)care of disability, rehabilitation and inclusion of persons affected by leprosy. Chapter 7 describes the criteria for the key components of such services and proposes indicators for monitoring these.
Chapter 8 details the indicators used to monitor interruption of transmission and elimination of leprosy and describes how data may be interpreted. This chapter also introduces a new key tool for the process of verifying achievement of the target of interruption of transmission, the Leprosy Transmission Assessment Survey. Another new key tool is introduced in Chapter 9, the Leprosy Elimination Dossier. Evidence that a country has reached the goal of elimination of leprosy as a disease is compiled in this dossier. The dossier also describes how adequate provisions have been made for a post-elimination surveillance and response system.

The annexes provide a number of forms and practical tools that may be helpful to leprosy programmes on the road to interruption of transmission and elimination of leprosy.

4. Concepts and definitions

Like most NTDs, leprosy is an infectious disease. Efforts to control and eliminate infectious diseases go through a number of stages. WHO has defined these in a "Generic Framework for control, elimination and eradication of NTDs".[5] The Task Force on definitions, criteria and indicators for interruption of transmission and elimination of leprosy (TFCEL) has added a few concepts and their definitions that are important in the context of interruption of transmission and elimination of leprosy.

[5] World Health Organization ('2016)'. Generic framework for control, elimination and eradication of neglected tropical diseases, accessed 16 June 2023).

4.1 Generic Framework for control, elimination and eradication of neglected tropical diseases (adapted for leprosy)

4.1.1 Control

Reduction of disease incidence, prevalence, morbidity, and/or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction. Control may or may not be related to global targets set by WHO.

4.1.2 Elimination as a public health problem (a term related to both infection and disease)

Achievement of measurable global targets set by WHO in relation to a specific disease. When reached, continued actions are required to maintain the targets and/or to advance the interruption of transmission. The process of documenting elimination as a public health problem is called validation.

In the case of leprosy, a target for 'elimination as a public problem' was endorsed by the World Health Assembly Resolution WHA44.9 in May 1991. The target was to reduce the registered prevalence of leprosy to less than 1 per 10,000 population at the global level by the year 2000. Globally and in most endemic countries, this goal has been achieved.

4.1.3 Elimination of transmission (also referred to as interruption of transmission)

Reduction to zero of the incidence of infection caused by a specific pathogen in a defined geographical area, with minimal risk of reintroduction, as a result of deliberate efforts; continued actions to prevent re-establishment of transmission may be required.

4.1.4 Elimination of leprosy disease[6]

Zero new autochthonous leprosy cases occur in a given area or country for at least three consecutive years.

Recognising that this deviates from the practice used for a number of other NTDs, the TFCEL considered it important to make this distinction to avoid situations where elimination of transmission would be publicly announced while substantial numbers of new cases continue to occur for years after.

4.1.5 Eradication

Permanent reduction to zero of a specific pathogen globally, as a result of deliberate efforts, with no more risk of reintroduction. The process of documenting eradication is called certification.

It is noted that eradication of leprosy is not (currently) feasible because of the zoonotic reservoir and zoonotic transmission of *M. leprae*.

4.1.6 Extinction

Eradication of the specific pathogen so that it no longer exists in nature or the laboratory, which may occur with or without deliberate efforts.

4.2 Distinguishing interruption of transmission from elimination of leprosy disease

In the WHO NTD road map 2021–2030, leprosy is now one of 3 NTDs 'targeted for elimination (interruption of transmission)' (World Health Organization, 2020, p. 18). However, the incubation period of leprosy is very long, around 2-5 years for paucibacillary (PB) leprosy and 5–10 years for multibacillary (MB) leprosy (Richardus, Ignotti and Smith). Therefore, new cases of leprosy can be expected to emerge for years even after transmission of *M. leprae* has been interrupted. For a conceptual framework of the elimination of leprosy, it is thus important to separate interruption of transmission as a milestone from elimination of leprosy disease as the final milestone. This section discusses the relevant concepts and their definitions.

4.2.1 Autochthonous case

A case of leprosy presumed to have acquired the infection following local transmission in the reporting area.[6]

The concept behind this definition is that the case resulted from a locally acquired infection. The definition accommodates within-country situations of cases detected who are not residents of the district or state/province where they are detected. At subnational level, the term 'autochthonous' would mean 'locally acquired'.

4.2.2 Non-autochthonous case

A new case of leprosy whose infection is assumed to have occurred in another country or area than where s/he was diagnosed to have leprosy. S/he may have moved or migrated temporarily to the current country or area from a leprosy-endemic country or area. Alternatively, a resident of a country or area may be classified as 'non-autochthonous' if they have visited/resided in a leprosy-endemic country or area for 6 months or more in the past 15 years. If the person moved to the current country or area more than 15 years ago, they may be assumed to have acquired the infection locally, so can be classified as an autochthonous case. Epidemiologically, non-autochthonous cases are not considered part of the local chain of transmission.

4.2.3 Sporadic cases

'Sporadic' refers to a disease that occurs infrequently and irregularly.[8] For leprosy, this is defined as 'occasional new cases of leprosy occurring during elimination Phase 2 (child cases only) or Phase 3 in a given area in a particular year.' Sporadic cases are unrelated, i.e., they are not contacts of the same index case, part of the same transmission cluster or part of a possible re-emergence of leprosy (which should be considered in case of 'occurrence of three or more child cases on average in three consecutive years' in one area during Phase 2 (after interruption of transmission), or three or more cases (any age) on average in three consecutive years in one area Phase 3 (Post-elimination surveillance

[6] World Health Organization ("2021)". Task Force on definitions, criteria and indicators for interruption of transmission and elimination of leprosy: report of the final meeting. WHO Regional Office for South-East Asia, accessed 16 June 2023.

phase)').In an area that is already in the post-elimination phase, every new case needs to be investigated to ensure that the diagnosis is confirmed and the case treated as per the national guidelines. Additionally, it is important to establish whether the new case is autochthonous or is likely to have been infected elsewhere. In case more than one autochthonous case occurs in one district or municipality, a possible relationship between these should be investigated.

The following criteria may be used to decide whether the cases are related:

- The cases are newly detected and have been established to be autochthonous, *and*
- The cases live within the same village or neighbourhood, *or* are blood relatives, friends or social contacts, *or* have spent time together regularly during any 3 months or more over the past 5 years,[7] *and/or*
- The cases are both contacts of the same index case (for a definition of 'contact', see Glossary)

4.2.4 Population at risk

This term is commonly used in the control of NTDs (World Health Organisation, 2020). It has been used very often in leprosy. It is defined in the context of leprosy as 'close contacts of new leprosy cases (household members and neighbours) and everyone in a given leprosy-endemic area who lives (or has lived) for at least 6 months in the same village or neighbourhood as one or more untreated leprosy cases'.[6] For prevention of leprosy, this concept may be operationalised as the 'number of people requiring post-exposure prophylaxis' (based on Taal et al. 2021).

4.2.5 Interruption of transmission

This is defined as 'An epidemiological state in a leprosy-endemic country or area where there is no more local transmission of *M. leprae*', evidenced by zero new autochthonous cases among children <15 years of age for at least 5 years.' The milestone cut-off was chosen because of the average incubation period often quoted is 5 years. Study of datasets at the subnational level has shown no new local increases in new cases after this milestone was reached.

4.2.6 Elimination of leprosy disease

This is defined as 'zero new autochthonous leprosy cases for at least three consecutive years' after achieving the milestone of interruption of transmission. The milestone cut-off of '3 consecutive years' was chosen for pragmatic reasons to not force countries to have to wait a long time after achieving zero autochthonous cases before requesting verification of elimination of leprosy disease. A study of several country datasets suggests that the appearance of occasional sporadic autochthonous new cases has no consequence in terms of local transmission.

[7] These criteria are arbitrarily chosen based on likelihood of actual close contact and a duration well beyond casual contact.

4.2.7 Endemic

The constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographical area.[8] Leprosy control programmes often differentiate between levels of endemicity. Conceptually, this is linked to the phases of elimination. The following criteria are recommended for use at national, state/province and district level:

High endemic: Countries or areas that are in Elimination Phase 1 (before interruption of transmission)
Low endemic: Countries or areas that are in Elimination Phase 2 or 3 (after interruption of transmission)
Non endemic: Countries or areas where no or only sporadic autochthonous cases have occurred for at least 10 years

4.2.8 Non-endemic (for leprosy)

An area or country is called 'non-endemic' if autochthonous leprosy cases have not normally been detected in the population of that area or country for 10 years or more. However sporadic cases may still occur.

The following criteria will be used to decide whether an area or country is indeed non-endemic:

- Verification (at the country level) or acknowledgement (subnational level) of elimination of leprosy disease has been completed
- No new cases are detected other than cases that are sporadic or non-autochthonous
- A surveillance system is present which is capable of detecting, diagnosing and reporting leprosy

[8] Centers for Disease Control and Prevention. principles of epidemiology in public health practice, Third edition. CDC Web Archive, accessed 16 June 2023.

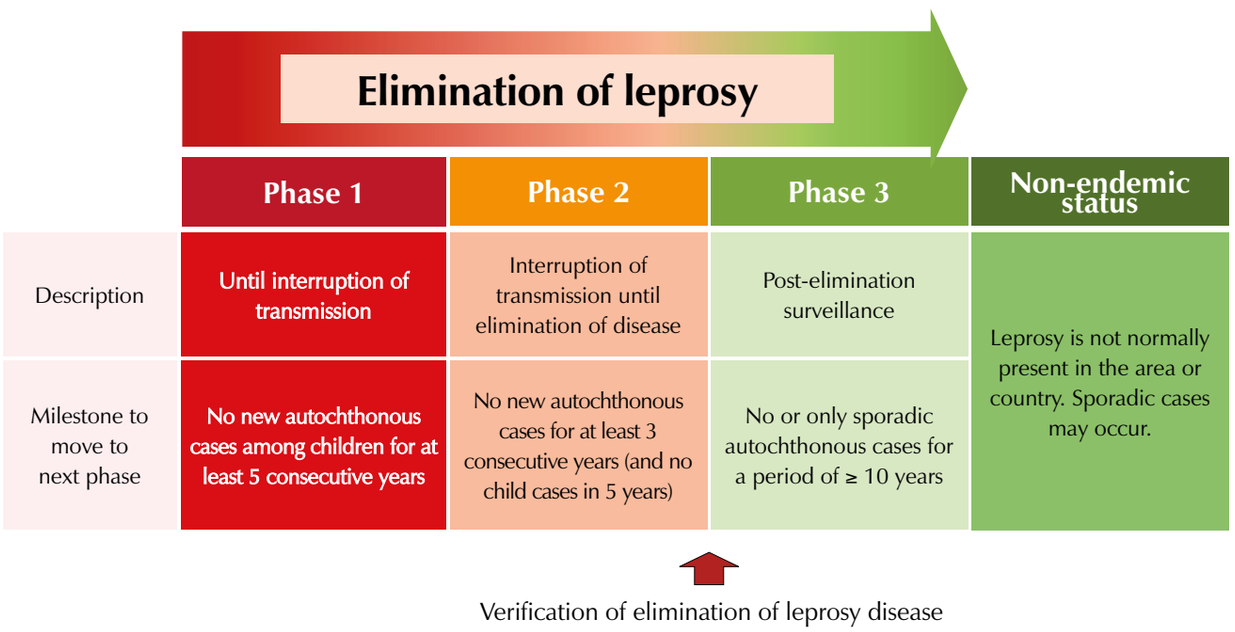
5.
Phases of elimination

In the trajectory of elimination of leprosy, two elimination phases and one post-elimination phase can be distinguished (see Figure 1 below). These phases are relevant and should be applied at different levels, global, national and subnational level. Before formal verification of elimination can be done at the national level, this milestone will have to be reached at all first-level subnational administrative units. The achievement is thus a bottom-up process that acknowledges that the leprosy situation at the subnational level can be very different in different provinces/states and districts/municipalities.

This diversity is also seen at the country level. Some countries have not yet reached the target of interruption of transmission, while others are already in a post-elimination phase. To move forward and use the criteria and tools in this Technical guidance document, it is therefore important to first review the leprosy situation at the national and subnational level, applying the indicators and milestones given in Figure 1. Simple, traffic-light colouring can be used for this. It should be noted that in jurisdictions with small populations, the milestone for 'interruption of transmission' – 5 consecutive years without new autochthonous child cases – may be reached before 'elimination as a public health problem' is achieved (e.g. if only adult cases are detected). While this may be confusing, it a consequence of shifting the focus from prevalence to interruption of transmission, incidence of disease and subsequently elimination of disease.

To illustrate the analyses that can be done in this way, a few country examples are given in this chapter.

Figure 1: Leprosy Elimination Framework showing the phases in the elimination of leprosy



5.1 Phase 1 – Until interruption of transmission of *M. leprae*

Phase 1 has a longtime-span with a large variation in endemicity levels between countries and within countries at subnational levels. Countries are likely to have many districts (or municipalities) and even states or provinces where no new child cases have been detected for many years. These areas have therefore already reached the milestone for interruption of transmission (no new autochthonous child cases for at least 5 consecutive years). Such a status needs to be confirmed to ensure that a lack of detection of child cases is not an artifact of an absence of awareness of leprosy, lack of training of health workers or a lack of (access to) diagnostic services. Once this has been confirmed in a given administrative area, the health ministry can formally acknowledge that interruption of transmission has been achieved in that area.

The leprosy programme will promote both passive case detection through community awareness and active case detection through screening of contacts. Most primary health centres (PHCs) in endemic areas will offer services for confirmation of diagnosis of persons with signs and symptoms suggestive of leprosy and treatment with MDT of any new cases confirmed. Household, neighbour and social contacts will receive chemoprophylaxis as per the WHO and national guidelines. This is aimed not only at preventing contacts who are already infected from developing leprosy themselves but also at interrupting transmission from such individuals as early as possible.

A full range of services for prevention and management of disabilities is offered by most PHCs and health and social services are expected to offer or facilitate access to self-care groups, community-based rehabilitation (CBR) and mental health services. In collaboration with local health workers and NGOs, the district leprosy programme will initiate stigma reduction activities and other activities to promote the inclusion of persons affected by leprosy (see Table 2).

5.2 Phase 2 – from interruption of transmission until elimination of leprosy disease

During Phase 2 only adult autochthonous cases are detected. Their infection is assumed to have taken place a long time ago. Any new child case should be considered a critical incident and should be investigated closely. A key question is whether the child case is autochthonous or not and what the likely source case has been. In a number of country datasets with case-level data, sporadic child cases are present, but these do not seem to have led to re-emergence of leprosy in the area in subsequent years. This should be carefully monitored through annual screening of contacts of the child as well as those of the index case, if known.

Evidence shows that, as areas or countries move towards interruption of transmission and elimination of leprosy disease, most new cases are likely to be MB and clustering of cases in families or among close contacts is likely to increase over time. The leprosy programme will continue active case detection through screening of contacts and confirmation of diagnosis of persons with signs and symptoms suggestive of leprosy and treatment of any new cases confirmed. Contacts continue to receive chemoprophylaxis as per the WHO and national guidelines. This is primarily aimed at preventing contacts who are already infected from developing leprosy themselves. Secondary cases in Phase 2 and 3 and in non-endemic areas appear to be extremely rare. It may be that areas have not diagnosed any new patients for many years in which case they may be acknowledged for interruption of transmission and elimination of leprosy disease at the same time if they have met certain criteria (see below and Chapter 9).

The full range of disability services is continued at PHCs where cases are registered or that have persons with leprosy-related disabilities in their catchment area. Health and social services are expected to continue offering or facilitating access to self-care groups, CBR and mental health services. Depending on the level of leprosy-related stigma, local health workers, NGOs, the district leprosy programme will continue stigma reduction activities and other activities to promote the inclusion of persons affected by leprosy (see Table 2).

If an administrative area has not diagnosed any new autochthonous cases for at least 3 years, they have reached the milestone for elimination of leprosy disease. As with the interruption of transmission milestone, at the subnational level, this achievement is checked by the national leprosy programme and, if achieved, acknowledged by the health ministry. Part of the ascertainment process is a Leprosy Programme and Transmission Assessment (LPTA) in the concerned area (see section 8.5). As part of this survey, evidence is collected that will be part of the national Leprosy Elimination Dossier.

In administrative areas where no new autochthonous cases have been detected for 10 years or more *and* who meet the criteria described in Table 3, conducting a full LPTA is not necessary. In this situation, the modified LPTA can be done through a review meeting at which all relevant stakeholders are present (local government, health workers, any relevant NGOs, representative of persons affected). It will be especially important to verify that leprosy training of primary and community level health workers has been done.

Once all subnational administrative areas have reached the milestone for elimination of leprosy disease, the country is ready to submit its Leprosy Elimination Dossier to WHO and request verification of elimination (see Chapter 9). Compiling this dossier is a substantial amount of work, so countries are advised to build this up gradually over a few years leading up to the achievement of the elimination milestone.

5.3 Phase 3 – Post-elimination surveillance phase

Once elimination of leprosy disease has been verified by WHO, the country enters the post-elimination surveillance phase. It is important to note that, because of the long incubation period of leprosy, occasional new cases are still expected to emerge. They are likely to be detected as persons with signs and/or symptoms that are suggestive of leprosy. They need to be examined by a leprosy-trained health worker or physician. If confirmed, they are to be treated with MDT. It is therefore crucial that a good surveillance and response system is in place. These occasional cases are called 'sporadic cases' (see definition 4.2.3). Each sporadic case needs to be investigated to establish whether the infection is likely to have been acquired locally or elsewhere. If the patient comes from a leprosy-endemic country or area they are classified as 'non-autochthonous' unless they have lived in the current country or an area for 15 years or more (see 4.2.2). If the patient has visited or resided in a leprosy-endemic country, or in case of a subnational area, an endemic area in the same country, for 6 months or more in the past 10 years, they are also assumed to have acquired the infection elsewhere. They are therefore not an autochthonous case. If no evidence is found that the patient would have acquired the infection elsewhere, they are considered autochthonous. To establish where the case is 'sporadic' a possible relationship with other sporadic new cases should be investigated. The criteria to decide whether two new cases are related are given in section 4.2.3. If two cases are considered to be related, the

consequence is that they are likely to be part of the same transmission cluster sharing either a known or unknown source case. This means that transmission may not have been interrupted and contacts of these cases need to be screened annually for the next 5 years. In this situation, all household, neighbour and social contacts should be offered chemoprophylaxis. Theoretically, re-emergence of leprosy could occur in a given area. This possibility should be investigated when three or more cases of leprosy on average have occurred in three consecutive years in one area. If no operational reason for the increased incidence is found, and if new cases continue to occur, the health authorities need to take appropriate action, which may include reversing the area to the previous phase of elimination, taking not only the data but also local circumstances and concerns into account.

Besides the new case surveillance and response, which includes diagnosis and treatment with MDT, services will continue to be needed for management of complications, such as reactions and nerve damage, prevention of secondary impairments and management of disability, e.g., with assistive devices or reconstructive surgery, physiotherapy or occupational therapy. Potentially, there are still substantial numbers of persons with leprosy-related disabilities alive and – from time to time – in need of disability care, mental health care, rehabilitation or services to promote inclusion. With the passage of time, these services will increasingly be offered in an integrated manner since services and interventions needed are rarely leprosy specific.

5.4 Non-endemic status

If no or only sporadic new autochthonous cases have been detected for at least 10 years in a given country or administrative area, the country or area can be considered non-endemic. Non-autochthonous cases may still be reported and if this is the situation, appropriate surveillance and response facilities need to be in place. The same is true for services for management of complications, prevention of secondary impairments and management of disability, rehabilitation and mental health. However, these would be offered through generic health facilities that also help persons with similar problems due to other causes. If a substantial number of non-autochthonous cases continues to be reported, leprosy training will still be needed for staff working at designated diagnosis and treatment facilities.

Examples of how the Phases of Elimination can be applied to country data are given in Annex 2.

6. Indicators

The indicators outlined in this chapter are only those that are relevant to the phases of elimination. They are grouped according to the two milestones to be achieved: interruption of transmission and elimination of leprosy disease.

6.1 Interruption (elimination) of transmission

6.1.1 Child proportion among new cases

How to monitor progress towards interruption of transmission

Definition: "Proportion of new autochthonous child cases (<15 years of age) among the total new autochthonous cases detected expressed as a percentage" (M&E Guide p.33) [9]

Formula

$$\frac{\text{Number of new autochthonous child cases (<15 years of age) detected}}{\text{Total number of new autochthonous cases detected in the reporting period}} \times 100$$

Note

In low-endemic areas (<50 new cases per million per year), the number of new child cases (<15 years of age) is also likely to be very small. In this situation, using the absolute number of new child cases is preferable, rather than a percentage, since the latter would vary too much with small changes in the numerator.

Interpretation

Leprosy among children represents recent transmission. It also indicates efficiency of detection and diagnosis.

6.1.2 New case rate among children

Definition: "Number of new autochthonous child cases (<15 years of age) detected in a given population in a year expressed as rate per million population".

Formula

$$\frac{\text{Number of new autochthonous child cases (<15 years of age) detected in the reporting year}}{\text{Child population (<15 years of age)}} \times 1\,000\,000$$

Interpretation

Leprosy among children represents recent transmission. It also indicates efficacy of detection and diagnosis. The rate of new child cases in the child population provides a more stable indicator than the 'Child percentage among new cases', especially when the number of new cases is small (<50).

[9] World Health Organization (2017). Global Leprosy Strategy 2016–2020. Accelerating towards a leprosy-free world. Monitoring and Evaluation Guide. New Delhi: WHO Regional Office for South-East Asia, accessed 16 June 2023.

6.1.3 Number of new autochthonous child cases (<15 years of age) detected

Definition: "Number of new autochthonous child cases (<15 years of age) detected in a given population in the reporting year".

Interpretation

The absolute number of new autochthonous child cases reflects recent transmission and can also be used to calculate the MDT requirement for children. It is a more suitable indicator than the Child percentage among new cases when the total number of cases is very small (<50).

6.1.4 (Trend in) Age at detection

Definition: "Distribution according to age group at detection among new autochthonous cases detected in a given country in a reporting year, or frequency distribution of new cases according to age group in a given country over a period of time".

Notes

- Age group could be just adult/child as used until now, but ideally would include smaller age groups, e.g., for children 0–4, 5–9, 10–14 years of age.
- Average life expectancy increases with better nutrition, improved access to health care, etc., independently of any actual trend in disease incidence. This may contribute to a shift in mean age at detection to older age groups.

Interpretation

An increase in mean age at detection, a shift in the mode towards older age groups and a decreasing percentage of children among new cases (or child rate) all suggest that a country or area has achieved or is moving towards elimination of transmission (Suárez-García et al., 2017).

6.1.5 Seroprevalence for *M. leprae* infection among children

Definition: "Number of children (6–7 years of age) who test positive on a screening test for *M. leprae* infection expressed as a percentage of the total number of children in a given sample".

Formula

$$\frac{\text{Number of children (6–7 years of age) who tested positive}}{\text{Number of children (6–7 years of age) tested}} \times 100$$

Notes

- For now, this indicator is under investigation as a tool for detecting seroprevalence. Further research is encouraged.
- To use this indicator for monitoring within a given population, repeated random sample surveys are needed; preferably after interventions; alternatively, after every 5 years.
- The areas in which such surveys are to be conducted and the sampling method need to be defined in operational guidelines or standard operating procedures for verification of interruption of transmission.

Interpretation

A positive screening test for *M. leprae* infection measured in young children would indicate recent transmission. Since young children can only have been infected in the past few years this indicator has been proposed as a relatively sensitive indicator of transmission.

6.1.6 (Trend in) MB percentage among new cases

Definition: "The (trend in) percentage of MB cases among the total new cases detected" (M&E Guide p.36)[9]

Formula

$$\frac{\text{Number of new MB cases detected}}{\text{Total number of new cases detected in the reporting period}} \times 100$$

Notes

- The definition of MB is important and needs to be restated; variations in the definition may be a problem for interpreting trends over time.
- Caution is needed in interpretation since there are regional differences in the natural history of leprosy.

Interpretation

MB leprosy is associated with longer incubation periods than paucibacillary (PB) leprosy. Patients with leprosy due to recent infection are more likely to have PB disease. Therefore, an increasing trend in the MB percentage among new cases might indicate that transmission is declining or may already have been interrupted (Irgens and Skjaerven, 1985).

6.2 Elimination of leprosy disease

6.2.1 Number of new autochthonous cases detected

"Number of new autochthonous cases detected in a given population in a year".

Interpretation

The target of elimination of leprosy disease in a given area is zero new autochthonous cases. The number of new autochthonous cases is a direct indicator of that, which is especially useful when new case numbers become very small.

6.2.2 New case detection rate

Definition: "Number of new autochthonous cases detected in a given population in a year expressed as rate per million population" (M&E Guide, p.27)[9]

Formula

$$\frac{\text{Number of new autochthonous cases detected in a year}}{\text{Mid-year population}} \times 1\,000\,000$$

Note

Unless data on non-autochthonous cases are collected and reported separately, the number of new cases reported (numerator) is assumed to be the number of new autochthonous cases.

Interpretation

This indicator is applicable at the country and subnational levels. It is the most important indicator reflecting the burden of leprosy in an area. It is used as a proxy for incidence rate because the incidence rate cannot be measured directly. There is usually a gap between incidence and detection – detection can underestimate or overestimate incidence depending on the efficiency of case detection. Information obtained from new cases on the duration of disease may give information on the delay in case detection among the new cases. The rate is more significant than absolute numbers of new cases because it reflects more accurately the burden of leprosy relative to the population and the transmission (M&E Guide, p.27-28)[9].

6.2.3 Proportion of non-autochthonous among total new cases detected

Definition: "Proportion of new cases who acquired infection outside the area or country where the case is diagnosed among the total new cases detected expressed as a percentage".

Formula

$$\frac{\text{Number of new non-autochthonous cases detected}}{\text{Total number of new cases detected in the reporting period}} \times 100$$

Where new case numbers are small, the absolute number of new non-autochthonous cases should be used.

Interpretation

This indicator reflects the relative frequency of non-autochthonous cases versus leprosy cases assumed to have acquired their infection locally in a given area. It shows the importance of non-autochthonous cases as part of the total case detection in the country.

6.2.4 New case detection rate

Definition: "Number of new cases detected in a given population in a year expressed as rate per million population" (M&E Guide, p.27)[9]

Formula

$$\frac{\text{Number of new cases detected in a year}}{\text{Mid-year population}} \times 1\,000\,000$$

Interpretation

The number of new cases requiring anti-leprosy treatment is part of the total number of people requiring leprosy-related interventions. Since the indicator includes all new cases detected, both autochthonous and non-autochthonous, it is the best single measure of the burden of leprosy in the area or country.

6.2.5 Rate of new cases with grade- 2 disability

Definition: "Number of new cases with G2D detected among the new cases in a defined population in a year expressed as rate per million population" (M&E Guide, p.19)[9]

Formula

$$\frac{\text{Number of new cases detected with G2D}}{\text{Mid-year population}} \times 1\,000\,000$$

Interpretation

This indicator reflects both delay in diagnosis of leprosy and the new case detection. Delay in diagnosis leads to an increased risk of visible (grade- 2) disability. The indicator would decrease as the number of cases decreases and as the number of new cases with G2D decreases.

6.2.6 Prevalence rate

Definition: "Number of leprosy cases registered for treatment in a given population at one point in time (usually at the end of the reporting year) expressed as a rate per 1 million population (M&E Guide, p.30)[9]

Formula

$$\frac{\text{Number of leprosy cases on register at one point in time (usually at the end of the reporting year}}{\text{Mid-year population}} \times 1\,000\,000$$

Interpretation

This indicator refers to the actual number of people who are in need of or are receiving MDT (registered for treatment) at a point in time (usually at the end of the reporting year). It reflects the caseload managed by the health services. This indicator has been used in the past to define the target of elimination as public health problem (prevalence rate below 1 per 10 000 population). It is not used to define the elimination phases.

7. Criteria for Verification

Throughout the elimination process, leprosy programmes need to offer services that meet certain criteria, both in quality and quantity, to work effectively towards the elimination goal and to meet the needs of diagnosis, case management, treatment of complications, rehabilitation and inclusion of all persons affected by leprosy. Some of these apply until the milestone of elimination of leprosy disease has been reached, while others are needed throughout the post-elimination phase and beyond as well. These criteria link to the evidence that needs to be compiled in the Leprosy Elimination Dossier used to verify the achievement of the elimination milestone at the national level. The criteria can also be used for periodic reviews of the progress made by the leprosy programme.

The ‘criteria for verification’ are elaborated in this document. They are arranged under three headings, Political commitment, Programme implementation and Surveillance. A general description is given and, followed by, details, indicators, means of verification and levels of achievement which are given in the Tables 2 and 3.

7.1 Political commitment

7.1.1 National strategic plan

Successful implementation of national programmes is dependent on commitment expressed and demonstrated at the national and subnational levels. The availability or development of a country-owned national ‘zero leprosy road map’ and a strategic plan which takes into consideration social determinants of health in the country and is in line with the Global Leprosy Strategy 2021-2030 and the NTD Roadmap 2021–2030 demonstrates political commitment. Allocation of budgets and channelling of funds to the operational level are also proof of commitment of national and/or local governments. The national strategic plan should be accompanied by standard operating procedures (SOPs) for all leprosy-related services and interventions. They form the basis for assessments by internal teams and for future verification by the external team to ascertain elimination of the disease. The national health plan should have a focus on training to sustain expertise in leprosy and programme management. A well-defined referral system from community to sentinel centres, centres of excellence or referral centres should be in place. A drug procurement system and supply chain management should also be in place.

Political commitment, like some other criteria, is crucial in all phases of elimination, including in the post-elimination surveillance phase (Phase 3).

7.1.2 Advocacy for leprosy with authorities

Policy-makers need to be apprised of the current leprosy situation in terms of its endemicity in the country and distribution at subnational levels in order to garner political support and resources to interrupt transmission, eliminate the disease and sustain surveillance in the post-elimination phase, along with the services required to manage disability and promote inclusion. The advocacy interventions required to meet this criterion are regular communication with policy-makers through direct meetings, briefings and releasing status reports in the form of brochures.

7.1.3 Enabling environment for persons affected by leprosy

Governments have a responsibility to ensure that persons affected by leprosy are included in all aspects of life and society. They should ensure that there are no laws, policies, practices or regulations that allow discrimination against persons affected by leprosy. They should also ensure that pension and other welfare schemes are accessible for persons with disability including persons affected by leprosy.

7.1.4 Participation of stakeholders and partnerships

Networks of persons affected by leprosy, health ministries, WHO, ILEP agencies, the private sector (e.g. Novartis), academic institutions and professional associations (e.g. of dermatologists) have traditionally particularly in leprosy control activities in endemic countries. In a few countries – particularly those without a national leprosy programme – leprosy services are mainly or solely provided by partner organisations. Organised partnerships at the national and subnational level can help to ensure concerted efforts in eliminating leprosy; they also can help to prevent duplication of services. It is recommended that national zero leprosy partnerships be constituted by all stakeholders, defining clear roles for each. Partnerships may not be relevant in countries where the number of cases reported annually is very small.

7.1.5 Inclusion of organisations and networks of persons affected by leprosy

Organisations of persons affected by leprosy can play important roles in many aspects of leprosy services. They have a key position in advocacy, since they are the rights holders with regard to health (care), equality and non-discrimination, education, work and employment and other human rights (United Nations, 2006). Organisations of persons affected by leprosy should be involved in country reviews, policy making, Leprosy Programme and Transmission Assessments and the compilation of the Leprosy Elimination Dossier. Where discriminatory laws exist, organisations of persons affected are well placed to lobby for abolition or amendment of such laws.

7.1.6 Acknowledgement and use of the United Nations Principles and Guidelines

The United Nations Principles and Guidelines for elimination of discrimination against persons affected by leprosy and their family members[10] should be acknowledged and implemented in all leprosy-endemic countries. The Principles and Guidelines are based on and link to the UN Convention on Rights of Persons with Disability (UNCRPD), which has been ratified by 182 countries and signed by 164.[11] Specific information and education sessions will need to be organised for national human rights councils and organisation of persons affected if they exist. Awareness about the principles and guidelines contained in this document should be incorporated in all training modules on leprosy for health workers, social workers and others involved in leprosy services.

[10] United Nations. Principles and Guidelines for the elimination of discrimination against persons affected by leprosy and their family members. UN Digital Library, accessed 16 June 2023.

[11] United Nations. Convention on the Rights of Persons with Disabilities (CRPD). UN Department of Economic and Social Affairs, accessed 16 June 2023.

7.2 Programme implementation

7.2.1 Integration of leprosy into general health services

The national health plan should specify that leprosy case detection and treatment services are to be integrated in the general health care system. Integrated case finding initiatives should be conducted as relevant, e.g., as part of skin camps or dermatology services, or as part of cross-NTD case detection activities. Integration would entail that diagnosis and management of leprosy patients is done in general medical or dermatological clinics or services for patients with infectious diseases.

7.2.2 Training of health care workers

To implement quality leprosy services and to progress towards interruption of transmission, elimination of leprosy disease and to post-elimination surveillance, it is essential to have adequate numbers of appropriately trained health care staff in programme management and service provision. Training programmes and training materials dedicated to the leprosy programme or integrated with other disease control programmes should be available at national and subnational levels.

7.2.3 Awareness about leprosy in the general population

Early detection and prompt treatment with MDT is the key to interrupt transmission and subsequently eliminate disease in a geographical area. It is also key to prevention of disabilities. Awareness about symptoms and early care-seeking are crucial and are linked to improved awareness on leprosy. The modes of enhancing awareness will also be recorded in the process. Awareness raising is a mandatory criterion in countries passing through the phases of interruption of transmission and elimination of disease. It is of lower priority in countries in the post-elimination surveillance phase and in countries where leprosy is only found among the non-autochthonous population.

7.2.4. Implementation of the leprosy care package

Leprosy services capable of diagnosis and provision of treatment (MDT) for all new cases and relapses are essential at all levels of endemicity. Availability and accessibility are key factors, especially as endemicity levels decrease. Because of the long duration of treatment, it is important that the responsible health workers can manage the treatment of leprosy in a respectful and patient-friendly manner. When services to diagnose and treat leprosy are no longer commonly available, a well-established referral system will be crucial. The alternative is a response system where a specialised team visits a health unit that has reported a possible case of leprosy for case confirmation and on-the-job training in treatment and management of complications. The capacity to detect and treat relapses is also considered a criterion as relapse cases may lead to continuing transmission of infection.

An important feature of good leprosy services is their ability to do everything possible to detect and prevent disability. This includes prevention, detection and management of complications such as reactions, nerve damage and wounds. An essential care package for treatment and management of complications should be in place, including SOPs. It is important to ensure that drugs required to

treat reactions and nerve damage, such as prednisolone and loose clofazimine are available. Self-care training and counselling regarding (the risk of) complications are also part of this aspect of the services. All these interventions require availability of staff with the right knowledge and adequate skills.

7.2.5 Referral centres and a referral mechanism

Referral centres should be available for patients whose complications cannot be managed at the primary care level. Such services should be integrated into general specialist care where possible. The level at which such services are available should be appropriate to the need.

7.2.6 Post-exposure prophylaxis

The Global Leprosy Strategy 2021–2030 recommends post-exposure prophylaxis (PEP) with single-dose rifampicin (SDR) as a strategy that can contribute to both interruption of transmission and elimination of leprosy disease. It is therefore relevant at all levels of endemicity. Even when there is evidence that transmission has stopped, SDR-PEP may prevent leprosy cases among contacts who may have been infected years earlier. It is important that SDR-PEP activities follow the normative guidance in the WHO Guidelines on Diagnosis, Treatment and Prevention of Leprosy[12] and the WHO Technical guidance on contact tracing and post-exposure prophylaxis.[13] SDR-PEP should be combined with contact screening. Leprosy programmes should strive to include neighbours and social contacts to increase effectiveness of the intervention. SDR-PEP is not likely to be relevant in countries where only non-autochthonous leprosy cases are seen, since such cases rarely if ever lead to secondary cases.

7.2.7 Access to social support and rehabilitation services

Persons affected by leprosy who have more advanced impairments causing limitations in their daily activities and restrictions in social participation may require rehabilitation beyond what the primary care level can offer to optimise their functioning in society. Countries need to be able to demonstrate that person with leprosy-related disabilities have access to referral facilities for rehabilitation.

Persons affected by leprosy who face substantial restrictions in social participation may require social support and social rehabilitation to optimise their inclusion in society. Attention is needed that people requiring such support have access to existing government provisions and programmes for social welfare and CBR services. Where needed, persons with special needs should be referred to services specialised in socioeconomic rehabilitation. Countries need to be able to demonstrate that referral systems exist from the primary health facilities to such services.

[12]World Health Organization ("2018)". Guidelines for the diagnosis, treatment and prevention of leprosy. WHO Regional Office for South-East Asia, accessed 16 June 2023.
[13]World Health Organization ("2020)". Leprosy/Hansen disease: contact tracing and post-exposure prophylaxis. WHO Regional Office for South-East Asia, accessed 16 June 2023.

7.2.8 Access to mental health services

Research has shown that a high proportion of persons affected by leprosy have a poor mental wellbeing, especially in the form of depression and anxiety (Somar, Waltz and van Brakel, 2020). Family members and carers may also suffer mental health consequences. In areas with high stigma against leprosy, the diagnosis of leprosy has even driven people to attempt suicide (Rocha-Leite et al., 2014). It is therefore very important that practitioners involved in diagnosis and treatment of leprosy patients are aware of possible consequences for mental health and the treatment and referral options available locally. One possible strategy is through lay or peer counselling or peer support by local health workers or persons affected by leprosy (Lusli et al., 2015; van 't Noordende et al., 2020) or through referral to professional mental health services.

7.2.9 Reducing and monitoring leprosy-related stigma in communities

Stigma causes a lot of suffering and mental distress among persons affected by leprosy and their family members. In addition, stigma may be a barrier to chemoprophylaxis or early case detection because of fear of disclosure among those who suspect they may have leprosy. Levels of stigma vary a lot by area. It is therefore important that leprosy programmes know which areas have a high level of stigma so that interventions to reduce stigma can be contextualised and targeted to where the problems are serious. Evidence-based interventions to reduce stigma are available, as are tools to measure the various aspects of stigma quantitatively. When interventions are implemented, the effect of these should be monitored over time. Since data on stigma severity cannot be easily collected as part of a routine surveillance system, it is important that regular sample surveys are done. Partner organisations can play a valuable role in mapping and monitoring the stigma situation in endemic areas.

7.3 Surveillance

7.3.1 Data management systems

An effective surveillance and data management system is essential for leprosy programmes in different phases of elimination. A surveillance system can be considered sensitive if cases are detected before disabilities develop. A good data management system is an important component that enhances effectiveness of the system. Such a system needs to be available wherever leprosy treatment services are provided, from the PHC to the national level. The state-of-the-art would be an electronic system that collects patient-level data, feeding this into a national-level database. This should be linked to geographical mapping of new cases that shows the location of cases and allows identification of clusters (hotspots) where relevant. The quality and effectiveness of the surveillance system may be assessed by looking at delay in case detection and coverage of contact screening. A surveillance and data management system may be integrated in some countries, while in others, it may be combined with other NTDs or with TB. In preparation for a Dossier for Leprosy Elimination in countries with very low numbers, the presence of an effective system to detect new cases will be verified. An effective surveillance and response system – including submission of zero-reports – should be maintained during the post-elimination surveillance phase for at least 10 years to pick up any sporadic cases that may still occur. It should preferably be combined with a surveillance system for other NTDs or infectious diseases. Any cases occurring after the 10-year post-elimination surveillance period should still be notified, but zero-reporting is no longer necessary.

7.3.2 Contact tracing and other interventions for active case detection

Evidence shows that contacts of a leprosy patient have a higher probability of being infected than people in the general population (Jesudasan et al., 1984; Van Beers, Hatta and Klatser, 1999; Moet et al., 2006). In low-endemic areas, new leprosy cases can often identify a former case in their family (Richardus et al., 2005). Contact tracing and screening is an essential intervention in both high and low-endemic settings. It is important for screening to be done as soon as feasible after a new case is diagnosed. Annual screening is recommended for 5 years in the case of contacts of an MB index case and 3 years for contacts of a PB index case. Health workers should aim for a high coverage of contacts screened. Often this means that a home visit will have to be conducted. However, contact screening should not be limited to household contacts only. Evidence shows that neighbours and social contacts of new leprosy patients also have an increased risk of developing leprosy themselves. Used as an active case detection strategy, contact screening should therefore include a wider circle of contacts than only the household. If at all possible, contact screening should be combined with distribution of post-exposure prophylaxis (PEP) (see next section). In high-endemic areas, a whole village or neighbourhood might be included in the screening. On the other hand, if contacts of solitary or sporadic cases are screened, it would be reasonable to limit this to close contacts only (e.g., household contacts and next-door neighbours). The extent of contact screening and PEP distribution should be adjusted to the phase of elimination. It is therefore important to determine where hotspots or clusters of (former) cases exist, so that interventions can be well targeted and their intensity adjusted to the phase of elimination.

Other active case detection interventions that have been shown to be effective include skin camps, rapid village surveys and door-to-door screening of people in disadvantaged population groups, or remote or difficult-to-reach areas. In areas that are Phase 1, screening of schoolchildren is also used successfully. Active case detection contributes to early case detection, which in turn reduces the period a patient is infectious.

7.3.3 Monitoring and evaluation

Monitoring of leprosy situation in all subnational level units should be a continuous activity to ascertain that the subnational units reach the designated milestones in their journey towards elimination of leprosy disease in the country. Data monitoring using the Leprosy Elimination Monitoring Tool (LEMT) provides an easy way to follow progress towards interruption of transmission and elimination of leprosy disease at subnational levels. It can be easily combined with serial mapping to visualise progress. Monitoring in the form of supportive supervision should be conducted at all levels of the leprosy programme. Evaluations should be carried out by internal teams using the LPTA when a second-tier subnational unit reaches the milestone of elimination of leprosy disease.

7.3.4 Surveillance of anti-microbial resistance

National leprosy control programme should have a system in place to monitor the occurrence of anti-microbial resistance (AMR) in *M. leprae*. It is important to monitor trends over time, especially regarding resistance to rifampicin and multi-drug resistance. It is especially important that screening is carried out of retreatment cases, such as relapses and returned defaulters. Such patients should be referred to a centre where their sample can be collected. AMR surveillance and monitoring should follow the guidance given in the WHO document 'A guide for surveillance of antimicrobial resistance in leprosy'.[14]

7.3.5 Surveillance of adverse drug reactions

Adverse reactions to leprosy drugs should also be monitored. Technical guidance on this is being developed.

[14] World Health Organization ('2017)'. A guide for surveillance of antimicrobial resistance in leprosy: 2017 update. WHO Regional Office for South-East Asia, accessed 16 June 2023.

7.4 Criteria, interventions and indicators for Phase 1 (until interruption of transmission) and Phase 2 (until elimination of leprosy disease)

Table 2: Leprosy programme criteria, indicators and sources of data/information for Phase 1 and 2: interruption of transmission and elimination of leprosy disease

Criterion	Indicators	Source of data/ information	Level of achievement
Political commitment			
Country-owned national strategic plan adapting global leprosy strategy 2021–2030/NTD roadmap 2030	A National strategic plan/national health plan to achieve interruption of transmission and elimination of leprosy disease is available A health plan providing for an integrated leprosy case detection and treatment services is available Algorithms/standard operating procedures (SOPs) for diagnosis, management, prevention, rehabilitation including care of disabilities are available National health plan has a focus on training to sustain expertise in leprosy and programme management A well-defined referral system for referral from the community to a sentinel centre/ centre of excellence/referral unit is in place[15] Drug procurement and supply chain management are in place (relevant to leprosy)	Perusal of the national strategic plan Multi-stakeholder consultation	Yes/Partly/No

[15]An institution where facilities such as for training, surveillance, provision of specialized care for leprosy are available at a suitable level (at least one per country)

Criterion	Indicators	Source of data/ information	Level of achievement
Enabling environment for persons affected by leprosy	Existing laws/policies/traditional practices/ regulations that allow discrimination against persons affected by leprosy	Report on existing laws that allow discrimination against persons affected by leprosy	Yes/No/ Work in progress
	Number of instances of discrimination reported		Number reported
	Social support e.g. entitlements, pension/ welfare schemes for persons with disability include persons affected by leprosy	Discussions at the national level	Yes/No
	Principles and Guidelines[16] are available in the national language	Reports	Yes/No
	Positive norms or regulations exist to facilitate social inclusion of persons affected by leprosy		Yes/No
Participation of stakeholders	CSOs[17], organisations of persons affected by leprosy or disability, NGOs[17], private practitioners, academia participate in programme planning and management	Meeting minutes MoU[17]	Yes/ sometimes/No Yes/No
	Associations of persons affected by leprosy exist and participate	Reports	
Programme implementation			
Integration of leprosy into general health services (suspect, diagnose and treat leprosy at subnational units and/or referral centres)	Leprosy care package and prevention activities implemented in an integrated manner	Reports, HIS[17], health facility assessment	Yes/No
	Referral units with facilities to suspect, diagnose and treat leprosy are available	SOPs[17]	Yes/No
Training of health staff (leprosy-specific or integrated with NTDs[17] or other programmes)	Training status of health workers at a designated level (health centres and referral units)	Certificate/evidence of training from self-learning/national/ WHO accredited courses	Yes/No

[16]Principles and guidelines for the elimination of discrimination against persons affected by leprosy and their family members
[17]See Abbreviations and acronyms on page 5.

Criterion	Indicators	Source of data/ information	Level of achievement
Awareness about leprosy	Awareness campaigns: media	Information circulars and/or communication materials	Yes/No
	Level of awareness in the general community	Interview/discussion with the general community	Yes/No
Leprosy care package for treatment and management of complications	Diagnosis, treatment of patients, management of reactions and prevention and care of disabilities are in line with SOP [18]	SOP[17] Observation and discussions during health facility assessment	Yes/No Yes/No
	Drugs required to manage leprosy and reactions are available		
Referral mechanism[19] for diagnosis, treatment of leprosy and rehabilitation for persons with leprosy-related disabilities and for mental health care	Referral mechanism with designated levels from the community to apex/sentinel/ referral unit in place	Observation and discussions during health facility assessment	Yes/No
	Number of people who received assistive devices or other rehabilitation services	Reports	Number per year
Contact tracing	Proportion of cases for whom contact tracing was undertaken (for patients registered in the past five years)	Patient cards, registers, HIS[17]	Percentage
	Proportion of contacts of patients examined		
Administration of single dose rifampicin (SDR) to eligible contacts as post-exposure prophylaxis (PEP)	Adoption of SDR-PEP in guidelines	Health plan	Yes/No
	Proportion of eligible contacts who received SDR	Records, registers, HIS[17]	Percentage
Reduction of leprosy-related stigma in communities and among health workers	Leprosy-related stigma in communities and among health workers is monitored (using tools such as 5-QSI-CS)	Reports Observations	Yes/No

[18]Implementation of leprosy care package – verifying adoption of standard operating procedures and observation during health facility assessment.

[19]Referral mechanism should be part of leprosy care package and contain details of diagnosis, treatment, management of complications, disability care and rehabilitation This will be verified through health facility assessment and reported under referral mechanism. The SOPs should have reference to this for verification.

Criterion	Indicators	Source of data/ information	Level of achievement
Surveillance			
Data management system	A digital data management system is in place	Observation	Yes/No
	Reporting is done at the subnational level (including zero case reports)	Reports	
Mapping of new autochthonous leprosy patients	New autochthonous leprosy patients have been mapped	Reports, HIS[17]	Yes/No
Screening of household, neighbour and social contacts of new leprosy cases	Number of contacts listed per index patient (target as per the national plan)	Reports, HIS[17] SOP[17]	Number
Screening of persons with suggestive signs of leprosy in skin OPD/health centres and skin camps	Persons not found to have leprosy among persons screened with signs suggestive of leprosy	Records and reports SOP[17]	Number
	Leprosy is included as one of the diseases in migrant or displaced persons health screening and care programmes		Yes/No
Sentinel surveillance and passive surveillance	Sentinel centre/apex centre/centre of excellence/referral unit[20] with staff trained to diagnose and manage leprosy is available at an appropriate level (district/ municipality or state/province)	Observation, records and reports, discussion	Leprosy cases (child/adult; autochthonous/ non-autochthonous)
Management of sporadic child cases (in Phase 2) and adult cases (in Phase 3)	Critical instance investigation of sporadic child and adult cases	Records and reports SOP[17]	Yes/No

[20]An institution where facilities such as for training, surveillance, provision of specialized care for leprosy are available at a suitable level (at least one per country)

Criterion	Indicators	Source of data/ information	Level of achievement
Monitoring, supportive supervision and evaluation	A monitoring and supportive supervision system is in place	Observation, reports, records, SOPs	Yes/No
	Progress in leprosy elimination is monitored at the subnational level using the LEMT[17]		Yes/No
	Programme services are monitored using the LPTA[17]		Yes/No
Involvement of private practitioners	Private practitioners are involved in treating leprosy	Reports from private practitioners, discussion	Yes/No
Surveillance through involvement of pharmacists and chemists	Availability of over the counter leprosy drugs used in treatment of leprosy	Discussions observations	Yes/No
Monitoring of anti-microbial resistance (AMR)	A system is in place to test for possible drug resistance	Reports, Observation	Yes/No
	Percentage relapse cases tested	HIS[17]	Percentage
Pharmacovigilance system to monitor adverse drug reactions	A pharmacovigilance system is in place	Reports Observation	Yes/No

7.5 Criteria for verification at the end of Phase 2: elimination of leprosy disease

Table 3: Programme criteria for verification, indicators and sources of data/information at the end of Phase 2 (elimination of leprosy disease)

Criterion for verification	Indicators	Source of data/ information	Level of achievement
Political commitment			
Country-owned national strategic plan adapting global leprosy strategy 2021–2030/NTD roadmap 2030	A National strategic plan/national health plan to achieve interruption of transmission and elimination of leprosy disease is available with resource allocation	Perusal of national strategic plan Multi-stakeholder consultation	Yes/Partly/No
	A health plan providing for an integrated leprosy case detection and treatment services is available		
	Availability of algorithms/standard operating procedures (SoPs) for diagnosis, management, prevention, rehabilitation including care of disabilities		
	National health plan have a focus on training to sustain expertise in leprosy and programme management		
	A well-defined referral system from the community to a sentinel centre/centre of excellence/referral unit is in place[21]		
	Drug procurement and supply chain management are in place (relevant to leprosy)		
	Advocacy materials (e.g. investment case for elimination of leprosy; information booklets, infographics and videos) are available for sensitizing policy-makers at the national and subnational levels	Review of advocacy materials available	

[21]An institution where facilities such as for training, surveillance, provision of specialized care for leprosy are available at a suitable level (at least one per country)

Criterion for verification	Indicators	Source of data/ information	Level of achievement
Enabling environment for persons affected by leprosy	No laws/policies/traditional practices/ regulations that allow discrimination against persons affected by leprosy	Report on existing laws that allow discrimination against persons affected by leprosy	Yes/No/ Work in progress
	Number of instances of discrimination reported		Number reported
	Social support e.g. entitlements, pension/ welfare schemes for persons with disability include persons affected by leprosy		Yes/No
	Principles and Guidelines[16] are available in the national language		
	Positive norms or regulations exist to facilitate social inclusion of persons affected by leprosy		
Programme implementation			
Integration of leprosy into general health services	Integrated case finding, leprosy care package and prevention activities implemented	Programme reports, HIS[17], facility-based assessment	Yes/No
Training of health staff (leprosy-specific or integrated with NTDs[17] or other programmes)	Training status of health workers	Certificate/evidence of training from self-learning/national/ WHO accredited courses	Yes/No
Leprosy care package for treatment and management of complications is implemented	Diagnosis, WHO recommended standard of care for treatment of patients, management of reactions and prevention and care of disabilities practices in line with SoPs[22]	Availability of care package and SoPs	Yes/No
	Drugs required to manage leprosy are available	Observation, discussions, health facility assessment	
Referral mechanism	Referral mechanism with designated levels from community to apex/sentinel/referral unit to be verified	Observation, discussions, health facility assessment	Yes/No

[22]Implementation of leprosy package of care – verifying adoption of standard operating procedures and observation during health facility assessment

Criterion for verification	Indicators	Source of data/ information	Level of achievement
Contact tracing	Proportion of cases for whom contact examination (for patients registered for the past five years) was undertaken	Patient cards, registers, HIS[17]	Percentage
	Proportion of contacts of patients examined		
Administration of single dose rifampicin (SDR) to eligible contacts as post-exposure prophylaxis (PEP)	Adoption of SDR-PEP	Health plan	Yes/No
	Proportion of eligible contacts who received SDR	Records, registers, HIS[17]	Percentage
Awareness about leprosy	Awareness campaigns: media	Information circulars and/or communication materials	Yes/No
	Level of awareness in the general community and among traditional healers and opinion leaders	Discussion with the general community	Good/ moderate/ poor
Surveillance			
Sentinel surveillance and passive surveillance	Sentinel centre/apex centre/centre of excellence/referral unit with staff trained to diagnose and manage leprosy is available at an appropriate level (district/ municipality or state/province)	Observation, records and reports, discussion	Leprosy cases (child/adult; autochthonous non-autochthonous)
Screening of persons with suggestive signs of leprosy in skin OPD/health centres and skin camps	Number of persons found to have leprosy among persons screened	Records and reports, HIS[17]	Number
	Leprosy screening is included as one of the diseases in migrant or displaced persons health screening and care programmes		Yes/No
Management of sporadic cases	Mapping of sporadic cases	Records and reports	Yes/No
	Critical instance investigation of sporadic cases is done		

[23]An institution where facilities such as for training, surveillance, provision of specialized care for leprosy are available at a suitable level (at least one per country)

Criterion for verification	Indicators	Source of data/ information	Level of achievement
Involvement of private providers	Private practitioners are involved in treating leprosy complications and disabilities of eyes, hands and feet	Reports from private practitioners, discussion	Yes/No
Surveillance through involvement of pharmacists and chemists		Reports, discussions, observations	Yes/No
Data management system		Reports	Yes/No

7.5.1 Research

National programmes are encouraged to carry out or facilitate basic and operational research in accordance with national and local priorities and the priorities identified in the Global Leprosy Strategy 2021–2030 (WHO Global Leprosy Programme, 2021, p. 13) and by the Global Partnership for Zero Leprosy (Steinmann et al., 2020). These include improving diagnostic tools, defining markers to assess transmission of leprosy and elimination of the disease, new treatment regimens, improved methods to predict and diagnose reactions and nerve damage, inclusive approaches in community-based rehabilitation and tools and interventions for stigma reduction. National programmes are encouraged to conduct an annual meeting on leprosy research needs and progress in the country.

7.5.2 Recommendations for the post-elimination phase

- Maintaining a national partnership for zero leprosy including government, development partners and persons affected by leprosy
- Including persons affected by leprosy in planning and implementation and monitoring of leprosy services
- Maintaining a surveillance system to detect, report and map any sporadic or non-autochthonous new cases, as well as zero case reporting in areas where this is relevant.
- Maintaining a web-based data management system
- Maintaining apex or referral centres with adequate knowledge and skills for diagnoses and management of leprosy cases
- Maintaining e-learning modules and training locations for skills acquisition to ensure leprosy training at appropriate levels
- Using the Principles and Guidelines in awareness raising on human rights of persons affected and in education on leprosy

8. Monitoring interruption of transmission and elimination of leprosy disease

Many countries have some subnational level units (e.g., districts, islands) that have reached the stage of interruption of transmission and even elimination of disease. National programmes are encouraged to map out such areas and evaluate these internally using the criteria described here and the indicators mentioned in the matrix. This will help the national programme to document that subnational units have fulfilled the criteria for interruption of transmission and ensuring availability of leprosy services for the next phase.

Evaluation reports of all subnational units need to be presented while the whole country moves through the next phase towards the milestone of elimination of leprosy. Countries are expected to prepare a Leprosy Elimination Dossier demonstrating that they have reached elimination of the disease. The dossier comprising a summary of the evaluation reports on subnational units will be presented to the external team tasked with verifying disease elimination for the country as a whole.

Countries that have reported no or only sporadic autochthonous cases for more than ten consecutive years would be requested to submit a dossier to this effect as an alternative way to declare leprosy elimination at the national level.

8.1 Documenting and ascertaining achievement towards elimination

It is recommended that the LPTA is undertaken by internal teams at the subnational level units (typically second-tier) at the time of reaching the milestone for 'Interruption of transmission' (see Section 5.1). LPTA will be used as a pre-qualification tool to ascertain that the concerned unit has reached 'interruption of transmission'. When all second-tier subnational units (e.g., districts) in one first-level tier unit (e.g., state) have reached 'interruption of transmission', the first-level subnational unit can also be declared to have reached 'interruption of transmission'. When all first-level tiers have reached this benchmark, then interruption of transmission is declared at country level.

Similarly, when the criteria for elimination of leprosy disease (see section 5.2) have been achieved in all second-level subnational units within a given first-level unit, the first-level unit is considered to have reached elimination of leprosy disease. When all first-level units have reached this milestone, the country can apply for external verification of elimination of leprosy disease by submitting a Leprosy Elimination Dossier to WHO (see Section 9.1).

8.2 Leprosy Elimination Monitoring Tool

A new data monitoring tool has been designed that allows areas and countries to follow their progress across the phases of elimination and determine when they (are ready to) move from one phase to the next. The Leprosy Elimination Monitoring Tool (LEMT) is Excel based and requires data to be imported or entered by year for each administrative unit that is being monitored, separately for autochthonous child cases and adult cases. If available, data on non-autochthonous cases can also be entered. Child and adult case figures are the only data needed, along with the names and unique area codes of the administrative units. Using a simple legend that corresponds with the phase-transition criteria, the cells in the spreadsheet are coloured using the traffic light colours that correspond with the phases (see Figure 1). Examples of the LEMT with data from the Maldives and Morocco are given in Annex 2.

8.3 Assessing transmission level of *M. leprae*

One of the indicators suggested for assessing and monitoring the level of transmission of M. leprae, i.e., the level of infection, is the seroprevalence of PGL-1 antibodies in children in a defined community. A systematic review of 28 studies on PGL-1 testing in children concluded, "Quantitative anti-PGL-I serology in young children holds promise as a screening test to assess *M. leprae* infection and may be applied as a proxy for transmission and thereby as a means to monitor the effect of (prophylactic) interventions on the route to leprosy elimination." (Pierneef *et al.*, 2021) While seroprevalence or use of another biomedical screening test is still a matter for further research at the time of writing this Technical guidance, it is likely that such a tool would become available in the years to come.

8.4 Zoonotic and environmental sources of *M. leprae*

If there are known zoonotic carriers of *M. leprae* in the country, such as nine-banded armadillos, surveys may be carried out to establish whether these animals indeed carry *M. leprae* and whether there is evidence of transmission from animals to humans. Further information, including research questions and methodological recommendations can be found in a prototype protocol that is available on request. Evidence on transmission from environmental sources of *M. leprae* (e.g., water, soil, parasites) is still equivocal at the time of writing this Technical guidance.

8.5 Leprosy Programme and Transmission Assessment

The Leprosy Programme and Transmission Assessment (LPTA) is an activity that is carried out by internal teams towards the end of Phase 1 when a subnational jurisdiction (typically first or second-tier) reaches the milestone for interruption of transmission, i.e., zero autochthonous child cases for a consecutive period of five years. It is done at the national level at the end of Phase 2, when the second milestone of elimination of leprosy disease has been reached. An LPTA will be carried out to document that all programme criteria have been met and examine trends of epidemiological indicators in such jurisdiction to confirm that the milestone has been achieved. The LPTA includes assessment of health facilities that provide leprosy services. The LPTA comprises or review of epidemiological data, health facility assessment and data validation and verification of the programme criteria through observation during a field survey. The evidence collected in this way in subnational health administrative units[24], is compiled in a Leprosy Elimination Dossier to be submitted to WHO when the country reaches the milestone for elimination of disease in the country a whole. Countries that have not detected any new leprosy cases in the past 3 years or more can use the LPTA at national level prior to or as part of the verification process. Countries likely to be among the first to apply for verification may have had no new cases detected for more than 10 years.

[24]In countries where leprosy has been concentrated in one or more specific jurisdictions only in the last 10 years, the requirement to conduct LPTA would only apply to these areas.

8.5.1 LPTA for use at the subnational level at end of Phase 1 and during Phase 2

8.5.1.1 Assessment of the programme criteria

Several criteria in Table 2 relate to the wider leprosy programme rather than individual health facilities and are also applicable to the subnational level, for example, political commitment, allocation of trained health staff, awareness of leprosy in the population, and availability of a surveillance and data management system. These criteria also need to be assessed during an LPTA.

8.5.1.2 Review of epidemiological data

Epidemiological analysis through review of data at the second subnational level is to be done covering a period of 10–20 years. The data should be presented as trends for the indicators listed in Chapter 6. The data should also be presented in the format of the leprosy elimination monitoring tool used for analysis of leprosy elimination phases – i.e., new autochthonous child cases, autochthonous adult cases and total cases separately for subnational tiers (see Section 8.2). Examples are presented for Maldives and Morocco in Annex 2. These data can easily be linked to serial country maps, showing the evolution from pre-interruption over interruption of transmission to disease elimination and eventually completion of ten years post-elimination surveillance.

8.5.1.3 Data validation through field surveys

A field visit is included in the LPTA to validate a sample of the epidemiological data provided. as there is currently no objective test available to confirm the level of infection in the community. The number of health facilities to be visited in a given subnational unit should be determined in consultation with an epidemiologists and the local health authorities.

8.5.1.4 Health facility assessment

Health facility assessment will be carried out in a sample of health facilities visited to verify that the facility-linked criteria have been met (see Table 2), such as availability of diagnostic services, knowledge and skills of staff, treatment with MDT and the data management system, at health facilities providing treatment for the patients. Services for disability prevention and management and measures to reduce stigma and improve mental health will also be assessed, as is the availability of a mechanism for referral to more specialised facilities in case complications and disabilities cannot be managed at the peripheral level.

8.5.1.5 Data on zoonotic and environmental sources of leprosy

Where relevant, like in countries where 9-banded armadillos are endemic, data on zoonotic transmission and environmental sources of *M. leprae* should be reviewed and taken into account.

8.5.2 LPTA for use at the national level at the end of Phase 2

8.5.2.1 Assessment of the programme criteria

Similar to the Phase 1 LPTA, the extent to which the programme-wide criteria have been met should be assessed (see Table 3 for details on indicators and targets). However, given that no new cases are detected regularly at this stage, the level of leprosy control activities is expected to be much lower at this stage. The Phase 2 LPTA is therefore shorter than the Phase 1 LPTA. The other components of the LPTA are the same as described under Section 8.5.1.

8.5.2.2 Review of epidemiological data

National level epidemiological data are reviewed covering a period of 10-20 years. The data should be presented as trends for the indicators listed in Chapter 6. The data should also be presented in the format of the LEMT used for analysis of Leprosy Elimination Phases – i.e., new child cases and total cases separately for subnational tiers. Please see the examples presented for the Maldives and Morocco (see Annex 1). These data can easily be linked to serial country maps, showing the evolution from pre-interruption over interruption of transmission to disease elimination and eventually completion of 10-years post-elimination surveillance.

9. Verification of elimination

9.1 Compiling evidence of elimination of leprosy: the Leprosy Elimination Dossier

Once the internal evaluation of all subnational units has shown that the milestones for interruption of transmission and elimination of leprosy disease have been achieved and other programme criteria have been met, the country will be ready to enter into Phase 3, the Post elimination phase (see Figure 1). This evidence collected at the subnational level is compiled in the Leprosy Elimination Dossier. The dossier will be submitted to WHO with a request to verify that the country has reached elimination of disease. An external global evaluation team will be invited for '*verification*' of elimination of disease for the country as a whole.

9.2 Background

A Leprosy Elimination Dossier typically provides general information about the country, such as geographical information and population details with reference to recent census or population statistics reports. The population details also include mid-year population used for the calculation of epidemiological indicators in health programmes. A description of recent health surveys can be presented to give information to the international team about monitoring of health programmes. Details of surveillance mechanisms used for detecting cases in other infectious disease control programmes would help the external evaluation team.

Social determinants of health including social and development factors, economic condition of people, literacy levels in different population groups, poverty-related indicators and information about access to services by women need to be included in the dossier. This background information can be brief, but all the statements need to be substantiated with data using standard indicators drawn from national statistics. Information about the health system, describing how it is organized, the details of human resources in different segments of the health services needs to be presented. Data on training and on availability of leprosy-trained health staff are needed. Strategies for capacity building and facilities for training of health staff in infectious diseases, NTDs and leprosy in particular are needed to understand how the leprosy-related knowledge and skills can be sustained during the post-elimination phase. Monitoring and reporting mechanisms, frequency of reporting and information about the health management information system that is used for leprosy need to be included. This also helps in understanding how supervision of health programmes is organised. Budget allocations and expenditures related to infectious disease surveillance would reflect health system functioning and, indirectly, political commitment for health.

A detailed organogram of the health services should be included in the dossier giving details of health facilities at different levels: primary, secondary and tertiary levels. Detailed information about national and other tertiary referral centres offering services for persons affected by leprosy needs to be included. Links to recent evaluation reports of infectious disease control programmes would inform the external evaluation team about other interventions in the same field.

The main part of the dossier should be a description of leprosy control programme activities and services aimed at demonstrating that the country has achieved interruption of transmission and elimination of leprosy disease. Part of this should be a long-term trend analyses of the relevant key indicators described in Chapter 6. Data should demonstrate that no new autochthonous child cases have been detected for at least 5 years and no autochthonous adult cases for at least 3 years. In addition, data on the programme criteria should demonstrate that the programme has had adequate capacity to detect new cases, should they have occurred and that services have been and will continue to be offered to meet the needs of persons with leprosy-related disabilities and those needing support with inclusion.

Support will be provided to countries for preparing a dossier to claim elimination of leprosy. The Leprosy Elimination Dossier will form the basis for verification of elimination of leprosy disease by an external team. The external team may visit the country and ascertain the report contents through desk review and field visits to selected health facilities.

In countries where no case of leprosy has been detected for more than 10 years and a dedicated leprosy programme is not operational, preparing a full dossier and field visits by an external team might not be realistic. An abbreviated format for verification, the Leprosy Elimination Dossier Short Form, will be used instead. This contains certain key information, including zero reports for the past 10 years and evidence of an effective surveillance or disease notification system. This will be considered equivalent to a full dossier and, if approved by WHO, an announcement of the achievement of elimination of leprosy disease milestone can be made.

9.3 Outline of the Leprosy Elimination Dossier

- Background and context of the leprosy programme
- Leprosy programme overview
- Leprosy programme structure
- Interventions used to achieve interruption of transmission and elimination of leprosy
- Data on persons with leprosy-related disabilities
- Availability of services for leprosy-related disabilities
- Availability of services and interventions for zero stigma and discrimination
- Epidemiological information
    - Interruption of transmission
    - Elimination of leprosy disease
    - Leprosy elimination data by subnational area according to the Excel template provided
- Information on programme criteria
    - Zero transmission and leprosy disease
    - Zero disability (including diagnosis and clinical management of leprosy)
    - Zero stigma and discrimination
    - Cross-cutting criteria
- Description of post-elimination activities

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Annexes

1. Leprosy Care Package

Interventions and services required to provide person-centred services for treatment of leprosy, management of complications, long-term management of disability-related needs and mental health needs are combined in a 'leprosy care package'. The procedures and SOPs that accompany this care package are based on existing technical guidance either leprosy specific or across NTDs.

Programme compontent	Intervention or service	Verifiable indicator
Treatment and management of leprosy and related complications	Diagnosis and treatment with MDT according to the WHO Guidelines for the Diagnosis, Treatment and Prevention of Leprosy	WHO Disability grading done at diagnosis MDT completion rates (MB/PB)
	Management of reactions and nerve function impairment according to WHO guidance	Nerve function assessment SOP is available Number of patients with Type 1 reaction treated Number of patients with Type 2 reaction treated
	Availability of referral facilities at an appropriate level	Referral facilities are available
	Availability of MDT and drugs for reaction management	Current stock of MDT (months) Prednisolone is available Loose clofazimine available
	Management of adverse drug reactions (ADR)	A system to report ADR is available
Continued care of persons with primary and secondary disabilities	Availability of footwear and other protective and assistive devices	Number of persons with leprosy-related disabilities provided with assistive devices
	Availability of referral facilities for physical rehabilitation at an appropriate level	Referral facilities are available

Programme compontent	Intervention or service	Verifiable indicator
	Self-care training and information on prevention of disabilities (POD)	Self-care training available in designated centres Formation of self-care groups is promoted Information on POD available in designated centres
	Management of ulcers due to leprosy	Number of patients admitted to hospital for ulcer care per year
Social support and community-based rehabilitation (CBR)	Availability of social support (e.g., entitlements) and CBR services, as needed	Social support is available for persons affected by leprosy CBR services are available
Mental health care	Availability of psychological support at point of care	Psychological support through counselling is available at point of care

2 Country case studies on interruption of transmission and elimination of leprosy

2.1 Maldives

The Maldives are administratively divided into atolls and cities. When all 21 atolls and cities had achieved 'interruption of transmission', the country was considered to have achieved this status. This was the case in 2011. By 2020, nine atolls and cities had achieved a non-endemic status. Eight were still in the Post-elimination Surveillance Phase and elimination of leprosy disease was yet to be achieved in 13 atolls and cities. Figure 2 shows that transmission probably stopped in 2006, with only three sporadic child cases occurring since (in 2011, 2013 and 2015). Figure 3 shows that none of these had any consequences in terms of an increase in adult cases in subsequent years. Re-emergence of leprosy (three or more cases occurring on average in three consecutive years in one atoll) was not observed.

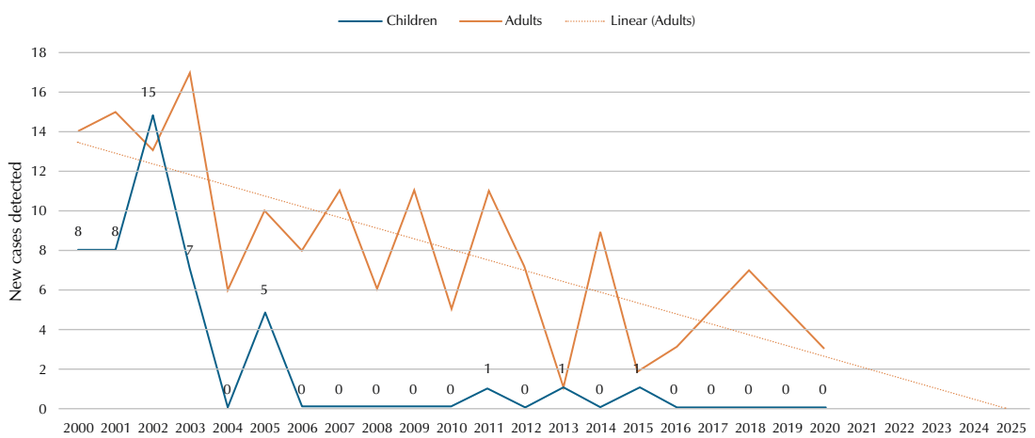


Figure 2: Trend in new adult and child cases detected in the Maldives. A linear trendline predicts zero new adult cases by 2025.

Figure 3: Leprosy Elimination Monitoring Tool - Maldives data 2000-2020

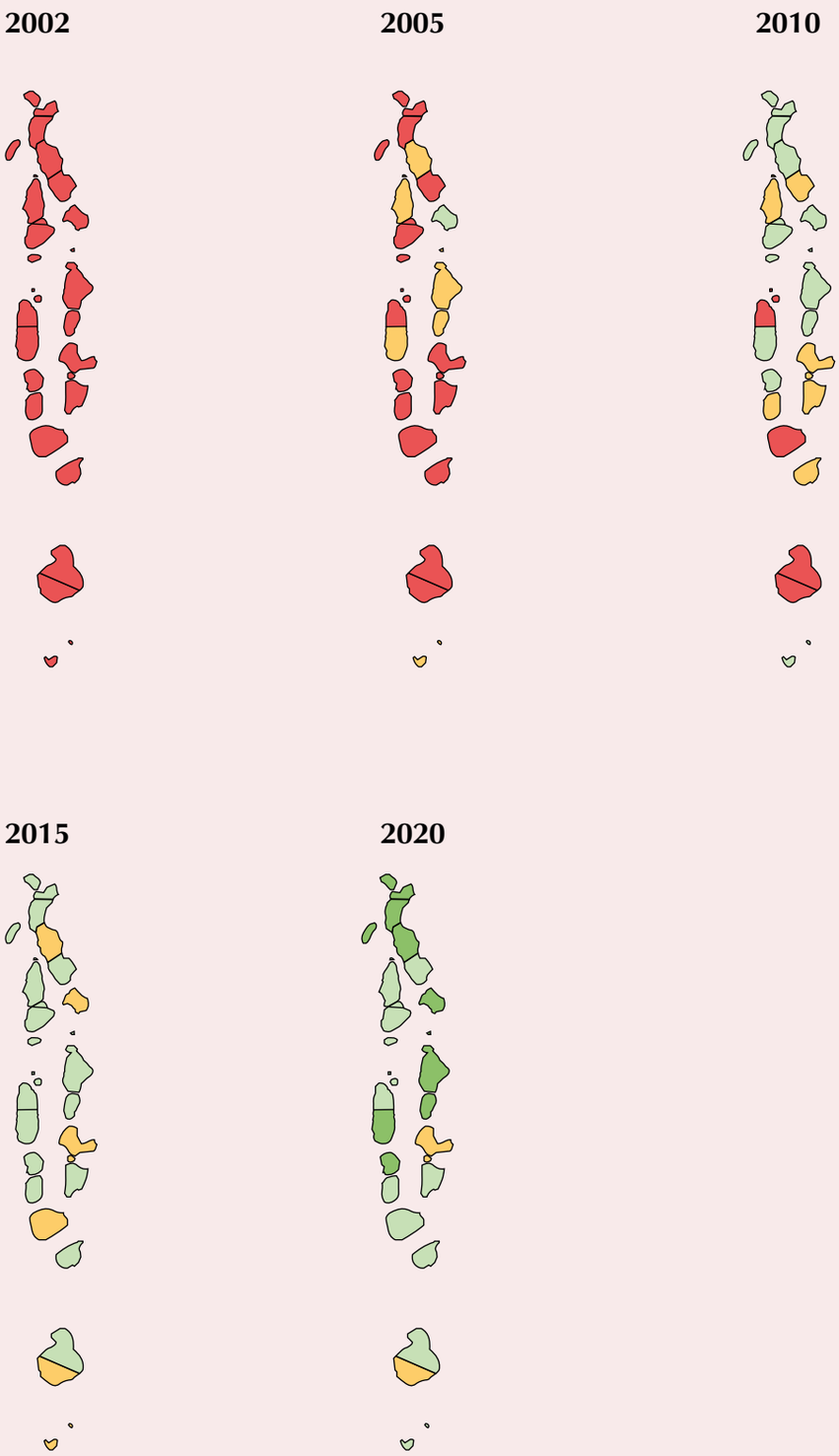
LEGEND

Area L1 - Area Name Level 1
UAC L1 - Unique Area code Level 1
Area L2 - Area Name Level 2
UAC L2 - Unique Area code Level 2

Phase 1 - Until interruption of transmissions (5 years no autochthonous child cases)
Phase 2 - Until elimination of leprosy disease (3 years no autochthonous cases)
Phase 3 - Post-elimination phases (10 years no autochthonous cases)
Non-endemic status
1 Sporadic autochthonous adult case
1 Sporadic autochthonous child case
Query operational cause of high number of cases
3 or more cases on average in 3 consecutive years; possible re-emergence to be investigated

Area L1	UAC L1	Area L2	UAC L2	Age Group	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
South Central	MV004	Alif Alif Atoll	MV004008	Children																					
				Adults																			1		
				Total new cases																			1		
South Central	MV004	Alif Dhaal Atoll	MV004020	Children	2																				
				Adults	1	1		1		1									1						
				Total new cases	3	1		1		1									1						
North Central	MV002	Baa Atoll	MV002007	Children	2																				
				Adults	1									1											
				Total new cases	3									1											
South Central	MV004	Dhaalu Atoll	MV004012	Children																					
				Adults											1	1									
				Total new cases											1	1									
South Central	MV004	Faafu Atoll	MV004011	Children		2		1																	
				Adults				1				1		2				1			1		2		2
				Total new cases		2		2				1		2				1			1		2		2
South	MV005	Gaafu Alif Atoll	MV005016	Children				3																	
				Adults	1		1	2				2				1			1					1	
				Total new cases	1		1	5				2				1			1					1	
South	MV005	Gaafu Dhaalu Atoll	MV005017	Children																					
				Adults	1	1		1			1			1	1					1		1	2	1	
				Total new cases	1	1		1			1			1	1					1		1	2	1	
South	MV005	Gnaviyani City	MV005018	Children																					
				Adults																					
				Total new cases																					
North	MV001	Haa Alif Atoll	MV001001	Children		1	1			1															
				Adults		1			1	2	2	2	1			1									
				Total new cases		2	1		1	3	2	2	1			1									
North	MV001	Haa Daalu City	MV001002	Children	2	1																			
				Adults	1	4	4				1	1	1	1			1		3	1	1	1	1	2	1
				Total new cases	3	5	4				1	1	1	1			1		3	1	1	1	1	2	1
South Central	MV004	Kaafu Atoll	MV004009	Children			4	1		1								1		1					
				Adults	3	2		1				1		2	1		2		1					1	
				Total new cases	3	2	4	2		1		1		2	1		2	1	1	1				2	
South Central	MV004	Laamu Atoll	MV004015	Children																					
				Adults		1	2																		
				Total new cases		1	2																		
North Central	MV002	Lhaviyani Atoll	MV002005	Children	1		6	1		2															
				Adults		1	1			1	1	1	1	1			1								
				Total new cases	1	1	7	1		3	1	1	1	1			1								
Male Econnomic	MV003	Male' City	MV003021	Children																					
				Adults	3	1	1	1	3		1				2	4	1				1	1			
				Total new cases	3	1	1	1	3		1				2	4	1				1	1			
South Central	MV004	Meemu Atoll	MV004013	Children																					
				Adults			1																		
				Total new cases			1																		
North Central	MV002	Noonu Atoll	MV002004	Children		1		1																	
				Adults		1		1		1							1		1						
				Total new cases		2		2		1							1		1						
North Central	MV002	Raa Atoll	MV002006	Children		1										1									
				Adults	1			1		1	1	1							1			1			
				Total new cases	1	1		1		1	1	1				1			1			1			
South	MV005	Seenu/Addu City	MV005019	Children	1		2			1															
				Adults	1	2	1	1	1				1	2		1	2					1		1	
				Total new cases	2	2	3	1	1	1			1	2		1	2					1		1	
North	MV001	Shaviyani Atoll	MV001003	Children																					
				Adults			1						1			1									
				Total new cases			1						1			1									
South Central	MV004	Thaa Atoll	MV004014	Children																					
				Adults						2	1														
				Total new cases						2	1														
South Central	MV004	Vaavu Atoll	MV004010	Children		1																			
				Adults	1		1	2								1									
				Total new cases	1	1	1	2								1									

Figure 4: Serial maps showing the progression of the Maldives through the phases of elimination of leprosy



2.2 Morocco

Morocco is administratively divided into regions (first tier) and prefectures and provinces (second-tier administrative divisions). Data pertaining to new cases (both child and total cases) detected between 2002 and 2020 are presented in Figure 6. When all prefectures and provinces in one region had achieved a particular milestone, the region was considered to have achieved this status. In 2020, all provinces and regions had achieved this status. Elimination of leprosy disease is yet to be achieved in 15 prefectures/provinces in seven out of 12 regions.

Re-emergence of leprosy was not observed in any of the prefectures/provinces. However, it is important that every case detected during the post-elimination surveillance period is thoroughly investigated. Five cases were detected after more than 10 years of post-elimination surveillance. This highlights the fact that sporadic cases may still occur even after this phase, due to the long incubation period in some patients. The 10-year cut-off for the follow-up period is a rather arbitrary trade-off between maintaining capacity to detect leprosy (including trained human resources, periodic reporting, etc.) and missing rare cases. In an integrated infectious disease surveillance system, rare cases can be picked up even after this 10-year period.

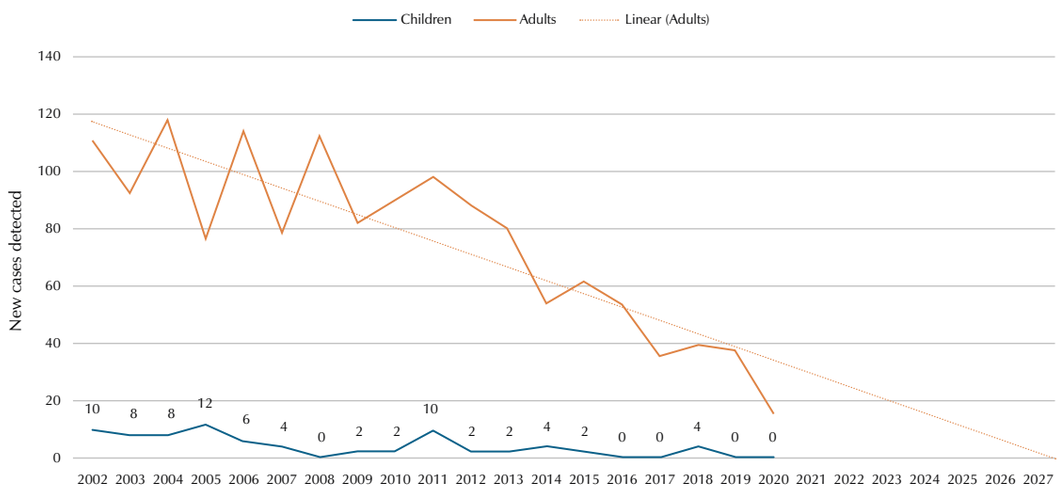


Figure 5: Trend in new adult and child cases detected in Morocco. A linear trendline predicts zero new adult cases by 2027.

Figure 5 shows that Morocco has detected very few child cases since 2012. As the Elimination Monitoring Tool shows, the child cases detected in the past five years were only sporadic child cases. This indicates that transmission is already interrupted in the whole country. The trendline in Figure 5 predicts that no new adult leprosy cases are likely to be found after 2027, putting the country on track for verification of elimination of leprosy disease by or before 2030.

Figure 6: Leprosy Elimination Monitoring Tool - Morocco data 2002-2020

LEGEND

Area L1 - Area Name Level 1
UAC L1 - Unique Area code Level 1
Area L2 - Area Name Level 2
UAC L2 - Unique Area code Level 2

Phase 1 - Until interruption of transmissions (5 years no autochthonous child cases)
Phase 2 - Until elimination of leprosy disease (3 years no autochthonous cases)
Phase 3 - Post-elimination phases (10 years no autochthonous cases)
Non-endemic status
1 Sporadic autochthonous adult case
1 Sporadic autochthonous child case
Query operational cause of high number of cases
3 or more cases on average in 3 consecutive years; possible re-emergence to be investigated

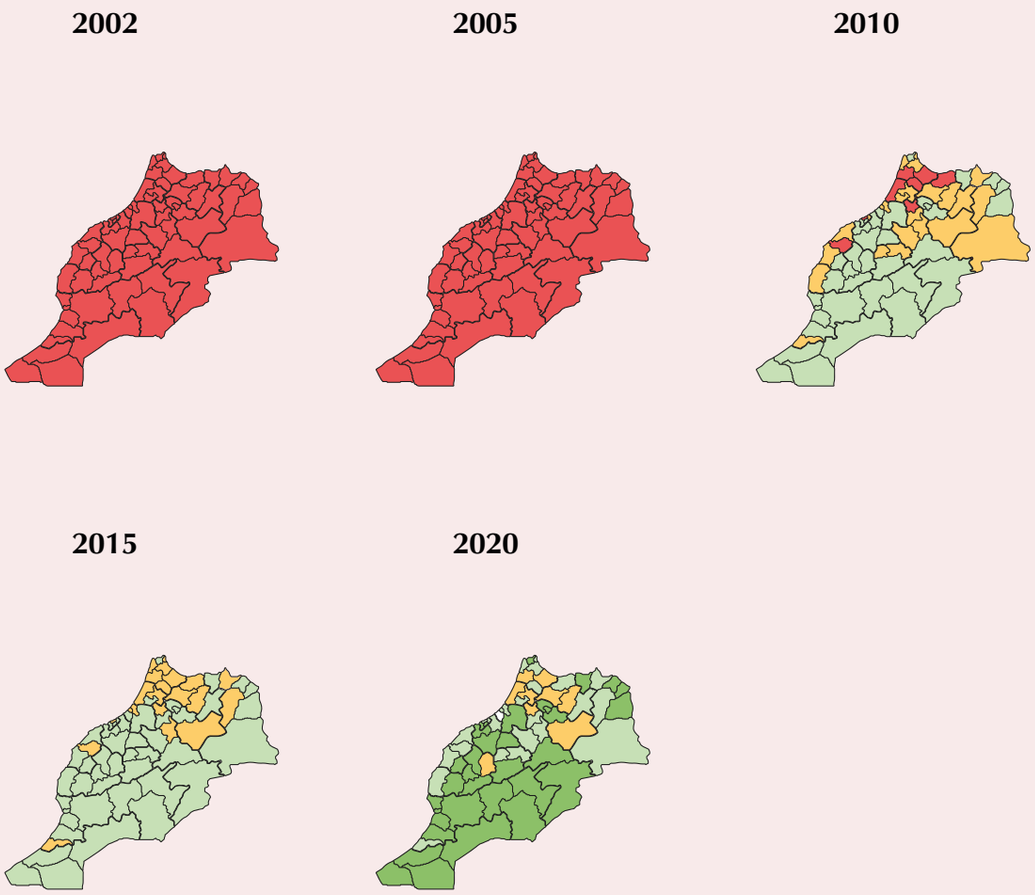
Area L1	UAC L1	Area L2	UAC L2	Age Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Béni Mellal-Khénifra	MA001	Azilal	MA001001	Children																			
				Adults	1		1		6				1		1				1				
				Total new cases	1		1		6				1		1				1				
Béni Mellal-Khénifra	MA001	Béni-Mellal	MA001002	Children																			
				Adults	1	1			1			1										1	
				Total new cases	1	1			1			1										1	
Béni Mellal-Khénifra	MA001	Fquih Ben Salah	MA001003	Children	1																		
				Adults	1	1			2	1	2				1								
				Total new cases	2	1			2	1	2				1								
Béni Mellal-Khénifra	MA001	Khénifra	MA001004	Children																			
				Adults					1			1											
				Total new cases					1			1											
Béni Mellal-Khénifra	MA001	Khouribga	MA001005	Children																			
				Adults																		1	
				Total new cases																		1	
Casablanca-Settat	MA002	Berrechid	MA002001	Children																			
				Adults			2	1															
				Total new cases			2	1															
Casablanca-Settat	MA002	El Jadida	MA002002	Children																			
				Adults				1	1	1			2	1					1				
				Total new cases				1	1	1			2	1					1				
Casablanca-Settat	MA002	Médiouna	MA002003	Children																			
				Adults				3					1				2						
				Total new cases				3					1				2						
Casablanca-Settat	MA002	Nouaceur	MA002004	Children													1						
				Adults												1							
				Total new cases												1	1						
Casablanca-Settat	MA002	Casablanca	MA002005	Children					1														
				Adults	3	4	4	1			4		2	2		1	2	1	1				
				Total new cases	3	4	4	1	1		4		2	2		1	2	1	1				
Casablanca-Settat	MA002	Mohammedia	MA002006	Children																			
				Adults					1		2												
				Total new cases					1		2												
Casablanca-Settat	MA002	Ben Slimana	MA002007	Children																			
				Adults		1						1	1				2						
				Total new cases		1						1	1				2						
Casablanca-Settat	MA002	Sidi Bennour	MA002008	Children					1														
				Adults	1	3			1	4	1		1	5		1					1	1	2	1
				Total new cases	1	3			2	4	1		1	5		1					1	1	2	1
Casablanca-Settat	MA002	Settat	MA002009	Children		1								1									
				Adults	1	1		2							1								
				Total new cases	1	2		2						1	1								
Drâaa-Tafilatet	MA003	Ouarzazate	MA003001	Children																			
				Adults																			
				Total new cases																			
Drâaa-Tafilatet	MA003	Errachidia	MA003002	Children																			
				Adults									1										
				Total new cases									1										
Drâaa-Tafilatet	MA003	Midelt	MA003003	Children																			
				Adults						1									1				
				Total new cases						1									1				
Drâaa-Tafilatet	MA003	Tinghir	MA003004	Children	1																		
				Adults	3							1											1
				Total new cases	4							1											1
Drâaa-Tafilatet	MA003	Zagora	MA003005	Children																			
				Adults																			
				Total new cases																			
Fès-Meknès	MA004	Fès	MA004001	Children																			
				Adults	2	1	1		4							2	1						
				Total new cases	2	1	1		4							2	1						
Fès-Meknès	MA004	Meknès	MA004002	Children				1															
				Adults		1	4				1			4	1	1		1	3			1	
				Total new cases		1	4	1			1			4	1	1		1	3			1	

Area L1	UAC L1	Area L2	UAC L2	Age Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fès-Meknès	MA004	El Hajeb	MA004003	Children																			
				Adults		2	2				1								1				
				Total new cases		2	2				1								1				
Fès-Meknès	MA004	Ifrane	MA004004	Children																			
				Adults	1			1	1			1		1		1							
				Total new cases	1			1	1			1		1		1							
Fès-Meknès	MA004	Boulemane	MA004005	Children										2									
				Adults	6	6	3	5	3	3	7	2	1	10	2	3	1	2	6	2		1	
				Total new cases	6	6	3	5	3	3	7	2	1	12	2	3	1	2	6	2		1	
Fès-Meknès	MA004	Moulay Yacoub	MA004006	Children																			
				Adults															1				
				Total new cases															1				
Fès-Meknès	MA004	Sefrou	MA004007	Children																			
				Adults												1						1	
				Total new cases												1						1	
Fès-Meknès	MA004	Taounate	MA004008	Children										1									
				Adults	2	1	2	3	5	3	6	4	2	1	2	3	1	2	4		2	2	
				Total new cases	2	1	2	3	5	3	6	4	2	2	2	3	1	2	4		2	2	
Fès-Meknès	MA004	Taza	MA004009	Children																			
				Adults	2	1	2	2	1	3	2		1					5		3		3	
				Total new cases	2	1	2	2	1	3	2		1					5		3		3	
Guelmin-Oued Noun	MA005	Assa-Zag	MA005001	Children																			
				Adults																		1	
				Total new cases																		1	
Guelmin-Oued Noun	MA005	Guelmin	MA005002	Children																			
				Adults																			
				Total new cases																			
Guelmin-Oued Noun	MA005	Tan-Tan	MA005003	Children																			
				Adults						1													
				Total new cases						1													
Guelmin-Oued Noun	MA005	Sidi Ifni	MA005004	Children																			
				Adults			1			1	1			1	1			1					
				Total new cases			1			1	1			1	1			1					
Marrakech-Safi	MA006	Al Haouz	MA006001	Children																			
				Adults								1		1									
				Total new cases								1		1									
Marrakech-Safi	MA006	Chicahoua	MA006002	Children																			
				Adults												1							
				Total new cases												1							
Marrakech-Safi	MA006	Essaouira	MA006003	Children																			
				Adults		4	2			2													
				Total new cases		4	2			2													
Marrakech-Safi	MA006	Marrakech	MA006004	Children			1																
				Adults					1				1					1		1			
				Total new cases			1		1				1					1		1			
Marrakech-Safi	MA006	El Kelâat Es Sraghn	MA006006	Children																			
				Adults			2											1	1		3		1
				Total new cases			2											1	1		3		1
Marrakech-Safi	MA006	Safi	MA006007	Children	1																		
				Adults						1				1		1		1					
				Total new cases	1					1				1		1		1					
Marrakech-Safi	MA006	Youssoufia	MA006008	Children																			
				Adults		1	1	1						1	2								1
				Total new cases		1	1	1						1	2								1
Marrakech-Safi	MA006	Rehamna	MA006008	Children																			
				Adults					1								1						
				Total new cases					1								1						
Orientale	MA007	Oujda-Angad	MA007001	Children																			
				Adults	1										1			1	1				
				Total new cases	1										1			1	1				
Orientale	MA007	Berkane	MA007002	Children																			
				Adults	1										1			1					
				Total new cases	1										1			1					

Area L1	UAC L1	Area L2	UAC L2	Age Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Orientale	MA007	Driouch	MA007003	Children	1																		
				Adults				2	2					1							1		
				Total new cases	1			2	2					1							1		
Orientale	MA007	Figuig	MA007004	Children																			
				Adults		1	1				3				2	1							1
				Total new cases		1	1				3				2	1							1
Orientale	MA007	Guercif	MA007005	Children		2																	
				Adults	2	3		1	1	1										2	1		
				Total new cases	2	5		1	1	1										2	1		
Orientale	MA007	Jerada	MA007006	Children																			
				Adults																			
				Total new cases																			
Orientale	MA007	Nador	MA007007	Children			2																
				Adults	1		1	1		1	2	2	1		1					2		1	
				Total new cases	1		3	1		1	2	2	1		1					2		1	
Orientale	MA007	Taourirt	MA007008	Children																			
				Adults			2	2	1		1		1			2	1	4					
				Total new cases			2	2	1		1		1			2	1	4					
Rabat-Salé-Kénitra	MA008	Skhirat-Temar	MA008001	Children																			
				Adults				1							1								
				Total new cases				1							1								
Rabat-Salé-Kénitra	MA008	Rebat	MA008002	Children																			
				Adults	2				1	1		1		1		1				1			
				Total new cases	2				1	1		1		1		1				1			
Rabat-Salé-Kénitra	MA008	Salé	MA008003	Children																			
				Adults	1	2		2	1				3		1	1	2	1					
				Total new cases	1	2		2	1				3		1	1	2	1					
Rabat-Salé-Kénitra	MA008	Kénitra	MA008004	Children	1			1	1								1						
				Adults	1		3	2	4	2		3	2	1	1	2	1		1		1	1	
				Total new cases	2		3	3	5	2		3	2	1	1	2	2		1		1	1	
Rabat-Salé-Kénitra	MA008	Khémisset	MA008005	Children																			
				Adults										1	1		1	1					
				Total new cases										1	1		1	1					
Rabat-Salé-Kénitra	MA008	Sidi Kacem	MA008006	Children						1			1		1	1		1					
				Adults	6	4	4	4	2	2	2	1	2		1			2	1	2	1	1	1
				Total new cases	6	4	4	4	2	3	2	1	3		2	1		3	1	2	1	1	1
Rabat-Salé-Kénitra	MA008	Sidi Slimane	MA008007	Children																			
				Adults					1	2		2				2		1					
				Total new cases					1	2		2				2		1					
Souss-Massa	MA009	Agadir-Ida Ou Tanane	MA009001	Children																			
				Adults							1	1			1								
				Total new cases							1	1			1								
Souss-Massa	MA009	Chtouka Aït Baha	MA009002	Children																			
				Adults							1					1	2						
				Total new cases							1					1	2						
Souss-Massa	MA009	Inezgane-Aït Melloul	MA009003	Children																			
				Adults					2							1					1		
				Total new cases					2							1					1		
Souss-Massa	MA009	Taroudant	MA009004	Children																			
				Adults							1		2				1	1					
				Total new cases							1		2				1	1					
Souss-Massa	MA009	Tata	MA009005	Children																			
				Adults																			
				Total new cases																			
Souss-Massa	MA009	Tiznit	MA009006	Children																			
				Adults																			
				Total new cases																			
Tanger-Tétouan-Al Hoeceima	MA010	Al Hoeceima	MA010001	Children				2															
				Adults			1					1		1		1					1	1	
				Total new cases			1	2				1		1		1					1	1	
Tanger-Tétouan-Al Hoeceima	MA010	Chefchaouen	MA010002	Children				1															
				Adults	4	1	1		4	3	5	5			7	7		1			2	1	1
				Total new cases	4	1	1	1	4	3	5	5			7	7		1			2	1	1

Area L1	UAC L1	Area L2	UAC L2	Age Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Tanger-Tétouan-Al Hoeceima	MA010	Fahs-Anjra	MA010003	Children																	1		
				Adults																			
				Total new cases																	1		
Tanger-Tétouan-Al Hoeceima	MA010	Larache	MA010004	Children				1						1							1		
				Adults	7	1	10	1	4		4	3	7	6	8	3	5	3	2	2	4	1	
				Total new cases	7	1	10	2	4		4	3	7	7	8	3	5	3	2	2	5	1	
Tanger-Tétouan-Al Hoeceima	MA010	M'diq-Fnideq	MA010005	Children																			
				Adults								1	3	2		2	1		1				
				Total new cases								1	3	2		2	1		1				
Tanger-Tétouan-Al Hoeceima	MA010	Tangier-Assilah	MA010006	Children																			
				Adults	1	1	2		2	1	1	3		3	1					2	2		
				Total new cases	1	1	2		2	1	1	3		3	1					2	2		
Tanger-Tétouan-Al Hoeceima	MA010	Ouezzane	MA010007	Children		1	1					1											
				Adults	1	2	6	2	3	2	6	3	2	3	1		1		1				
				Total new cases	1	3	7	2	3	2	6	4	2	3	1		1		1				
Tanger-Tétouan-Al Hoeceima	MA010	Tétouan	MA010008	Children																			
				Adults	2	3	1			3	2	3	6	2	3		2					1	
				Total new cases	2	3	1			3	2	3	6	2	3		2					1	
Laâyouna-Sakia El Hamra	MA011	Boujdour	MA011001	Children																			
				Adults																			
				Total new cases																			
Laâyouna-Sakia El Hamra	MA011	Es Semara	MA011002	Children																			
				Adults																			
				Total new cases																			
Laâyouna-Sakia El Hamra	MA011	Laâyouna	MA011003	Children																			
				Adults	1																		
				Total new cases	1																		
Laâyouna-Sakia El Hamra	MA011	Tarfaya	MA011004	Children						1													
				Adults																			
				Total new cases						1													
Dakhla-Oued Ed-Dahab	MA012	Aousserd	MA012001	Children																			
				Adults											1								
				Total new cases											1								
Dakhla-Oued Ed-Dahab	MA012	Oued Ed-Dahab	MA012002	Children																			
				Adults									2		1								
				Total new cases									2		1								

Figure 7: Serial maps showing the progression of Morocco through the phases of elimination of leprosy



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